ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

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Volume 1
Executive summary

Introduction

This is the last interim report of project 3.2 before the final report due in October of this year. It comes at a time of intense work in progress and can, therefore, only offer an instant snapshot of the current state of work. This is obviously a bit difficult when the work consists of elaborating scenarios, as scenarios have to go through several cycles of writing and re-writing, based on brainstorming, expert validation and (political) consultation. Presenting a report in the middle of this process is obviously a bit awkward. Thus, we ask the reader to consider this report as what it is: an **intermediate** report, presenting **draft** results which will probably already have been reworked when this report is read.

This said, work has advanced quite a lot since the last report (March 2005) and things are getting closer to their final shape, thus allowing a first glimpse at what the final product(s) of this project will look like. This is a very complex project, combining very different tasks and very different aspects within these tasks. We have, therefore, decided to divide the reports into several volumes, thus allowing the reader to choose the parts she is most interested in.

This **first volume** contains an **executive summary** of the project, presenting the most important findings and advancements of the project. In addition, we summarise the main political messages that can be extracted from our work. Finally, this volume takes up the tables of contents of all the other volumes in order to allow easy 'navigation' through this vast amount of information.

The **second volume** presents the **final versions of the thematic knowledge bases and scenarios**, already presented in draft form in the second interim report and reworked and shortened since then. This volume is of particular use to those who are looking for an overview of the current state of knowledge in a specific field or those who would like some inspiration concerning possible spatial impacts of sectoral policy options or particular evolutions of exogenous driving forces.

In the **third volume** we offer a first look at what will become the **integrated territorial scenarios**. These are the first public drafts and will certainly need discussion and revision in the next phase of the project. The baseline and the two prospective, roll-forward scenarios are more advanced than the proactive, roll-back scenario for which we only present a proposal of a final image, which will have to be politically validated before we can go on with this scenario. Finally, we propose some reflections on the use of wild cards for the testing of these scenarios, as well as first results of some brainstorming on visualisation.

The **fourth volume** is probably the most 'scientific' volume of this report. It gives you a tour of the 'engine room' of the project, showing most of the quantitative work done in support of the scenarios, on models (**MASST** and **KTEN**), on indicators (**ETCI**) and on long-term data (**LTDB**). All of these components of the project develop highly innovative methodologies for territorial analysis. The second part of this volume is dedicated to the **communication and validation process** of the scenarios.

In the **fifth volume** we explain the work done concerning the project's task of supporting the ESPON Coordination Unit in the **scientific coordination** of the entire ESPON programme. This includes technical aspects such as the **ESPON Database and MapKit**,

but also more content oriented issues such as the selection of **ESPON Key Indicators** and the elaboration of an E**SPON 'Binder'** containing important information for ESPON projects.

Finally, in the **sixth volume** we present the current state of reflection and work on the advancement of a **territorial impact assessment/analysis (TIA)** methodology, proposing both a theoretical discussion of how 'territorial cohesion' could be interpreted and a practical proposal for an umbrella methodology, allowing to treat analyse policy sectors in a differentiated, but coherent manner.

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Executive Summary

1. Introduction

This project aims at responding to two main questions:

1) **How will the European territory evolve until 2030 ?**
2) **How will different policy choices influence this evolution ?**

This should lead to the description of policy options, especially linked to a roll-back scenario describing possible paths towards a European territory corresponding to the policy goals defined today.

This report is the last interim report of the project before the final report in October 2006. As such it is the last occasion to present the work in progress and to submit the choices made to external scrutiny. However, while reading this report, and particularly volume 3 on the integrated scenarios, **please bear in mind that this is an instant snapshot of an ongoing process**. As the scenario building process is qualitative and cyclical (see next section), looking at its state in the course of one of the cycles obviously means that the reader only gets a partial impression of what the final product will look like. This also means that some of the elements in the scenarios are weaker then others and that the entire battery of support tools to the scenarios has to go through more interactive revisions.

In light of the highly political nature of this particular project, this entails **the risk of misinterpretation and misuse of the current 'results'.** We, therefore, urge the reader to take this report for what it is, i.e. preliminary, draft versions of the scenarios which still have to go through a first phase of political validation. These scenarios are to be understood as the first basis of discussion and the feedback collected will flow back into a new cycle of revision, both of the scenarios themselves and of the tools developed in their support. More interaction will, therefore, be necessary between this project and the ESPON Monitoring Committee in the next 6 months.

1.1 For the impatient: A very short answer to the main questions

In a very early stage of the project one of the team members wrote in a first scenario sketch: **'Europe will not lose its spatial macrostructure which has been created during the last 1000 years of its modern history'**. This is, in short, the main answer to the questions raised in this project. It can be justified by arguing that most of the determinants of spatial structures have a very strong self-reinforcing nature. In a very blatant example, metropolitan areas will not become rural areas and (except for a few exceptions – mainly linked to industrialisation) vice versa. On the contrary, the metropolitan character of certain areas attracts certain types of activities and certain types of populations which reinforce this same metropolitan character. And policy cannot do very much about this.

It is, however, only the short answer. Obviously, the situation is a bit more complex as soon as one takes a closer look at the different regions in Europe and their evolution. Even if the macrostructures are relatively stable, the contents of these structures might change. At the same time, some (mainly 'exogenous') territorial challenges transcend the classical elements defining spatial organisation and even if they, therefore, not change the overall structure, their impact remains of importance for regional development issues.

The main aim of ESPON in general, but of this project in particular, is to take a closer look and to evaluate what the main trends, challenges and opportunities are for European territorial development.

1.2 A brief reminder of the methodology

This project proceeds to a more differentiated evaluation of spatial trends by elaborating future scenarios in support of informed decision making. The team approaches scenario writing as a cyclical process. Each cycle can be characterised by the following elements:

- Assessment and revision of existing knowledge in order to identify trends and driving forces
- Definition of policy relevant hypotheses
- Elaboration of a scenario story based on hypotheses, trends and driving forces
- Evaluation of the territorial impact of the story and elaboration of (future) territorial images

Each of these elements builds on the others and the cycles have to be run through several times. This process involves constant back and forth movements at different levels:

1. between the basic information about trends and driving forces and the scenario stories
2. between the qualitative scenarios and quantitative tools
3. between the scientific team and the policy stakeholders (MC)

So far the team has gone through four such cycles:

- First cycle: thematic scenario bases + definition of thematic scenario hypotheses
- Second cycle: draft thematic scenarios
- Third cycle: finalisation of thematic scenarios integrating feedback
- Fourth cycle: draft integrated scenarios

We are, currently in the last phase of this third cycle, presenting in this report first draft integrated scenarios and awaiting feedback on them. This will then lead into the fourth cycle which will allow the revision of the scenarios themselves, but also of the quantitative support tools and of the scenario knowledge bases wherever necessary. This cycle should come to its end by September this year, when the elaboration of the final report will begin.

2. Results? (Vol 2 & 3)

When working with scenarios of the kind elaborated in this project it is a bit awkward to speak of 'results'. **Policy scenarios are speculative by definition and are meant as thinking aids and discussion basis in the context of policy making, not as definitive scientific statements of 'truth'.**

However, we can extract some of the policy-relevant elements identified in the integrated scenario base and the scenarios. For the results of the thematic scenarios, please refer to the summary in the second interim report and to volume 2 of this report.

We will begin by giving an overview of the current trends and driving forces observed. Then we will present the current findings of the roll-forward scenario. Finally, we will briefly relate the state of the roll-back scenario.

2.1 Simple Complexities: Current state of the European territory

In the early 2000s, a number of trends push Europe towards territorial cohesion, while others are counteracting such processes.

The concentration of population and activities in the central parts of the European territory is the dominating factor of territorial imbalances. At EU-15 level, a high

concentration of economic activity and population in the central area or Pentagon, which covers 18% of the EU15 land area while accounting for 41% of population, 48% of GDP and 75% of expenditure on R&D. New trends show however signs of a more balanced development, with the growth of a number of urban areas in peripheral parts of the EU, including[1]:

- an extension of the core towards the east with growth of cities such as Berlin, Munich and Vienna;
- capital cities in Scandinavia, Stockholm and Helsinki, in particular, have become strong economically especially in new technologies;
- a number of urban areas in peripheral parts of the EU, such as Dublin, Athens and Lisbon, have also experienced significant growth in GDP per head over the past decade;
- a number of urban regions located outside the core seem to have a population and economic potential strong enough to attract research activities and to link up over time with the main European, and even international, centres of decision making.

[1] Third Cohesion Report. 2004. P. 27-28

Drivers of spatial development: Polarisation and dispersal areas

(see Figure 1)

Polarisation areas

The combination of demographic and economic criteria provides a global picture of metropolitan areas of ESPON29 in 2000. These metropolitan areas are based on the multiscalar analysis of population density and GDP per capita at local and medium scale. What is important in terms of polarisation is the situation as compared to neighbouring territories. With a baseline scenario of metropolisation (concentration of population in most important urban areas) and economic competitiveness (concentration of invests and activities in most developed territories), the area represented in red on the map are the most likely to gain population and to increase their GDP/inh. as compared to the neighbouring ones. ***We assume here a model of negative spillover (backwash effects) with increasing spatial differentiation****.*
The fact to measure polarisation at medium and local scales (50-100-200 km) implies that it is possible to find growth poles in all parts of the European territory and generally at least one in each country. The only exceptions are the Czech republic, Slovenia or Estonia where the capitals are not sufficiently important to balance the attractiveness of neighbouring territories with higher density and/or higher GDP per capita. In many states, we observe several areas of potential growth like in Spain, Portugal, Greece, Portugal or Italy. In North-Western Europe, we have rather an axial pattern with a continuous set of growth poles along the 'Blue Banana', from Northern Italy to UK.

Dispersal areas

Dispersal areas represent the reverse situation of territories which are strongly polarised by neighbouring metropolitan areas, in economic or demographic terms. The weakness of these areas can be related either to relatively low density or relatively low GDP per capita as compared to neighbouring territories. As the map is expressed in absolute terms, it focuses on the peripheral areas with relatively high population density i.e. areas which are potentially able to be the origin of important flows of out-migration towards attractive areas (polarisation areas). ***Under the assumption of growing polarisation and negative spillover effects, these areas will be clearly the 'losers' of the future dynamics of the European territory. But on the other hand, we can also consider that these areas can be privileged destinations of investment flows from neighbouring metropolitan areas looking for low cost labour force or recreational activities.*** *These territories represent the majority of the whole ESPON area and can be found in all ESPON member states. They represent the majority of the area in many countries, especially France, Czech Republic, Slovakia, Slovenia, Poland, Bulgaria Hungary and Greece. They are less frequent in Nordic countries because the population density of northern peripheries in not sufficient to generate important push effects in absolute terms. The situation of the northern peripheries is in a sense worse than the one of the countries with high push factors as they cannot benefit from important redistribution of neighbouring regions.*

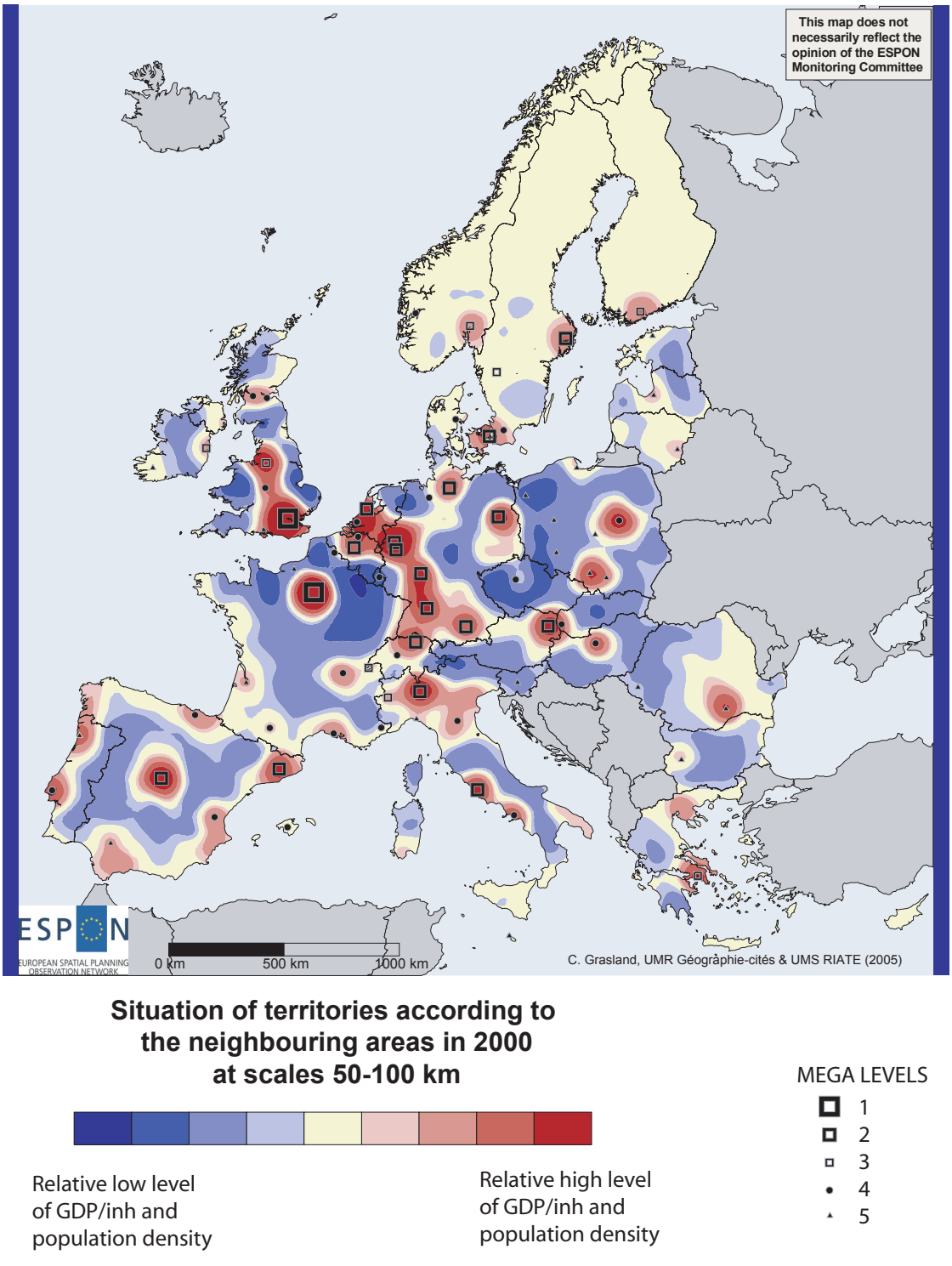


Figure 1 Polarisation and diffusion areas

In a Europe-wide perspective, countries and regions with the **most constraining demographic evolution** (strong population ageing and negative migration balance) are to be found in the eastern periphery and in some parts of the southern, northern and western peripheries. In the more central parts of the wider Europe, this type of negative evolution can mainly be identified in large parts of the new German Länder and in central France. Demography can be considered as a positive factor for the evolution of various countries and regions. These are largely concentrated in the central parts of the wider Europe, such as the regions of the "Blue Banana" from the British Midlands to northern Italy as well as the regions of the French Atlantic coast, the Loire and Rhône regions, parts of Catalonia, but they also comprise a large number of peripheral regions, especially the metropolitan areas.

By 2005, **issues of economic dualisation and socio-cultural integration** have already reached a significant level in a number of countries, even if violent manifestations (such as recently in France) were so far rather the exception. In territorial terms, the metropolitan regions are more affected than rural areas. The Pentagon is however not the only part of Europe where issues of socio-cultural integration arise. These problems also exist in the eastern periphery as well as in the southern periphery of Spain and Italy.

Accelerating globalisation favours the regions with the most advanced economies or with specific comparative advantages such as cheap labour force. In this respect, in Europe metropolitan areas are largely favoured, when compared with the more rural areas, but a number of east-European regions are witnessing significant foreign investments because of lower labour costs. **The east/west divide is progressively being replaced by a metropolitan/non metropolitan divide** and this trend is likely to become stronger over time, although a number of factors such as the part of the population with a high education level, the expenditures in R&D activities and the registration of patents still favour the western regions, especially those of the Pentagon and of Northern Europe.

With regard to **accessibility and transport infrastructure endowment**, Europe is characterised by a **clear east-west divide in terms of motorway density by inhabitant**. A catching up process has started in Central and Eastern Europe and is favouring mainly the major corridors connecting metropolitan areas among themselves and with the EU-15. **The picture is rather different when it comes to potential European multimodal accessibility**. The divide is clearly between the Pentagon and the peripheries, irrespectively of their eastern, southern, western or northern location. A striking aspect of this differentiation is that large parts of the new member countries of Central and Eastern Europe, especially the parts adjacent to the EU-15, have a multimodal accessibility level much higher than that of a number of EU-15 peripheries. The new member/accession countries and regions with very low European multimodal accessibility are in particular the Baltic States, Bulgaria, the eastern parts of Romania, Cyprus and Malta.

In terms of territorial cohesion, the emerging **new energy paradigm** is likely to have contrasted impacts. It certainly will be less detrimental for the regions, the economy of which is the least dependent upon transport functions and costs. These are the more central regions of the Pentagon. It will also be less harmful to the regions with a lower share of traditional, energy-consuming manufacturing activities. The regions which will benefit from it are those where renewable energy can be produced or exploited, such as fertile rural regions and forestry regions (biomass and biofuels), southern regions (solar energy), coastal and hilly regions (wind energy). Recent transport policies, not only in the new member states, again favour road transport over more sustainable transport modes. It seems that this evolution has not yet integrated the new energy paradigm. In more general terms, **the new energy paradigm will certainly be an obstacle to the development of mobility and it will favour substitution to physical mobility through telecommunications**. It is also likely that the **location patterns of households will change and will favour areas well serviced by public transportation at the expense of locations distant from cities and only accessible by cars**. More compact cities will result from this evolution.

As far as the potential geographical distribution of **climate change impacts** is concerned, a first, tentative attempt to regionalize impacts in Europe is presented below. Two aspects are taken into account; the impacts themselves, and possible mitigation and adaptation measures:

- *Coastal plains and delta areas* are confronted with increasing risk levels of inundation.
- *River valleys in Northern and Eastern Europe* will have to deal with increased flooding.
- *Mountainous areas* are in two ways vulnerable. One is decreasing winter tourism as a result of declining snow cover. A second issue is the vulnerability of ecosystems to global warming.
- *Southern European agricultural areas* will be affected by water shortages.
- *Southern European cities* are confronted with water shortages and heat waves. These problems might affect quality of life in such a manner, that these cities loose attractiveness and people and businesses start to move out.
- *Southern European tourism areas (coasts)* could suffer decreasing numbers of visitors in summer due to risk of heat waves and water shortages.
- *Northern European fringe north of current agricultural areas* might prepare for increasing possibilities of a change to agricultural production.
- *Depopulated areas in Southern Europe* are now facing problems of desertification.
- *Depopulated areas in Northern and Eastern Europe* can be attractive not only for forestation to create carbon sinks. If technological developments head for biofuel, these regions might convert themselves to one of the world's main producers.

Summing up, the **territorial impacts of climate change are likely to be rather**

detrimental to territorial cohesion, although a number of rural or peripheral/disadvantaged regions could draw some benefits in future, in particular in the northern half of the EU.

It is important to observe that **close interactions exist between climate change and the energy sector**. While the general warming up is reducing energy demand for heating (spring, autumn and winter time), it also increases energy demand for air conditioning, in particular in southern regions. Drought is also responsible for the reduction of hydro-power potential in southern regions and therefore for the increase of demand of other types of energy supply. **The ongoing changes in the present balance between climate and energy are therefore rather detrimental to territorial cohesion.**

In the early 2000s, a number of **new technologies** are emerging in a variety of fields (biotechnologies, nanotechnologies, energy and transport technologies, ICT etc.). The territorial impacts of the generalisation and maturation of such technologies will very much depend upon the use which is made of them. It seems however that **a number of these technologies have a potential for benefiting to territorial cohesion if they are properly applied**.

The present evolution in the **transport sector** is rather contradictory as far as territorial cohesion is concerned. The renewed emphasis on road transport makes possible the improvement of accessibility in peripheral regions, the (provisional) reduction of congestion in the more central ones and the catching up of the new member countries in terms of infrastructure endowment. In this respect, it can be rather beneficial to territorial cohesion. However, **with respect to the changing energy paradigm, present policies favouring road and motorway transport should be considered as short-term ones**, because the steady oil price increase will be detrimental to road transport in general and demand for other transport modes is likely to increase. **The objective of territorial cohesion calls for a reconsideration of transport policies integrating the new energy constraints as well as a higher degree of sustainability.**

Environmental sustainability, as a component of territorial cohesion, **is improving in a number of fields**, but **new threats are also emerging**. The Framework Water Directive in the EU is likely to significantly contribute to the conservation of water resources at the scale of river basins. Climate change is likely to further constrain the availability of water in the southern European regions. A potential risk exists of a revival of intensive agriculture related to the production of energy crops and of raw materials for industrial purpose. As far as natural areas are concerned, the implementation of the Natura 2000 programme is undoubtedly a progress, but a reduction of protection measures in semi-natural areas outside the Natura 2000 schemes can be observed. Natural areas in Southern Europe are increasingly threatened by drought which regularly causes devastating forest fires. The abandonment of a number of rural areas (desertification) is damaging for cultural

landscapes. Pressures on natural areas are also being observed on numerous coastal regions, resulting from the steady densification process.

A number of changes in **lifestyles** are likely to have impacts on territorial cohesion at micro-scale. Changes in **mobility** are noticeable, under the influence of both ICT (tele-work, e-shopping, e-services) and, even more, of increasing energy price. With population ageing, the mobility patterns are also changing. Settlement systems will be affected by new mobility trends. Changes can also be observed in **leisure patterns**. New forms of tourism are developing, with shorter duration but with higher cultural or activity content. Most important changes in lifestyles have taken place in the new member states during the transition period and are still going on, the most significant features being travelling, changing consumption patterns and increasing motorisation.

Territorial integration is progressing throughout Europe. The most striking manifestation has been the **progressive integration between Eastern and Western Europe** since the 1990s after several decades of Iron Curtain. Less impressive but also powerful is the territorial integration along national borders within the EU and also with Switzerland and Norway. Although a similar process is developing in the new member countries of Central and Eastern Europe, cross-border permeability remains limited.

2.2 Back to the future: Where are Europe's regions heading ?

In order to explore the future evolutions of European regions and the overall spatial structure of the ESPON space, the team, in collaboration with the ESPON Monitoring Committee, decided to elaborate three roll-forward scenarios, one baseline and two prospective policy scenarios. The latter were defined using two 'axes' of policy making, not necessarily opposing each other, but implying different priorities (see Figure 2): on one axis policy choices are lead by the desire for cohesion, on the other axis they are determined by the desire for competitiveness, including of Europe as a whole. The combination of the two priorities in a non-contradictory way was defined as the 'ideal' situation and thus characterizes the final image of the roll-back scenario which aims at exploring possible paths (and contradictions on these paths) towards this ideal.

For the three roll-forward scenarios, brainstorming within the team, several discussions with the Monitoring Committee and a regional validation exercise at the ESPON seminar in Manchester in November 2005 have led to the definition of a series of hypotheses, of which the most important are listed in Table 1 allowing an easy comparison between the three scenarios.

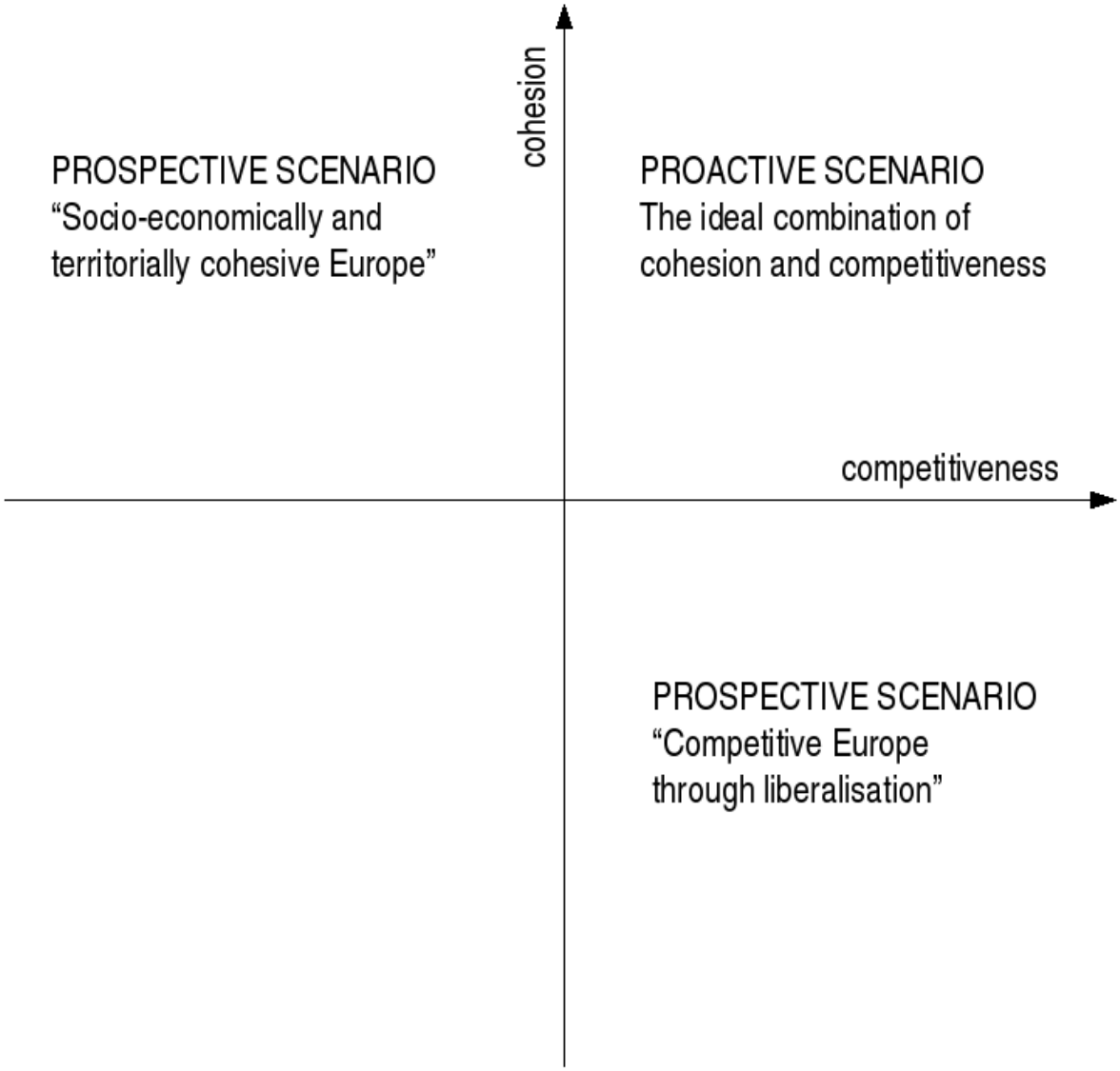


Figure 2 The axes defining the integrated prospective policy scenarios

Baseline scenario	Competitive Europe	Cohesive Europe
Demography - Fertility down and mortality down => population ageing - Total European population stable (+ enlargement) - Increased, but globally controlled external migration - no change on constraints to internal migration	**Demography** - increase in selective (economic sectors & destination) external in-migration - abolishment of constraints to internal migration - increase in retirement age - encouraging fertility rate through fiscal incentives	**Demography** - restrictive external migration policies - more flexible retirement ages - encouraging fertility rates (=> encourage better balance of population structure) - more flexible arrangements for child care
Economy - slowly increasing total activity rate - slowly growing R&D expenditure, but constant technological gap to USA - decrease of public expenditure	**Economy** - sustained increase of activity rate - flexibilisation of labour markets - stronger reduction of total public expenditure than in baseline scenario - further privatisation and liberalization of public services	**Economy** - increasing activity rate, in particular in peripheral regions - maintaining the volume of EU budget - reinforcement and strong focus of structural funds on weakest regions - further harmonization of taxation and social security systems
Energy - steady increase of energy prices - European consumption stable/decreasing - increase of the use of renewables	**Energy** - steady increase of energy prices - European consumption increasing - realisation of TEN – E: investment in infrastructure according to market demand	**Energy** - steady increase of energy prices - realisation of TEN-E - promotion of decentralised energy production (in particular renewables)
Transport - constant increase of infrastructure endowment - constant congestion levels - application of the Kyoto Agreement	**Transport** - realisation of TEN-T: investment in infrastructure according to market demand - priority to links between metropolitan areas	**Transport** - development of TEN-T with priority to peripheral regions at different scales - support to transport services in rural and less developed regions
Rural development - further liberalisation of international trade - progressive reduction of CAP budget	**Rural development** - rapid and radical liberalisation of CAP (reduction of tariffs, of budget and of export subsidies) - reduction of support to rural development policy	**Rural development** - minor CAP reforms, but shift from pillar 1 to pillar 2. - priority to environmental and animal health criteria - active policy for diversification of rural areas, including SMEs, tourism, residential

		functions etc.
Socio-cultural sector - increasing polarisation between socio-cultural groups - growing socio-cultural (ethnic, religious, and social) tensions	**Socio-cultural sector** - reactive management of social problems in large cities - increase of surveillance and security systems	**Socio-cultural sector** - promotion of regional and European identities - proactive socio-cultural integration policies, in particular in cities - increased fiscal and/or social investment in quality of life issues
Governance - increasing cooperation between cross-border regions - increase in multi-level and cross-sectoral approaches, but limited to specific programmes (rural development);	**Governance** - abolishing barriers to cross-border cooperation - less public intervention - reinforcement of the Open Method of Coordination - increased role of private sector in decision making	**Governance** - active multi-level territorial governance, in particular in areas supported by structural funds - strong role of public actors in territorial governance - stronger role for the European Commission
Climate change - Moderate overall climate change until 2030 (+1°) - Increase of extreme local events - Constant emission levels - Few (too little) structural adaptation measures	**Climate change** - constant to increasing emission levels - mitigation measures based on flexible schemes & stimulation of alternative technologies. - adaptation measures only where cost efficient	**Climate change** - constant emission levels - strict mitigation measures (taxes, road pricing as far as non detrimental to peripheral regions) - wide range of adaptation measures (EU hazard funds, large investments)
Enlargement - by 2008 Bulgaria & Romania - by 2020 Western Balkans - by 2030 Turkey - continued combination of deepening and widening - modest impact of neighbourhood policy	**Enlargement** Continuing enlargement to widen the market: - Romania, Bulgaria 2008 - Western Balkan 2015 - Turkey 2020, possibly Ukraine - Strengthening of the neighbourhood policy (Maghreb, Russia etc.)	**Enlargement** - deepening preferred to widening - break on further enlargement (except Bulgaria & Romania, which enter later than foreseen) - only lip service to neighbourhood policy

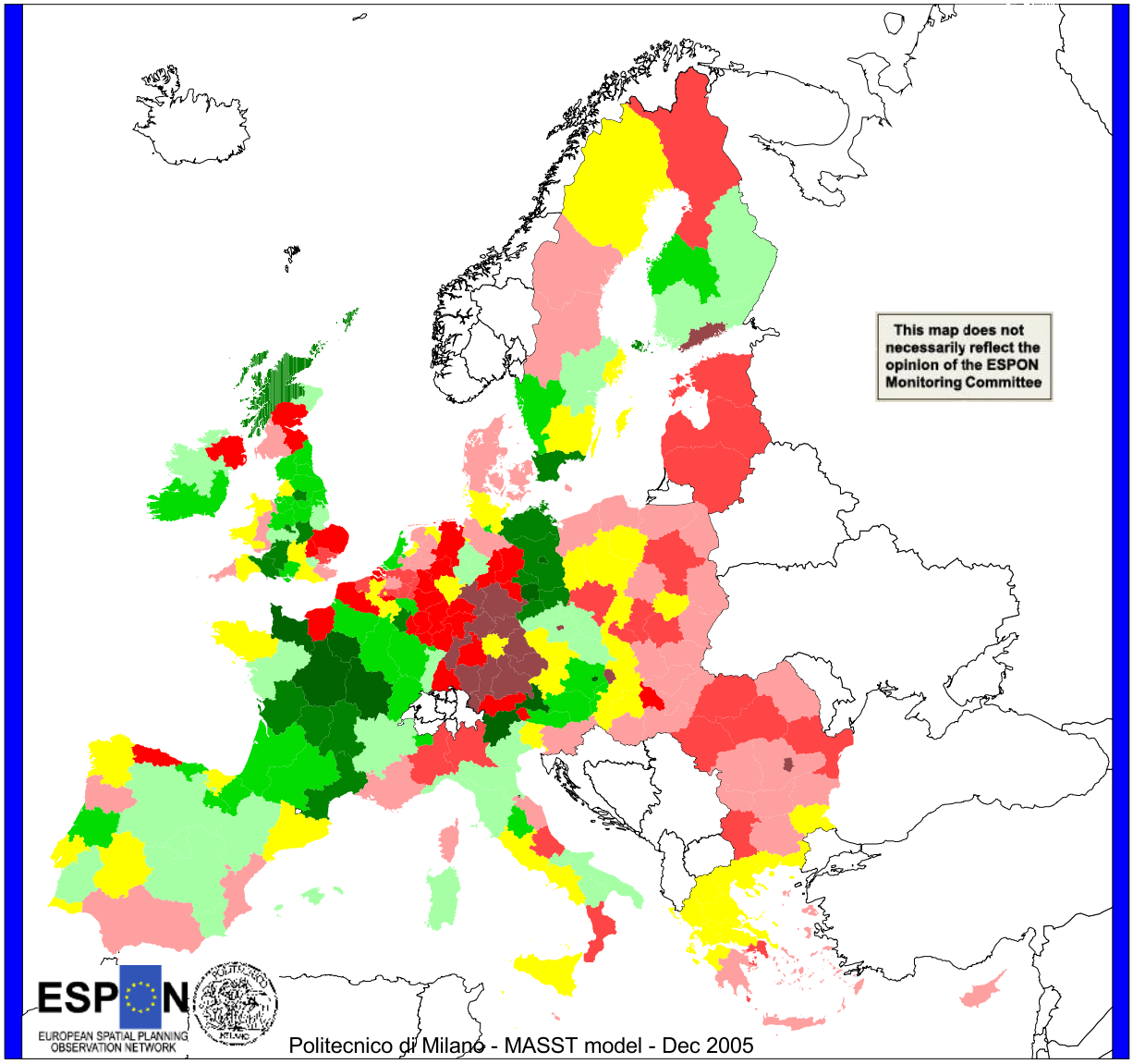
Table 1 Hypotheses for the baseline and the two prospective scenarios – global overview (unless stated otherwise, the hypotheses of the baseline scenario are also valid for the two other scenarios)

2.2.1 The Baseline scenario: territorial issues arising in 2030 from the baseline scenario

NB: the issues are described from the point of view of an observer situated in 2030

Europe-wide level

Significant regional economic disparities still exist in Europe by 2030, but less between East and West, as had been the case in the early 2000s, and more between metropolitan areas and remote rural regions with low attractiveness (see Figure 3).



3B: relative to EU25 gdp per person - difference 2015 -2002 - baseline scenario

- less than -15
- -15 - -10
- -10 - -5
- -5 - -2
- -2 - 0
- 0 - 2
- 2 - 5
- 5 - 10
- more than 10

Figure 3 Estimated GDP/cap (EU25=100) in 2015 – GDP/cap (EU25=100) in 2002 ; *preliminary* results of the MASST model

New global economic integration zones did not emerge; instead, the Pentagon has been widening along major corridors, encompassing a number of additional metropolitan areas. The wider Pentagon is by far the most competitive part of the European territory.

Differences in global accessibility between the wider Pentagon and peripheral areas remain significant by 2030 and are accentuated by the strong increase in the cost of transport (oil).

Outside the wider Pentagon, the level of economic development is more modest (except in a few large metropolitan areas and some tourist regions); it is however much more modest in the East than in the West. A significant amount of EU public resources allocated to weak regions (various types of infrastructures) has not generated significant amounts of private investments (weak leverage effect).

The pressure of illegal immigration is significant in most countries, but especially in those along the Mediterranean and eastern borders.

Intermediate level

The level of polycentricity has been diminishing in the new member countries of Central and Eastern Europe and, in a number of western, less developed regions. In the new member countries, the relative accessibility of areas along major corridors has increased. In more remote areas, it has been reduced.

City networks have consolidated in certain transnational areas (Baltic Sea Region; Triangle of the CEEC), but not in all transnational cooperation areas. In some of them, transnational integration is still weak and few economic and technological synergies have developed.

In a number of regions belonging to both East and West, the level of population ageing by 2030 is such that it generates a spiral of global decline and revival strategies are difficult to implement (see figure 4).

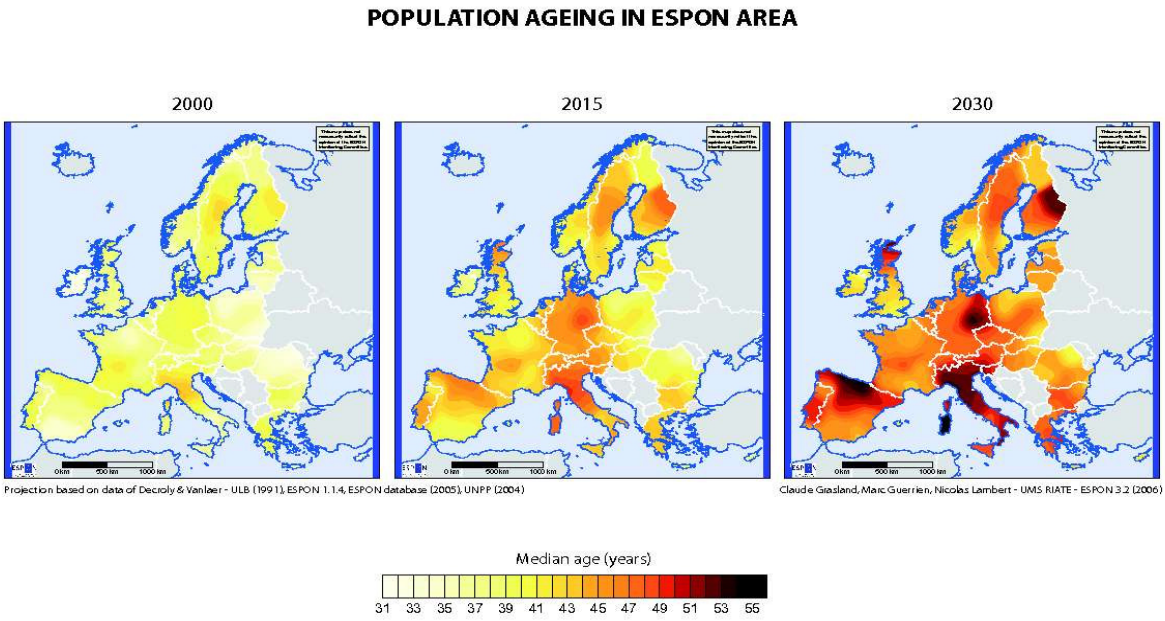


Figure 4 Estimated median age 2000, 2015 and 2030

In a number of southern regions, extreme climate events related to climate change in combination with a lack of prevention and adaptation measures have produced long-lasting and substantial economic and environmental damages, especially in rural areas.

Local/regional level

The internal socio-economic differentiation of cities has been strongly increasing, with some urban areas becoming more and more attractive and others more and more repellent. Differences in real estate prices within cities are such that they accentuate the segregation process. Gated communities have been developing;

Numerous retirees and self-employed have moved from cities towards attractive rural areas, where rents and real estate prices have strongly increased, generating housing problems for the local population;

A number of attractive coastal areas and mountain valleys are facing strong densification and urbanisation processes, generating pressure on traditional landscapes and on natural areas;

In fertile rural areas, the intensification of large-scale agriculture (export-oriented productions, energy crops) generates environmental problems (ground water pollution, soil erosion).

2.2.2 The prospective policy scenarios

For these two scenarios work is still in progress, with the final images still missing. We, therefore, only present a short summary of the main orientations of each of these scenarios and first results of the MASST model.

The **cohesion scenario** is a prospective, policy-oriented scenario in which the main priorities of public policies at EU level, in a context of growing globalisation, are focused on economic, social and territorial cohesion and not on global competitiveness. This does not mean that the improvement of competitiveness is excluded, but rather, that in case of incompatibility between cohesion and competitiveness (for instance if growing competitiveness is likely to increase territorial disparities), priority will be given to cohesion. It is however important to indicate that measures related to competitiveness in the context of structural policies are fully integrated in the scenario, even if they are likely to generate intra-regional disparities in less developed regions. It must be made clear that the scenario is a prospective policy scenario based on a strong cohesion policy and not a roll-back scenario minimizing regional disparities. Another major hypothesis is that the coming decades will be devoted to consolidating the enlarged EU in a balanced and sustainable way. Only Romania and Bulgaria will join the EU during the study period, while the neighbourhood policy will be focussed mainly on maintaining good relationships with immediate neighbour countries, quite independent of whether or not they are candidates to join the EU.

The **competitiveness scenario** is based on the assumption of a significant reshaping of EU policies originating in the poor results of the implementation of the Lisbon Strategy during the period 2000-2005. The low level of competitiveness of Europe compared with that of the USA and large emerging economies has called for an in-depth revision of public interventions, in particular at the EU level. The EU budget is being reduced and EU expenditures are being targeted towards R&D, education, ICT and strategic external accessibility, including in structural policies. The CAP is subject to rapid and radical liberalisation, with a significant reduction of support, of external tariffs and of export subsidies. The budget of structural policies is also being reduced, with a proportion of former EU interventions being re-nationalised and EU support being concentrated on the most competitive areas of less developed regions. As a counterpart, public services are further liberalised and privatised, labour markets are regulated in a more flexible way and

the third pillar of EU policies (foreign policy, justice and security) is being strengthened. Widening of the market through further EU enlargements is part of the strategy of increased competitiveness. After Romania and Bulgaria joining the EU in 2008, the Western Balkans will join in 2015 and Turkey and Ukraine in 2020. The neighbourhood policy is being strengthened and the Maghreb countries are integrated into the European Economic Area.

The **preliminary** MASST results give some interesting insights into the possible relative evolution of regional GDP according to the two scenarios (see figure 5).

The competitive scenario seems to generate somewhat stronger global economic growth at the EU-25 level, so that the EU25 average is higher than in the case of the baseline or the cohesion scenario. However, if we define territorial cohesion not in terms of total wealth, but in terms of relative wealth (gradients of wealth between regions), the MASST indicates, as expected, greater territorial cohesion for the cohesion-oriented policies through the smoothing of the more extreme differences in growth rates.

Generally, the cohesion-oriented scenario is quite close to the baseline scenario. In the competitiveness-oriented scenario, the pattern of regional economic growth between 2002 and 2015 is more divergent than in the other scenarios, with some areas improving more substantially their position in relation to the EU-25 average and others loosing significantly. The main winners of the competitive process are undoubtedly the regions of the Pentagon.

This evolution results in an increase of disparities in terms of economic development and employment opportunities, both within the member states and the EU as a whole. With significantly weaker cohesion-oriented structural support, with reduced CAP and under pressures of globalisation, the less developed regions undergo turbulent restructuring with reduced employment in agriculture and in rural areas. This results in faster depopulation of those areas and in lower investments in strategic infrastructure, human resource development and entrepreneurship. Polarisation of the European territory increases significantly.

In general, it is important to note, however, that in their current state the scenarios (and their quantitative formalisation) hint at the idea that **the choice of policy between a cohesion-oriented and a competitiveness-oriented approach might not be the most determinant element for the future of the spatial structure of Europe**. As already mentioned at the very beginning of this executive summary, this is due both to the fact that spatial structures have very strong inertia and that other driving forces (demography, climate change, energy prices, globalisation, etc.) have a much stronger effect than any policy could. This, therefore, **suggests that the debate on the future orientations of territorial development policies should shift in order to take into account these driving forces**.

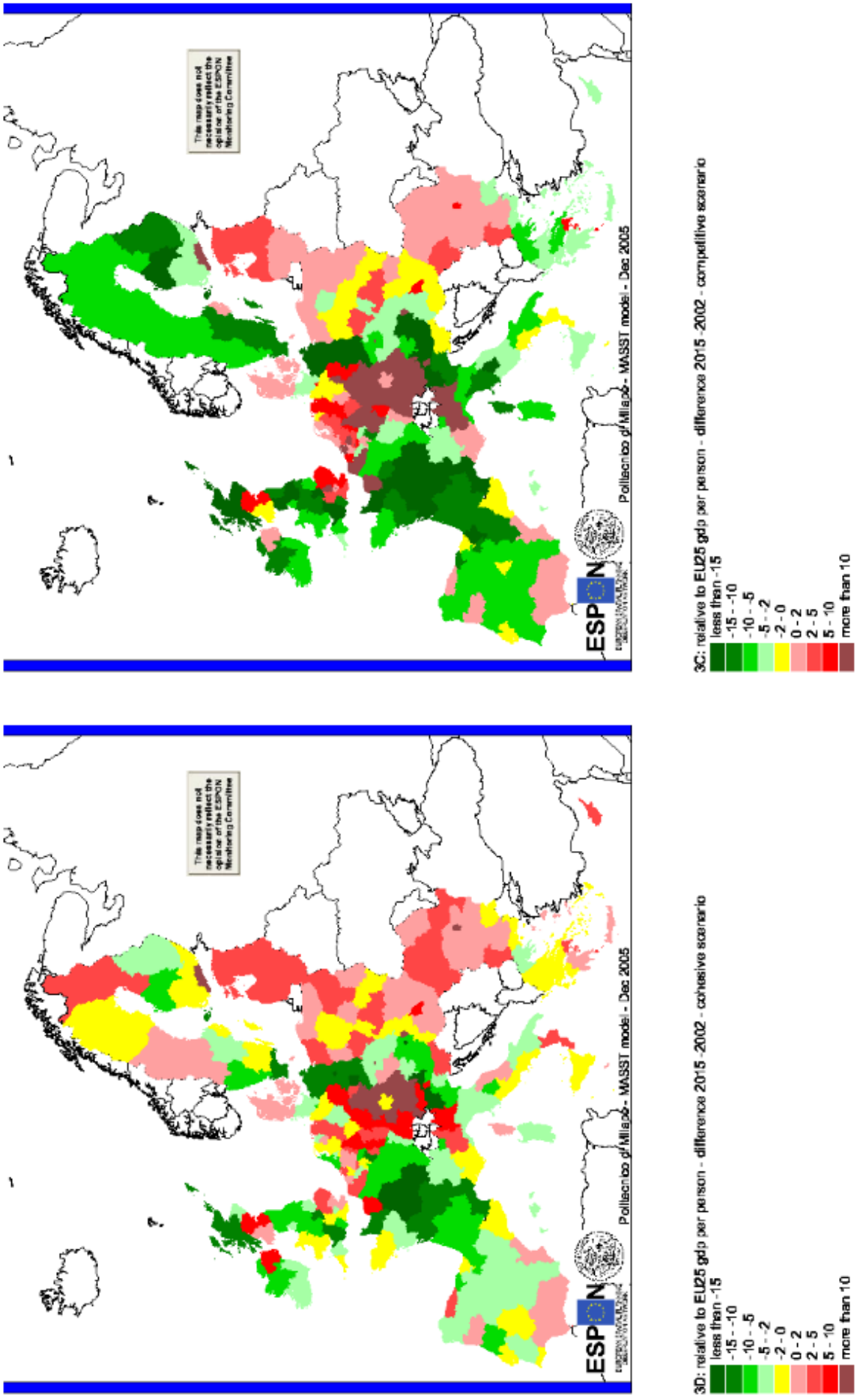


Figure 5 Preliminary MASST results for the cohesion and competitiveness scenarios – (2015 – 2002; EU25=100 for both years)

2.2.3 Speak your hearts desire: elements of a roll-back scenario

The Monitoring Committee has also requested the team to produce a roll-back scenario, which should be based on a final image of how Europe **should** look like in 2030. As mentioned earlier this was defined as being a combination of the two axes of competition and cohesion.

Once the final image elaborated and validated, the scenario will then describe one (or several) possible paths towards such a territorial structure and/or highlight potential contradictions inherent to the diverse policy goals expressed in this final image.

Although the request was to already provide a draft of such a scenario, the team has decided that it would not be very efficient to do so, until the roll-forward scenarios were more advanced. The latter will be used as a basis for the former and it is, therefore; necessary to first go through a validation of the baseline and the two prospective scenarios before building the roll-back scenario.

However, work has already gone into the definition of the policy goals, and in this report these goals are presented together with a first attempt at translating them into more concrete territorial elements.

3. What if? : Wild cards for testing the scenarios

As the ESPON 3.2 project deals with the conception of strategic scenarios for the future development of the European territory, Wild Card analysis can be useful in studying the internal reaction of the policy scenarios to certain external system shocks and to interpret some elements which were not included in the initial hypotheses.

In the framework of this project, the Wild Cards will serve as a sounding board for the developed scenarios, that is to say the baseline scenario, the two prospective scenarios, and the proactive scenario. The aim is to test qualitatively the reaction of each scenario to a panel of unexpected and potentially high-impact future developments. The assessment of the response of the scenarios to the selected Wild Cards can improve the understanding of how their individual parts interact with one another.

The process of the Wild Card analysis will be performed in three successive phases:

- Identification of the system to be tested
- Creation and description of the Wild Cards
- Application of the Wild Cards to the 4 scenarios

A first proposal for a selection of possible wild cards is presented in this report:

- Member State leaves the EU
- Middle East embraces democracy
- Russia 'blackmails' EU over energy prices
- Massive devaluation of the Euro??
- Collapse of fishing stocks in North Sea
- EU 'tax harmonisation' approved by core group of Member States
- Islamic expulsion from Europe
- Large-scale internal European migrations
- Nanotechnology Breakthrough
- Nuclear incident
- Atlantic tsunami
- Major river pollution incident

4. Measuring the future: quantitative tools in support of the scenarios (Vol. 4)

In order to support this qualitative speculative exercise, several tools were developed providing a quantitative (but nonetheless speculative) skeleton to the scenario stories. These tools are not to be understood as 'predictions' of how the future will develop, but as a quantitative formalisation of some of the driving forces identified allowing the application of the different hypotheses. Although these tools are obviously limited both by important data limits at regional scale and by the impossibility of formalising in mathematical language the entire complexity of regional development, they provide the advantage of being transparent and thus allowing a positivist scientific scrutiny, quality which lacks in the qualitative parts of the stories.

The team has, therefore, developed a regional economic model (MASST) as well as a freight and personnel transport model (KTEN), and elaborated some long-term projections of

indicators which are to capture the more holistic aspects of territorial development and cohesion, starting with socio-demographic issues (ETCI). In order to enable work on such projections into the future, work has also gone into the definition of a database model and implementation which allows the integration of long-term time series across changing definitions of indicators and geographical units (LTDB).

Figure 6 shows the interactions between the two models (representing the quantitative tools) and the general process of qualitative scenario building.

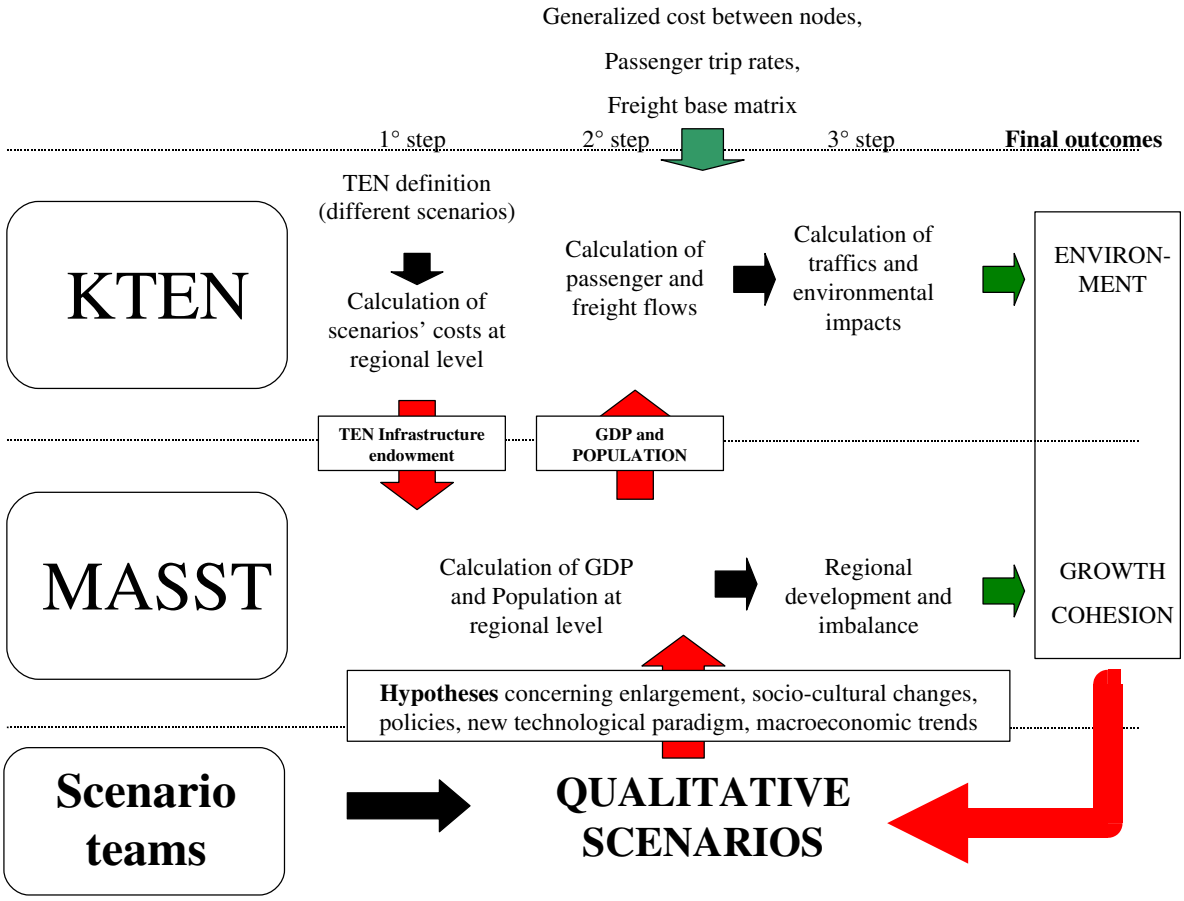


Figure 6 Scheme of interrelation between quantitative tools and scenarios

4.1 MASST (MAcroeconomic, Sectoral, Social and Territorial) Model

This report contains most of the work developed to obtain the estimates and the simulation of the quantitative scenarios within the ESPON 3.2. project. Since the SIR much progress has, therefore, been made. First of all, the conceptual logic of the MASST model has come

to a final formulation, which has also been 'tested' by presenting the theoretical approach of the model to a scientific audience in a conference. Secondly, the research group worked on the estimates of the past trends, and final results have been achieved also in this respect. Thirdly, the simulation step has been tackled and, working full time on the project, all phases of the simulation have been developed and preliminary results achieved. The simulation step required:

- qualitative assumptions on the scenarios. In this respect, the research team of the Politecnico of Milan has worked together will all other teams and elaborated the three scenarios: the baseline, the competitive and the cohesive scenario;
- the translation of the qualitative assumptions into quantitative ones. This step is a very critical one, and required a lot of work, reading official documents on future quantitative scenarios and elaborating on past and future trends of the exogenous variables;
- the implementation of the quantitative assumptions into the MASST model, and
- the mapping of the different results.

Because of the time constraints in which all these phases have been tackled, **the results presented have to be understood as <u>provisional</u>**. Refinements and adjustments to the quantitative assumptions can take place in the near future, and will be contained in the final report.

4.2 KTEN ('Know trans-European Networks')

KTEN, together with MASST, has been used to translate qualitative scenarios into quantitative ones, providing an economic, spatial and environmental strategic assessment of them. In particular, KTEN is used to define transport network scenarios and evaluate them.

KTEN is a passenger and freight traffic forecast metamodel developed to facilitate a strategic analysis of the trans-European Transport Networks in a wider pan-European and Mediterranean scale. It is a sequential Four-steps model, with combined modal split and assignment on multimodal networks.

KTEN's main outputs are multimodal passenger trips and costs and freight forecast between NUTS2 (disaggregated into NUTS3), traffics on rail, road, air and maritime links, relative European interest of road and rail links (considering interurban NUTS3 relation), spatial development and environmental aggregated indicators, all on the basis of the scenario hypotheses (and possibly others). The following steps have been accomplished:

- Definition of infrastructure scenarios using IGIS project database according to the scenarios sketched by ESPON 3.2 TPG, following expert criteria.

- Calculation of construction costs, which are sent to MASST.
- MASST provides provisional GDP and population forecasts.
- Calculation of travel costs between NUTS2 capitals for different transport modes in a year 2000 scenario and a complete scenario with all infrastructures finished.
- Creation of future passenger and freight matrices for the complete scenario.
- Assignment of matrices and calculation of indicators.
- Redefinition of infrastructure scenarios using calculated indicators.
- Calculation of construction costs, which are sent again to MASST.
- MASST provides GDP and population forecasts.

These steps are currently in process and will provide preliminary results very soon:

- Calculation of travel costs between NUTS2 capitals for different transport modes and all scenarios.
- Creation of future passenger and freight matrices for all scenarios.
- Assignment of matrices and calculation of indicators.

4.3 ETCI (European Territorial Cohesion Index)

The research concerning a European Territorial Cohesion Index in the first and second interim report lead to rather pessimistic results. Briefly said, we established that:

- The construction of synthetic indexes introduces an obvious contradiction between political significance and scientific quality.
- ETCI was initially conceived as a synthetic tool for the evaluation of prospective scenarios. But the growing importance of the concept of 'Territorial Cohesion' in

European debates has introduced suspicion on the potential use of this index for operational policies like allocation of Structural Funds.

- As far as ESPON is concerned, an ETCI should be based on the three dimensions of the ESDP which are (1) Economic competitiveness, (2) Social Cohesion and (3) Sustainable Development. Unfortunately, the data available at regional level focus mainly on the first dimension and there is an impressive lack of data on the social and environmental dimensions at regional level.
- It is certainly possible to improve the use of existing statistical material by a better use of spatial analysis tools but this improvement cannot replace the lack of social and environmental data.
- Generally speaking, the concept of territorial cohesion as it is presented in political documents implies an analysis of accessibility to services of general interest at local level which is impossible at NUTS2 or NUTS 3 level (SIR).
- Last but not least, one of the main interests of an ETCI is to elaborate long term series at regional level for Europe, based on reconstitution of past trends (1980-2000) and estimation of future trends (2015 or 2030) which is not possible for most variables of the actual ESPON database which cover only a short period (1995-2002).

Having established these important (despite negative) results, and taking into account the fact that other projects are concentrating their efforts on the production of synthetic indexes of ESPON results (2.4.2) and competitiveness (3.3), we have chosen to focus the effort of 3.2 on different priorities:

(1) Complete the quantitative support to scenarios on a major dimension which is complementary to accessibility (KTEN) and economic competitiveness (MASST) models.

For the evaluation of the policy scenarios extending the use of demographic variables to other dimensions than the one which was analysed by ESPON project 1.1.4 ('Demographic Trends') is, in our opinion, the most promising way to secure a social dimension.

We have, thus, worked out projections of median age, life-expectancy and a so-called 'remaining life' index combining the two. This index is defined by subtracting median age from life expectancy. The map in figure 7 shows that in 2030 large parts of the population of most European regions will have shorter a life span remaining than in 2000, with all this implies in relation to social and economic activity. The only areas which seem to avoid this to a certain extent are the dense areas of the Scandinavian countries, probably due to their proactive family policies and the South-East of England, mostly resulting from migratory movements.

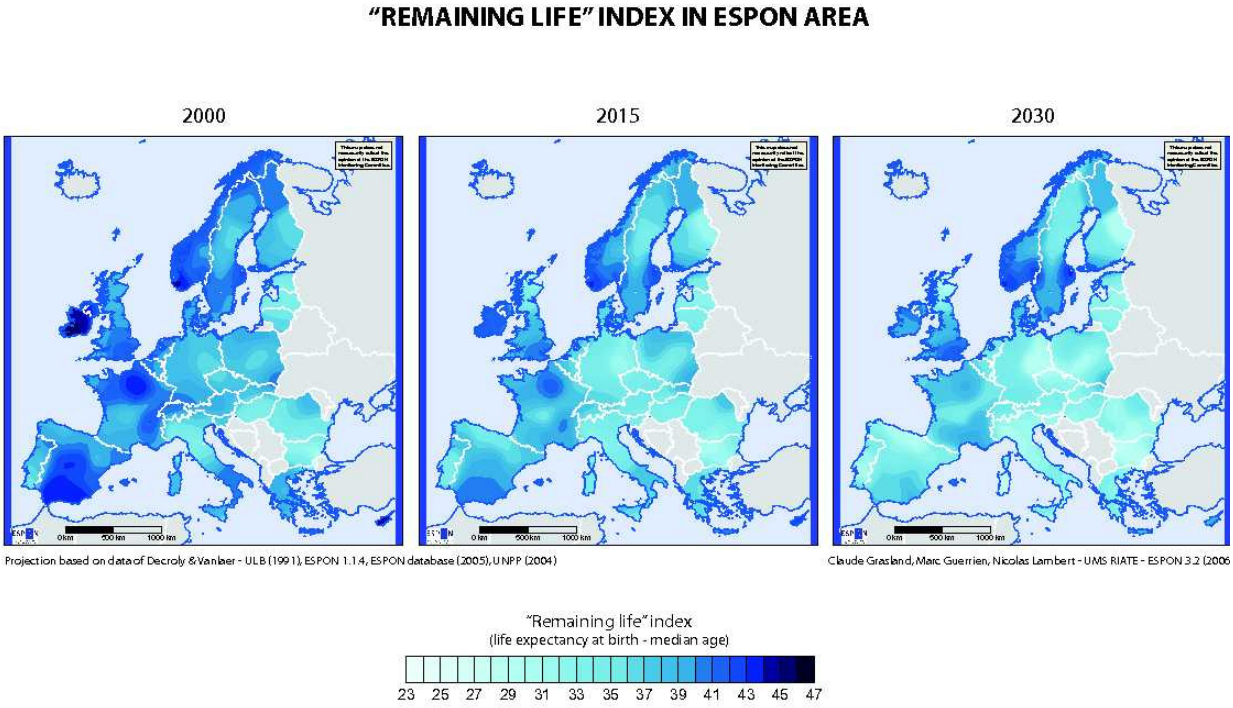


Figure 7 Life expectancy – Median age 2000, 2015 and 2030

(2) Establish the foundation for the measure of territorial cohesion in the future ESPON II

Accessibility to services of general interest is another essential aspect of the concept of territorial cohesion, which extends beyond the notion of economic and social cohesion. In policy terms, the objective is to help achieve a more balanced development by reducing existing disparities, preventing territorial imbalances and by making sectoral policies and regional policy more coherent.

However, it is essential, if we want to transpose accessibility to services of general interest into concrete political objectives, to be able to demonstrate that it is something that can be measured at European level. Our analysis focuses, therefore, more on the cross-border areas than at national level.

4.4 LTDB (Long-term Database)

Not really a tool for prospective research as such, the Long-Term Database (LTDB) is nonetheless an important pre-condition for such research. In order to be able to project into the future, one must dispose of long-term information concerning the past.

The Long-Term Database is thus an application designed to fulfill two main purposes:

- *The LTDB should provide a framework for **long-term storage of thematic and geometric data** for territorial units of the European area, at different resolution levels (ranging from the state level (NUTS 0) to the municipality level (NUTS 5))*. The long term storage of data implies tackling several issues:

  - **Evolutivity issues**: the LTDB should rely on a flexible schema, so that new data (e.g. indicator values) and new types of data (e.g. new types of indicators) can be easily added.

  - **Data quality issues**: the LTDB should keep track of the quality of the data it contains.

  - **Usability issues**: the LTDB should be usable by other people than its designers, possibly as a shared resource.

- *The LTDB should provide a framework for a **reliable estimation of missing indicator values**, either for filling informational gaps or for the purpose of simulating past or future hypothetical situations.* In order to provide this, several components are being designed:

  - A set of **generalized estimation methods** in order to make it possible to estimate unknown indicator values from the available information in the database.

  - A set of **generalized estimation strategies** should be provided in order to be able to choose the most appropriate estimation method for a given situation, based on the knowledge of thematic experts.

  - A **mechanism for evaluating the quality of the estimated data,** by taking into account the accuracy of the method and the quality of the data used for estimation.

Our approach in the design of the LTDB is modular and incremental. This allows, on the one hand, the building of independent modules, which can be developed and can evolve independently from each other, and, on the other hand, the development of basic

functionalities first, with the option of adding the more advanced ones later in the development of the application.

The prototype of the application is now finished and first tests are currently being conducted on actual data sets. First results have been applied to the ETCI research on the long-term evolution of demographic data.

5. Look Grand'ma!: showing the future of Europe

Scenarios are not only useful for the policy makers involved in the elaboration process as mind games and for internal discussion, but also, and mainly, as communication tools. They allow to raise awareness about fundamental driving forces and to explain policy options more vividly.

The spatial scenarios developed in this project target a wide audience, from the spatial development community at European level to regional territorial policy makers and the general public. As one of the members of the Monitoring Committee put it, 'These scenarios should be understandable by any grand-mother in the countryside.'

In the light of this very wide-ranging potential audience, the communication of the work in progress and of the results will have to be very diversified and targeted. However, the project does not dispose of great amounts of resources, be it time or money, to elaborate a very sophisticated communication strategy. Several elements have, therefore, been privileged (in addition to the obvious communication to the ESPON Monitoring Committee and the general ESPON community at ESPON seminars):

- Transnational and national events targeting the national and regional territorial development community
- Presentations in events of the scientific community
- Brainstorming on visualisation and animation of some of the scenario ideas (see volume 3)
- A final ESPON publication on scenarios
- Integration of project 3.2 into the general ESPON communication strategy

6. Now here's to ESPON: Scientific coordination of the ESPON programme (Vol 5)

An important task of project 3.2, taken over from project 3.1 in October 2004 is the support to the ESPON coordination unit in the scientific coordination of the entire ESPON programme. This consists in practical issues such as maintaining and enhancing the ESPON Database, preparing new versions of the ESPON Map Kit and preparing ESPON seminars and lead partner meetings. At the same time, more content-oriented aspects are also treated, such as the attempt of defining a common scientific approach to the projects, elaborating a limited list of ESPON key indicators for spatial monitoring, reflecting on how best to translate the research into policy recommendations (or "policy options"), preparing ESPON publications, etc.

In this last year of the ESPON I programme, one main aim will also be to synthesise the *acquis* in order to make it easily transferrable to ESPON II. This concerns as much the practical issues of project management as the definition of common scientific approaches and tools.

7. Think twice before doing this: A general tool for Territorial Impact Assessment of policies (Vol 6)

One of the tools high on the wish list of territorial policy makers is a tool which should allow non-specialists to organise their thinking about the territorial impacts of particular policy choices and programmes. This tool should offer the necessary framework for decision makers, and stakeholders in general, to help them explore the impacts of any policy on different spatial levels in order to allow informed debate and decision-making processes.

In reference to non-territorialised assessments of the same kind, this type of tool has been baptised **T**erritorial **I**mpact **A**ssessment (or TIA). Since the beginning of the programme, ESPON has attempted to shed some light on what TIA means and what it could look like in practical terms. TIA has been covered by all the priority 2 projects of the programme and some others. Most of the work has been about ex-post assessment of different sectoral policies, but some first attempts at ex-ante assessments also exist.

By definition, impact assessment of policies, especially of territorial policies, cannot be scientific in the positivist sense because of a lack of control groups and because results are not contestable.

We, therefore, propose a tool which should make the assessment process as transparent as possible, in order to allow debate on its results. The TEQUILA (**T**erritorial **E**fficiency **Qu**ality **I**dentity **L**ayered **A**ssessment) model is structured in two steps:

1) General Assessment of the impact of EU policies on the overall European territory. This assessment refers to an abstract territory, and the impact may be seen as a 'potential impact' (PIM)
2) A **Territorial Impact Model** for assessing the impact on single regions r defined as:

$$\mathbf{TIM}r = \sum_c \theta c \,.\, \mathbf{PIM}c \,.\, \mathbf{S}r,c \,.\, \mathbf{PI}r \,.\, \mathbf{Pa}r$$

TIM = territorial impact
c = criterion/dimension of the multi-criteria method
r = region
θc = weight of the c criterion/dimension
PIM = potential impact of policy (abstract, coming from Tequila model)
Sr,c = sensitivity of region r to criterion/dimension c (a weighted sum of regional indicators)
PI = policy intensity (in region r)
PA = policy applicability (a 0/1 variable)

Sr,c will be a vector (weighted sum) of regional characteristics, coming mainly from the ESPON data base.

ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

TPG members

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Volume 2
Final Thematic Bases and Scenarios

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Introduction

Territorial development contains very complex issues and is driven by a multitude of different factors. In order to build territorial scenarios, one needs first to understand the evolutions of these different drivers and the possible paths that these can take.

At the same time, territories are influenced by different sectoral policies. Quite seldomly, however, the sectoral experts are aware of the territorial dimension of their actions and, thus, do not take them into consideration when chosing one option over the other.

The thematic work in this volume aims at responding to both of the these issues by summarising the knowledge on the current state and trends in a series of thematic knowledge bases (also called "scenario bases") and by showing how different sectoral policy options in these fields can have very different territorial impacts (the "scenarios"). The territorialisation in these scenarios is quite broad and is only meant as a means to raise awareness to the complexity of possible outcomes, not to be an exhaustive review of impacts across the entire ESPON space.

Even though these thematic bases and scenarios feed into the integrated scenarios in volume three of this report, they stand on their own and can provide very important inspiration to policy makers. The bases are an important source of information for someone looking for a quick overview of the most important drivers and trends in a specific field and in relation to territorial development. The scenarios are as "mind-openers", widening the scope of reflection in policy making by playing through possible story lines linked to specific policy choices of some important exogenous factors.

The hypotheses for the scenarios were elaborated in close collaboration with the ESPON Monitoring Committee, in order to reflect some of the important questions raised in current policy making. The scenarios have deliberately been chosen to be quite contrasted, each representing quite opposite policy options, although they are all in the realm of the possible, some even likely. However, the scenarios should not be seen as deterministic predictions of what is to come. Rather, they are pedagogical exercises aiming at raising the awareness of policy makers and other stakeholders concerning possible evolutions. The main information policy-makers should look for in the scenarios are the driving forces and how they might interplay with each other as well as the differentiated, multi-sectoral impacts of specific policies. The final images painted at the end of each of the scenarios allow imagining the consequences of particular choices on the global picture of the European territory. Thus, the link between current policy debates and future evolutions becomes more tangible and decisions can be taken on the basis of informed estimations of possible impacts.

For each of the thematic fields, we present first the scenario base, leading to the definition of the hypotheses and then the scenarios themselves, in general two per theme.

1. Thematic scenario 'Demography and migration'

Michelle Wishardt, Ian Strange, Simin Davoudi (CUDEM)
and Martin Schuler (ETH Zürich)

1.1 Scenario base – Demography

1.1.1 Present situation, trends and forecasts

1.1.1.1 Current EU population trends in their global context

The number of inhabitants of the EU25, stood at 454.9 million at the beginning of 2004, a population which, in spite of healthy immigration rates, is becoming, in parts, virtually stationary. This situation has been referred to as 'zero population growth' and contrasts significantly with the picture across most of the rest of the world where the population continues to increase sharply[1] (see Table 1 in the Appendix below). The contrast is brought into sharpest relief by looking at the situation in the Asian and African countries bordering the EU, such as Syria, Libya and Algeria, where trends indicate substantial demographic gains. As these countries are the main source of the rise in migration to the EU, the disparity is clearly significant.

This so-called 'second demographic transition' in Europe, has been brought about by three decades of low fertility rates, producing shrinking cohorts of young people, in themselves generating a 'negative momentum'. Consequently across Europe as a whole, there are more deaths than births, producing by 1995 a natural decrease of 1 per 1000 (crude birth rate 10 per 1000, crude death rate 11 per 1000[2]). This correlation has been modified, in that while the birth rate has plummeted, a long-term rise in longevity has suppressed the mortality rate producing an ageing population.

Migration is much more important numerically than either births or deaths, indeed a rise in international immigration to Europe has been fundamental to maintaining the size of the EU. This situation has been supplemented by unregistered immigration, with at least three million 'illegal immigrants' living in the EU15 in 2003, according to European Commission estimates.

1.1.1.2 Territorial differentiation across the EU

Territorial variation across Europe is reflected in recent figures showing the average annual rate of population change. This averaged, between 2000 and 2005 at 0.0-0.1% for most of the EU, but 1.1-1.9% in Ireland and at the other extreme -0.4-0.1% in Italy and most of

[1] Over the past ½ century the world's population has been growing faster than ever before and according to UN projections – and hopes – faster than it will in the future (the annual average increment peaking at 87 million between 1985 and 1990). Between 1950 and 2003 89% of the increase in global population has taken place in Less Developed Countries, raising their share of the world's population to 81% in 2003. Asia has contributed nearly 2/3 of this increase, thus increasing its share from 56% to 61%. Africa has been the second largest contributor, with the highest growth rate – an increase of 285% over the 1950 level (compared to 156% for Asia and 33% for Europe).

[2] This contrasts with an average crude birth rate of 26 and death rate of 7 in North Africa and even more tipped in favour of youth in Western Asia, peaking at 45 and 9 in Yemen. In Turkey the crude birth rate is currently 21 and crude death rate is 6; their accession will clearly alter the overall age profile in the EU.

the countries of Central and Eastern Europe and more than -<0.5% across the Russian Federation. Demographic patterns at the meso level can be said to fall into three main patterns:

- continued moderate population growth; early decline in birth rates followed by stabilisation such that the number of births is still slightly higher than the number of deaths (France, The Netherlands and Ireland)
- early zero growth; early decline without stabilisations or negative growth rates leading to a reaction and a 'rebound of birth rates' (Austria, Denmark, Sweden and the UK)
- late zero growth; late, but sharp decline in birth rates, zero or negative growth since the mid to late 1980s (Southern Europe) and from early 1990s (Central and East European countries)

However, these national averages mask significant micro differences (centre/periphery e.g. France and the UK or North/South e.g. Italy or East/West e.g. Germany). ESPON 1.1.4 focused its findings on differences at this level (see below). However in spite of differences in the rate of change and the factors believed to be behind them, mortality and fertility trends across Europe can, in general, be seen to be converging. The decline in fertility has been most recent in Southern Europe, now showing the lowest figures of an average of 1.3 children per woman, and most striking in Eastern European countries[3].

The convergence in mortality rates has largely been the result of countries such as Portugal improving their life expectancy rates (by 14 years between the 1950s and the 1990s) compared to countries such as Denmark which made smaller gains. However, in Eastern Europe mortality rates continue to be notably higher and have actually increased.

Despite the evident convergence in natural population decline (which could also be perceived as stability or stagnation depending on perspective) across the EU, persistent though minor, variation in actual decline can be seen as Table 2 of the Appendix below.

The convergence is less evident in migration which is impacting on regions and countries quite differently. The most obvious feature has been the change in the larger Southern member states, which instead of being net exporters of people to north-west Europe and the 'New World' (as they were until the mid 1970s), have become net immigration countries, mainly as a result of large inflows of migrants from Africa and Asia[4]. With respect to immigration from Eastern Europe, Germany has been the main recipient. In the accommodation of asylum seekers, Austria and Sweden have been significant, relative to their population size, but less notable in gross terms.

Regional movements in population have been characterised variously as centre/periphery, East/West and by 'region type'. The main developments in the former two models have been a move from the peripheral areas to central economically strong zones, which have left areas of de-population and movement generally of younger workers from East to West. 'Region types' were established by the research of ESPON project 1.1.4 and they are presented as 6 categories, based on factors including a mixture of migration and natural population change (as Table 3 in the Appendix).

[3] The total fertility rate (estimate of the number of children a woman will bear throughout her child-bearing years) averages between 1.6 and 2.1 in France, the UK, the Netherlands, Ireland and now parts of Scandinavia, but lies between 0.0 and 1.5 for the rest of the EU and the Russian Federation. Higher rates in France and Scandinavia have been explained by some demographers to reflect generous national pro-natalist policies, in Scandinavia and the UK to reflect the high extra-marital birth-rate and in Ireland to be largely a reflection of a much higher than EU average cohort of young people due to previously higher fertility rates than existed across the rest of the EU. Nonetheless despite these deviations the general European trend in birth-rates is downward.

[4] In 1990, of the (registered) 13 million foreigners living in the then EU-12, 8 million were from outside Europe, with nearly half from North Africa or Turkey.

1.1.1.3 Demographic trends in historical context

The key demographic trends in Europe then, with regard to natural population change are falling birth rates and mortality rates producing increasing life expectancy. Migration trends are more complex. There has been a reduction in long-distance inter-European migration, but a continued high level of short-distance movements within Europe. These movements are producing de-population in certain areas. Similarly migration to Europe from outside the EU continues to reflect high potential and demand. Migration from non-EU countries to the EU is lower than had been predicted by some in the Seventies and Eighties, but shows clear East to West flows.

Current trends show a distinct departure from long-term trends. From the beginning of the nineteenth century demographic trends (described as the 'first demographic transition') were marked by rising population, as still apparent in most of the rest of the world (see table 1 in Appendix). But the end of the 1960s marked the beginning of a sharp downward trend, the 'second demographic transition' with the total fertility rate falling below replacement rate by 1975 (at least 2.1 needed to give a constant population in the long-term). Since then birth rates have continued to decrease, and by 1990-95 they stood at 1.5 births per woman (see Table 4 in the Appendix below), compared with an average of 5.1 in the least developed regions of the world and 3.2 and 3.4 respectively, in neighbouring North African and Western Asian states.

The increase in longevity has been a continuous feature of recent European history rather than the more recent and rapid fall in fertility[5], though arguably there is further scope for improvement particularly as the male/female differences in life expectancy have persisted. Nonetheless, on average life expectancy at birth has risen from 67 years in 1950-1955 to 76.5 years in 1990-1995. Consequently, the proportion of 65+ rose from 9.5% in 1950 to 15.5% in 1995 and the potential support ratio (no. of people aged 15-64 for each person 65+) fell in the same period from 7 to 4.3.

With respect to 'external' factors impacting on population, the nature of migration has changed over the past half century. Three distinct 'waves' can be identified; firstly the post-war 'guest-worker' phenomena, then family reunification and now the emergence of a 'post-industrial' pattern of migration. This comprises three elements: high-skill labour migration, clandestine movement (through illegal entry or after the expiry of a short-term student, tourist or work visa) and asylum seeking. Numerically, and in terms of visibility, the latter two categories are more significant.

In terms of migration between regions there has been a major change. In the years immediately following the end of World War Two intra-regional population movements in Europe were still dominated by rural to urban migration. By the 1970s counter-urbanisation, or other forms of 'de-concentration' became more pronounced in many areas and looked set to continue, at least for the increasing proportion of people who were retired, on higher incomes, or flexible and home-workers able to live away from their place of work. However despite this new tendency for people to 'locate themselves down the urban hierarchy' some European peripheries are seriously affected by population decline due mainly to a negative migration balance.

1.1.1.4 Projections of future population developments

The Population Reference Bureau (PRB) calculated that between 1996 and 2010 Europe's

[5] Infant mortality rates have also fallen, most markedly over the past fifty years; since the early 1950s in the 12 pre-1995 EU countries it has been falling by around 5% a year on average; from 49 per 1000 live births to 8 at the end of the 1980s

population would be maintained, largely as a result of declining mortality and migration by 2.3%, but would fall between 2010 and 2025, assuming a continuation of current trends by –0.3%. This compares with an average across the rest of the 'developed world' of 10% (1996-2010) and 8% (2010-2025), and for less developed countries of 25% (1996-2010) and 21% (2010-2025). The consequences of such projections are a continuation of the declining European element of the global population. The PRB predicts that by 2025 Europeans will account for one in 16 of the world's population, down from one in 6 in 1950 (UN forecasts of the situation of Europe in global context at 2050, based on trends between 2000 and 2005 are shown in Table 1, Appendix).

Excluding the migration factor, the most interesting dynamic to many socio-economic policy makers and planners is the ratio of young to older persons. Already the proportion of older people is higher than the proportion of the young (under 15) in several European countries, including Bulgaria, Germany, Greece, Italy, Portugal and Spain. The average percentage of persons over 65 in the EU-15 was 24.1% in 2000, (an average of 25 often suggested as an 'unacceptable' rate in purely economic terms). Eurostat predicts that the figure will reach at least 30% by 2015 and more than 40% by 2030 (a break-down of the forecasts by country are provided in Table 5 of the Appendix). However dependency ratios are culture specific, in terms of the ages at which people are expected to work, and not absolute. They could therefore be altered, at both ends of the age spectrum, by innovative labour market policies. Nonetheless there are policy implications impacting all aspects of life, most obviously health, housing, transport and health care.

1.1.2 EU policies relating to demography and migration

Explicit population policies are currently notable by their absence in most EU member states and clearly at the EU level, where there is no clear competence in this policy sphere. Obviously other policy spheres influence demographic trends: labour market and family policies in the case of fertility and the consequences of an ageing population and social and economic policies broadly to deal with migration. In all these cases it is easier to see the policy implications than to make policy recommendations, which is reflected in the lack of clear policy direction at the EU level[6].

1.1.2.1 EU policies relating to fertility

In the case of 'natural population development' the EU may be said to have adopted mild, non-explicit pro-natalist policies in the form of minimum standards in the field of parental leave[7] (though no agreement on any form of minimum income during parental leave) and a (non-binding) recommendation on child-care service provision.[8] Despite official statements from the Commission that measures must be promoted to 'reconcile work and family life' and assertions that these measures have 'opened the path toward the establishment of a minimum EU pattern of intervention in family policies' (Rossili, 2000), attempts to establish a unified European social policy have been beset with difficulties and resisted by member states, in particular the UK. Consequently the EU is still left with a 'status quo of (fragile) welfare state sovereignty and autonomy in member states producing a variable geometry' in the spheres of social and family policy described (Leibfried, 1994). As a result there has been substantial variation in the generosity, or not, of tax incentives to encourage child-

[6] The Green Paper 'Confronting demographic change: a new solidarity between the generations' COMMISSION OF THE EUROPEAN COMMUNITIES, Brussels, 16.3.2005 COM(2005) 94 final, may be an indication of an attempt to change this.

[7] Council Directive 96/34/EC of 3 June 1996 on the framework agreement on parental leave concluded by UNICE, CEEP and the ETUC. OJ L 145, 19.6.1996.

[8] Council Recommendation 92/241/EEC of 31 March 1992 on childcare. OJ L 123/16, 8.5.1992.

bearing, higher child benefit payments for second, third and subsequent children and subsidised child care provision for working parents. This has at least produced a situation allowing demographers to debate the relative impacts on fertility of different policies.

There are also differing attitudes across the EU in general to female labour force participation, although in this sphere there is a greater degree of EU social regulation[9]. Ironically improving the labour market opportunities for women has been widely cited as one of the driving forces behind falling fertility rates. However there are two possible explanations for this. Firstly, positive action has been directed at redressing the imbalance of women's opportunities in the labour market, rather than at redistributing results (jobs or careers), as occurred with American affirmative action that set quotas and discriminated in favour of women at the point of selection. Interestingly in the USA birth rates have not been declining in the way that they have in Europe. Secondly, this 'liberalism' in EU policy has become apparent in the growing de-regulation in female employment, so that in spite of directives on the protection of part-time and fixed-term workers which have attempted to cut out the more explicit forms of discrimination and abuse (such as that arising from the use of successive fixed-term employment contracts). The persistence of resultant forms of work insecurity may not be conducive to encouraging fertility. Stratigaki (2004) has argued that concepts initially introduced to encourage gender equality in the labour market and the 'reconciliation of working and family life', have gradually shifted in meaning from an objective with the potential of 'sharing family responsibilities between women and men' to a market-oriented objective ('encouraging flexible forms of employment') as it became incorporated in the European Employment Strategy of the 1990s. The current Lisbon Agenda objective of increasing women's participation in the labour market to more than 60% for 2010 would seem to uphold this view, if the EU is concerned about the long-term implications of the fall in the birth-rate, it has not, as yet, produced any explicit or unified policy to address the issue.

1.1.2.2 EU policies relating to longevity and ageing

In the field of ageing there has been more guidance from the European Commission, though still it is in its early stages and, as yet, is non-binding. Recent proposals from the Employment and Social Affairs Commission now stress a 'life cycle approach' to maintaining the EU's competitiveness in order to realise the Lisbon Strategy (op de Beke, 2004)[10]. This follows the revision of the employment strategy in 2003. The dual approach to the issue of the ageing population is to extend the working life and promote health into later life to support this. It is proposed that retirement age should be increased by an average of five years and that the participation of older workers is encouraged in a general sense by restructuring work to be more accommodating to the needs of older workers. The gender dimension of ageing has also been discussed by the Commission. At present the lack of harmonisation of child support is mirrored by a similar lack of unified policy relating to support for the elderly, including support for carers, this has resulted in a wide range of standards of provision, particularly for the frail and very old.

[9] Article 141(1) of the EC Treaty sets out the principle of equal pay for male and female workers for equal work or work of equal value, and Article 141(3) provides the legal base for EU legislation on equal pay. Directive 75/117 was adopted to implement the principle of equal pay. Furthermore, benefits paid in the context of occupational social security schemes also constitute pay within the meaning of Article 141, and Directives 86/378 and 96/97 implement the principle of equal pay in this area. Article 141(3) of the EC Treaty provides the legal base for EU legislation on equal treatment of men and women in matters of employment and occupation. The main piece of legislation which has been adopted in this field is Directive 76/207, recently amended by Directive 2002/73, which Member States are required to transpose in national legislation by October 2005. This legislation implements the principle of equal treatment as regards access to employment, self-employment and occupation, including working conditions, and vocational training.

[10] Op de Beke Op de Beke, J. (2004) 'The Life Cycle dimension of time use in EU social and employment policies', DG Employment and Social Affairs Commission, 9-10 September, 2004.

1.1.2.3 Migration policies

With respect to migration within the EU, the meso level, Article 51 of the Single European Act 1987 requires the 'free movement of workers and social security for migrant workers'. Clearly central to the single market ideal is the notion of free movement and thus any sub-regional imbalances consequent to this free movement can only be mitigated after the event, through the operation of Structural Funds and other specific initiatives. The lack of a unified social policy clearly has implications for internal migration across the EU, indeed it has been suggested that the lack of a harmonised form of EU social provision, in the form of a European-wide minimum safety net has increased the incidence, or at least the threat of welfare tourism and (unregulated) migration'.

Policies at the macro EU level are generally restricted to limiting the number of immigrants from outside the EU, policies which have resulted in allegations of a 'Fortress Europe' mentality. While discussions about the role of immigration in replacing falling populations have been the subject of much debate they have not resulted in formal policy initiatives specifying the type of migrants or final destination preferred. With regard to destination, 'European immigration needs' are significantly more urgent in the new member states than in the EU-15.

ESPON Project 1.1.4 argued that there was a need to reduce the gap in living standard and income levels in order to create a polycentric development on EU29-level. For example: 'the gap between the new EU members and the old ones are much more pronounced than the gap within the various countries. Temporary rules and regulations are perhaps in some cases necessary in order to hamper a short term large drain from east to west – the fear of mass migration are probably overvalued - but this is not a solution in the long run. Instead, a policy that stimulates symmetrical migratory movements should be … prioritised on the political and social agenda.' It warns though that 'Immigration can only offer a short-term solution to the consequences of ageing. Long-term solutions, such as higher labour force participation rates or a higher retirement age, stimulate an increased fertility rate and improve the labour productivity, which is necessary to deal with the consequences of ageing.' Also required are policies specific to areas of depopulation.

1.1.3 Main driving forces

Reasons for the decline in fertility and mortality relate mainly to health and lifestyle factors. In the case of fertility economic and employment factors are also important. With regard to migration there are push factors and pull factors accounting for the varying attraction of different member states. These clearly are complex and studies show that there are a lot of country specific factors that explain migration trends.

1.1.3.1 Reductions in the fertility rate

The decline in the birth rate is associated with:

- cultural factors; a shift in partnership arrangements - reduced permanency of marital relationships, lower number of marriages, unstable marriages, increase in divorce (children of single or divorced mothers less likely to have siblings) 'serial monogamy', rise in cohabitation. Also an increase in the mean age of women at first marriage and at

production of first child, leading to less children produced in total;
- economic factors; including consumerism, competitive conditions, cyclical recession and unstable employment and an increase in the proportion of working women[11] - all creating pressures leading to postponement (the tempo effect, in turn leading to the 'quantum effect' i.e. producing less children in total), or the decision not to start families;
- social factors; the decline in collective, familial or community values, media and cultural stress on individualism (fulfilment, mobility, living arrangements etc.), social/health changes, - increased availability and acceptability of new forms of contraception, easier access and a rise in societal and medical acceptance of termination (abortion).

In relation to regional differences, in Eastern Europe – post-communist forms of economic insecurity has been correlated with a sharp fall in birth rates, while in Southern Europe very low non-marital child bearing is one of the key factors reducing overall fertility. However, in Scandinavian countries policies to make motherhood and labour market participation more compatible are widely perceived to have led to partial recovery of rates, as they have in France.

1.1.3.2 Increasing life expectancy

Reductions in the mortality rate have been linked primarily to improvements in health care, access to health care and advances in medical treatment and lifestyle factors, such as good work conditions and diet.

Regionally variable factors impacting mortality rates are arguably 'the Mediterranean diet' in countries which have reduced cardiovascular mortality, and conversely the deterioration of social protection systems in Eastern Europe which can be correlated with an increase in mortality rates.

1.1.3.3 Migration

Changes in migration at the international level have been linked to: higher education opportunities, links between donor countries and some EU countries and other country specific factors, previous migration leading to family re-unification; and most importantly the persistent gulf in living standards and opportunities (especially employment) between EU and 'sending' countries.

At the intra-European meso level: key factors include; a steep rise in car ownership, advances in Information Technology allowing home-working; cohabitation, divorce and remarriage leading to more frequent residential mobility; economic pressures to move away from expensive urban centres; families with children moving further away from city cores as commuting becomes easier; greater variety of lifestyles; selective increase in freedom to move to 'sunbelt' zones and more attractive areas; increased work flexibility and decentralisation - post-industrialisation and economic re-structuring, post-materialism - quality of life considerations in moves out of congested and deteriorating zones, retirement migration, portable pensions and a rise in home ownership allowing more freedom in intra-regional/urban to rural migration and young people leaving home, not to marry but to pursue extended education or employment away from home communities.

What is significant about territorial differentiation in international migration is that reasons for emigration to established EU countries are gender and age specific within each of the 'donor countries'. This is vital in demographic terms in that if the gender/age balance of

[11] This point has been widely debated (see 1.1.2.1). The European Population Committee of the Council of Europe has contended that it is security of employment that pre-empts low fertility rates: precarious employment and unemployment are being correlated with decisions not to have children.

immigrants is different to that of the host country there will be demographic changes to the host country, as well as the 'donor' country. Clearly this could be highly significant in light of the ageing issue in European countries. Certain countries face the prospect both of a major 'youth drain' (Bulgaria and Romania, may experience an outflow of nearly 10% of the youngest age group in the next five years) and a 'brain drain' losing a substantial proportion of persons with third level education. The additional factor, not reviewed here, will be future differences or harmonisation of EU member states immigration policies.

Only a complete country review of migration could cover all relevant factors, but examples include: family motives (Cyprus, Malta); higher education (Central European countries, especially for young women); short-term financial motivation (Bulgaria, Romania); and unemployment (Turkey, Bulgaria and Estonia).

1.1.4 Identification of scenario hypotheses

The 'second demographic transition' apparent in Europe has been negatively presented by those concerned by the consequent ageing of the population and the growing contrasts with the rest of the world in terms of their age components. Thus, though global demographers (largely concerned with containing the global population 'explosion') see reductions in the fertility rate as the key to a successful stabilisation of population and development economists describe a phase of falling death rates followed by a phase of falling birth rates as a key indicator of human development levels (UNDP), many within the EU have expressed concern at the relative shrinking of their share of the world's population and the shifting age dynamics within it. While less developed regions continue to retain the triangular shape of a traditional 'age pyramid' with a broad base caused by above replacement rate fertility producing ever larger generations of potential parents, the EU and Eastern Europe, together with some other more developed regions – such as Japan – are increasingly characterised by a contracting base of young people leading to a rapid ageing of their population over and above the effects of increasing longevity. The apprehension, expressed by some, is that this situation is predicted to become even more top-heavy over the next half century, with Europe's proportion of persons over the age of 60 rising from 1/5 to between a 1/4 and a 1/3 by 2030. The possible consequences of this are the focus of the first scenario 'Silver Century' with a focus on the possible impacts on the 'European social model' of welfare provision, on the form social spending may take. Likely intra-European movements of different age and social sectors within the EU, based on existing trends, will also be considered and the subsequent implications for population distribution.

The second scenario 'Open Borders' will focus more explicitly on the migration issue and in particular the probable consequences, of the introduction by the EU of an explicit policy to encourage immigration to address the issues of ageing as set out above.

1.1.5 Information sources

European Foundation for the Improvement of Living and Working Conditions

The European Observatory on Demography

ESPON 1.1.4 Project - The Spatial Effects of Demographic Trends and Migration

Eurostat

International Office of Migration

Organisation for Economic Co-operation and Development Statistics Directorate

Population Division, United Nations

Population Reference Bureau

The European Population Committee (CAHP), Council of Europe

United Nations Economic Commission for Europe (UNECE) Population Forum

World Bank Population Projections: short and long-term estimates

1.1.6 Appendix: tables and graphs

	1900	1950	2003	2500 (UN projected)
World	1650	2519	6301	8919
Asia	947	1398	3823	5222
Europe	408	547	726	632
North America	82	172	326	448
Africa	133	221	851	1803

Source: UNECE Population Forum, 2003

Table 1 World population growth (millions)

	Population 2003 (mill)	Growth (%)	Infant mortality$	TFR~	Life Expectancy	% 2000	60+ 2050
World	6301	1.2	56	2.7	65	10	21
Asia	3823	1.3	53	2.6#	67	9	23
Europe	726	-0.1	9	1.4	74	20	35
N America	326	1	7	2.1	77	16	26
Africa	851	2.2	89	4.9	49	5	10

Source: UNECE Population Forum, 2003

Table 2 Key population statistics by region (millions): annual averages 2000-2005*

*Except for population (2003)
$ Per 1000 live births
~ Total fertility rate
# Rate averaged down due to the 'China effect' (one child policy)

	AT	BE	DK	FI	FR	DE	EL	IE	IT	LU	NL	PT	ES	SE	UK
2000	0.01	0.4(e)	0.13	0.15	0.42	-0.09	-0.02	0.67	-0.03	0.45	0.42	0.14	0.10	-0.03	0.11

By 2003 the decline in Italy and Germany had accelerated. Of the 10 new member states all have negative rates, except for Malta and Cyprus. The rates in Eastern Europe are also now almost all in absolute decline, the sharpest fall being seen in Bulgaria. These figures may also be measured annually by '000 inhabitants, see below.

Source: T1.3 Europe-wide comparative review, Council of Europe, 2004

Table 3 Current rate of 'natural population increase' (excess of births over deaths in the indigenous population in % – EU15 (average 2000, 1.8)

	AT	BE	DE	ES	IT	UK	BG	EE	LT	MT	PL	RO	SI
Natural	0.0	0.6	-1.8	1.7	-0.8	1.4	-5.9	-3.7	-3.0	1.8	-0.2	-2.6	-1.0
Total	3.1	3.9	0.1	7.2	2.8	3.2	-5.9	-3.8	-4.5	5.7	-0.6	-2.6	0.8

Half of the new member states were showing a total fall in population by 2003, but in the case of the Czech Republic, Slovakia and Slovenia immigration was preventing an overall decline.

Source: Eurostat European population trends, 04/6

Table 4 Natural population increase: Total population increase (by '000 inhabitants – selection of EU29 (average 2003, 0.8: 3.4)

1 In-migration and young population/'high' TFR
2 In-migration but low fertility rate
3 Out-migration but young population/'high' TFR
4 Out-migration and old population/'low' TFR, depopulation
5 In-migration and old population/'low' TFR
6 Out-migration but still young population/'high' TFR

PT=Total population development, PM=Net migration, PN=Natural population development, TFR=Total Fertility rate

Source: ESPON 1.1.4 Final Interim Report

Table 5 Demographic Typology of Regions

	AT	BE	DK	FI	FR	DE	EL	IE	IT	LU	NL	PT	ES	SE	UK	CZ+	SK+	SI+
1960	2.7	2.6	2.6	2.7	2.7	2.4	2.2	3.8	2.4	2.4	3.1	3.2	2.9	2.2	2.7			
2001 +2003	1.3	1.5	1.7	1.7	1.9	1.4	1.3	1.97	1.2	1.6	1.7	1.46	1.26	1.57	1.6	1.17	1.2	1.22

Source: T3.3 Europe-wide comparative review, Council of Europe, 2004

Table 6 Total Fertility Rate – EU15 (average 1960: 2.7, 2001: 1.4)

Year at which working age population is expected to stop growing/start declining	
-2000	IT, DE, LV, BG, RO
2004	HU
2006	LT, EE
2007	CZ
2008	DK, PT
2010	FI, EL, ES, SK
2011	SI, NL, BE, UK, FR, PL (average EU15, EU25)
2012	AT
2035	IE
2042	MT
2044	CY
2050+	SW, LU

Source: Eurostat 2004 Demographic Projection (Baseline Scenario), 2004

Table 7 Ageing Patterns – EU25

1.2 Scenarios

1.2.1 Scenario 1: Silver Century

1.2.1.1 Hypothesis underlying the scenario

This hypothesis is based on the continuation of current trends, both in terms of demographic evolutions and in terms of policy. The question asked by the scenario is thus: should current demographic, migration and labour market trends continue unchecked, how will Europe look in 2030?

The European population will continue to age and immigration will be very limited and controlled. The shrinking workforce will have to work longer hours and pay higher taxes to support the rising costs of health care and pensions for the growing number of older people. The fiscal demands of this 'ageing Europe' place tremendous stress on the 'European social model' of welfare provision which is based on a choice made to accept lower economic growth in return for more social protection and leisure time. The social model may be modified to meet the needs of older people, which will not help redress the continued falling birth-rate. Older people will move in increasing numbers to rural areas and from North and West to Southern 'retirement destination' areas, where they use their 'grey' voting power to shift public spending away from nurseries, schools and playgrounds towards health care and retirement homes. Core-periphery and the east-west demographic polarisation further accentuates as a result of depopulation and loss of labour force.

1.2.1.2 Driving forces

The main driving force leading to an ageing population and a shrinking and ageing working population is a continuation of the trend of falling total fertility rates, a trend continuous with a reduction in mortality rates. The outcome is increasing longevity and declining natural population growth.

Particular features of this driving force include the following:

- Continued decline in the total period fertility rate, with a reduction in child-bearing of women between 18-30
- Continued progressive ageing of the population, most notable in older cohorts - the 'fourth generation – in particular those aged between 80-85 years, and centenarians (100+ years) so that population ageing is 'deepening'[12].
- There is also a 'feminisation' of population ageing (primarily a consequence of lower mortality rates among women). As the population ages, so the female to male ratio increases. Also notable is that that almost 45% of older women are widows, and so live without 'spousal support'
- The working age population vis-à-vis the rest of the world falls and the age structure of the European work force becomes increasing dominated by the 45-64 cohort
- Increasing demographic segregation, more poverty and isolation amongst some older cohorts, others living in relative luxury in retirement villages in desirable locations.

[12] Eurostat predicts an increase of persons aged over 80 of approx. 16 million between 2005 and 2030, see Table 8 below.

- Migration into the EU continues to rise, both legally and illegally, but as destinations are confined to certain MEGAs, the desired 'replacement potential' has been limited.

1.2.1.3 Context and process of scenario development

In the decade and a half since the turn of the century fertility rates have continued on a downward trajectory. The average fertility rate has dropped to 1.2 (0.3% less than the rate in 2004). Meanwhile, life expectancy has continued to rise. Indeed, at birth, life expectancy in 2015 stands at 82 years for men, 87 years for women. The proportion of European population above the age of 60 has also increased from 21 percent in 2000, to between 8 to 15 percentage points higher. In other word, the numbers of the population above 60 is approximately1.5 times the level it was at the beginning of the century. Similarly, the proportion of the population below age 20 has declined up to 2015, but it is not directly a mirror image of the proportion of elderly. The proportion of children and teenagers in Europe has declined from its 2000 figure of 23 percent to 15 percent in 2015.

Demographic change has also started to be reflected in economic change. The declining number of workers has slowed down economic growth, with the ageing of the population adversely affecting consumer demand, asset values, corporate profits, and balance sheets. This occurs more heavily in some markets than others - in mature markets such as cars and home appliances, sales have shrunk year after year[13]. This is because, in its early stages, depopulation is characterised by the shrinking of the youngest age groups, and thus demand for products and services consumed by the young is the first to decline. In Germany, for instance, the cohort born between 1995 and 1999 is only 47 percent as large as the cohort born between 1970 and 1974. Financial services providing top-up pensions and second mortgages targeting more financially secure older people have flourished.

As a proportion of the labour market, the service sector has continued to grow rapidly. The majority of the new 'working class' employment now involves servicing the private or domestic 'needs' of middle class older people. Also in evidence has been a growing intergenerational division in service sector delivery, with a steep increase in occupational demand focusing on providing for needs of a growing elderly population. This has been accompanied by a boom in professional 'caring' qualifications.

Despite a rise in home ownership among older people, there has been a steep contraction of housing demand. This has undermined property values creating both reverse wealth effects at the household level and balance sheet weakness among financial institutions that hold mortgage-backed assets. This is seen to be related to 20 percent decline in the 25-44 age group across Europe, with certain regions, such as Spain and Italy seeing more radical declines of 36 percent and 30 percent respectively.

By 2030 the number of people in the over 60 age category is some 40% higher than at the turn of the century. In addition there has been a marked rise in the very old. In the UK for instance, compared with the 300 people aged 100+ in 1950, in 2030 there is a growing expectation that living for a century will be the norm for thousands of people. However, changes to the age structure are most marked in Germany. Here, by 2030, people over 65 accounted for almost half the adult population, compared with one-fifth at the beginning of the century. In other European countries the proportion of people over 65 is at least 30%. Furthermore, as the country's birth rate has failed to recover, the under 35 population has shrunk about twice as fast as the older population has grown. The net result is that the total population, 82m at the start of the century, has declined to 71.5m by 2030. The number of people of working age has fallen by a full quarter, from 40m to 30m.

[13] Arguably this has produced some pay-offs in terms of environmental sustainability.

These trends have been replicated to varying degrees across the EU. The key factor continues to be a failure of population replacement, producing the fall in the total population and working age population. There may be some correlation in the rising longevity and falling fertility, so that at the same time as life spans continue to rise, so fertility continues to fall as women leave childbirth later and later. By 2030 the TFR is barely at 1 per woman. The combination of this decline in birth rates and the increase in the life expectancy of people has created the 'gerontological drift'[14].

At the beginning of the century it was estimated that by 2030 the age at which full retirement benefits start would have risen to the mid-70s in all developed countries, while benefits for healthy pensioners would be substantially lower than their 2005 levels. It was also argued that fixed retirement ages for people in reasonable physical and mental health would have been abolished to prevent the pension burden on the working population from becoming unbearable. These predictions and concerns arose from a young and middle aged working population who suspected that there would not be enough pension provision when they reached traditional retirement age. But between 2005 and 2030, continued and growing electoral pressure from older voters, meant that pension reform was not politically feasible. Consequently, the estimates made by the World Bank in the 1990s, that spending on public pensions would increase from under 9% to over 16% of GDP between 1990 and 2040, have proved a fair evaluation[15]. By 2030 pension costs have reached 15% of GDP.

1.2.1.4 Impacts

- **Macro-economic, social and political impacts**

The 'baby boomer' generation have been retiring in large numbers resulting in the 'emptying out' of workplaces. This has been particularly noticeable in the area of public sector service employment. Despite various policy measures to retain workers, old people have been drawing their pensions much earlier than the retirement age. This reflects the growing economic power of older persons, who not only continue to draw pensions based on transfers from a decreasing workforce, but have been able to negotiate and maintain subsidies on many aspects of life, such as transport, entry to cultural events etc. Some policy makers have argued that these need retaining given the propensity of older people to save rather than spend, all efforts need to be made to retain older people's stake in the functioning of the economy.

One outcome of this is that less than 4% of men remain in the workforce by the age of 65. The level of economic inactivity has also remained high, well above the 2004 figure when 40% of Europeans of working age were economically inactive. The continued early exit rates from the labour market have accentuated by late entries with a continued emphasis on higher education extending for longer periods. Consequently the number of workers has fallen while the number of those dependent on them has risen. By 2015, the number of pensioners has grown relative to the number of workers, with 55 pensioners for every 100 workers (compared to 35 people of pensionable age for every 100 of working age in 2004). Thus the dependency rate stands at 2 people in work for every one in retirement. Inter-generational conflict resulting from this 'burden' has been the subject of much trade union debate, threatened and actual action.

Concerns about the declining competitiveness of the European economy relative to younger and growing economies continue. Developments in R&D and ICT remain the hope for its future global ranking, as well as reliance on technological advances to deal with persistent

[14] Characterised by an increase over time in the proportion of older people relative to younger people.
[15] Higher than the forecasts of the Economic Policy Committee given below.

labour scarcity problems. In the field of long-term geriatric care, temporary work visas for migrant workers has become a typical way of ensuring adequate staff, this has lead to allegations of the misuse of the guest worker syndrome, though there seems to be no shortage yet of migrants seeking these positions.

The consequences of the ageing of the population have not been confined to the labour market and related issues, the changing demographic balance have affected voting behaviour and subsequently political developments. The increasing power of the 'grey vote' has effectively blocked reforms to pension schemes and to proposals to increase the retirement age. Similarly, as the number of retired people has out numbered young voters, older people have become a determining force in shifting public spending priorities away from provision of services commonly associated with the young, such as nurseries, schools and playgrounds, towards services for the elderly, such as retirement homes and health care. At the same time, spending on the latter years of life has risen as the proportion of users of these services has increased relative to younger people. These changes in spending begin to be reflected in cultural and media output, with a marked reduction in emphasis on youth evident in at the outset of the century.

Nightmare visions depicting overwhelming demands on future health care budgets of an ageing population, popular at the end of the last century[16], have not materialised to the extent that had been predicted. Improvements in health and lifestyle of a large sector of older adults have resulted in dominance of the so-called 'receding horizon scenario', where the onset and progress of disease and disability have been postponed to precisely the same extent as death itself, so that the number of years of diseased and disabled existence have remained unchanged. The 'plateau effect' in some regions, and for a minority of people, has been further reduced in accordance with the 'compressed morbidity scenario', where both disability and death are postponed but the former more so than the latter, so that the interval between the onset of chronic disease or disability and death has been shortened. However in poorer socio-economic groups, higher mortality rates among men have persisted, and among women an extended period of dependency has become the norm, often with minimal and remote forms of support.

Social differentiation has not been reduced during the ageing of Europe's population, indeed socio-economic divisions – without policy intervention - have visibly multiplied in the period of 'remaining life' (age cohort 65-95+). Amongst higher income groups, live-in carers and domestic workers for older adults have become increasingly popular and large homes designed with, 'carers quarters' attached, have been developed throughout the EU. Conversely for lower income groups 'distance surveillance centres' have emerged. These sparsely staffed centres monitor the homes and movements of elderly people. Such 'distance care packages' have done little to confront the problem of isolation in old age. Indeed depression in the very elderly has increased as these forms of technology have not been used to maximise social or community contact. For all income groups the long-term consequences of a continued rise in marital and kinship insecurity has undermined family care of the elderly.

In general then all aspects of how life is organised have been changing as a consequence of the demographic shift; housing, transport and other forms of infrastructure have started to take different forms and there has been a revival of new forms of polycentricity, at the

[16] The 'nightmare scenario' where the age at which disease and disability strikes remains as it was in 2000, but death is postponed was the basis for the claims of an 'exponential' growth of health care costs. This was based on the apparent constant 'high' in health care costs from age 80 onwards in many member states (based on data from the Economic Policy Committee of the European Commission), depending on the length of the 'plateau effect'.

micro level, as older people prefer local accessibility to travelling long distances to large centres to shop etc. However at the macro level only France and the UK have experienced rising populations and this has largely been due to increased concentration and a continued influx of people to the conurbations around the Isle de France and Greater London.

- **Regional and territorial impacts**

The economic impact of the ageing population has varied significantly at the meso level, as some member states and regions have felt the impact of ageing much sooner and more strongly than others. In countries with more serious pension problems (such as Germany) public debt has grown to over 60% of GDP. Within the EU, Italy and Germany have seen their working age population drop by 47 percent and 43 percent respectively. By contrast, France and the United Kingdom have experienced less drastic declines of 26 percent and 15 percent. In countries where the rising costs of old age has been more severe (such as France, Italy and Spain), intergenerational conflict has been taking the form of so-called 'age riots' which have taken place intermittently in certain metropolitan areas.

Patterns of fertility decline at the macro level have converged, though at different rates, taking place firstly in North and West Europe (from the 1970s), followed by South and then Central and East Europe. Thus a similar transition has been occurring but at different time scales. Ageing has been felt first in North and West Europe, but has been developing rapidly across the Mediterranean, where life expectancies are among the longest in the EU. In Central and East Europe, where mortality rates had increased at the turn of the century, life expectancy rates have started to fall into line with the rest of the EU thus producing similar ageing trends. These have been exacerbated however as a result of intra-European migration. Since the end of quotas for East to West European countries in 2011, demographic imbalances in areas away from the economic centres of Central and Eastern member states have become serious, with – for instance - a shortage of working people in caring and other medical occupations leading to service shortfalls. The only countries where there has not been an overall fall in population over this period have been France and the UK.

At a macro level, the East/West, South/North, centre/periphery and urban/rural divisions within the EU have started to take on a significant age element. The East, South, rural areas and periphery have become either magnets for older people (in the case of the South) or areas where older people have been increasingly left behind, as younger cohorts move to economically more dynamic areas.

Many affluent older people are more mobile and have more diverse lifestyles. As such, they have begun to choose 'where to retire' and, increasingly, they have chosen to retire in areas with lower crime rates and good access to services, (particularly health care and hospitals), and with a pleasant climate. Indeed, residential segregation by age is apparent at the macro and micro level. Regarding the former, across Europe, older people are moving to Southern European 'retirement destinations'.

At the micro level, within member states, there are signs of 'age' segregation with retired people concentrating in rural areas, although there is a residual (mainly low income) older population remaining in urban areas. There are also an increasing number of gated type communities, which designate age or 'no children' conditions on residents. These trends are producing a growing spatial differentiation by generation.

In summary unregulated population movements to and within the EU have exacerbated, rather than mitigated in the way that had been hoped at the beginning of the century, the effects of the under-lying ageing trends in the period 2005 to 2030.

1.2.1.5 Final image

In 2030 the balance of power politically, economically and spatially will be increasingly dominated by older people. In territorial terms this will be apparent in a division of space with younger people being concentrated around urban working areas and retirees distributed across suburban and rural spaces. At a macro level there will also be differences in the age distribution of the population, with Southern areas of the EU becoming retirement destinations on a much larger scale than was apparent at the turn of the century. It has become the norm to work in the MEGA areas of the Core during working years, and retire away from these areas relatively early, in spite of continuing longevity and related debate about what the average retirement age should be.

Resistance to large-scale or 'directive' immigration has meant that the ageing of the workforce and population, which began at the end of the last century, has shown itself to be largely irreversible in nature, and gains from international immigration in its legal form have been relatively insignificant, except in the cities where the populations were already younger. In Eastern Europe the loss from emigration, particularly of younger peoples has contributed to the ageing effect. Attempts to contain and control illegal immigration continued to flounder, but the informal economy have continued to flourish – including the service sector and care of the elderly.

Demographic changes have had a continued negative impact on labour force rates, most noticeably in the East. Since 2010 the net intake of young people entering the work force substantially fell, reducing their labour force participation rates relative to workers over the age of 45. However the work force has been 'squeezed' at both ends, due to the popularity of late entry (higher education) and early exit (early retirement), at least among higher socio-economic groups. Between 2010 and 2025 technological adaptations partially compensated for declining work force participation rates as efforts were made to try and maintain the participation of some older workers in 'knowledge based' work.

1.2.1.6 Appendix: Base-line forecasts supporting this scenario

	2005-2050	**2005-2010**	**2010-2030**	**2030-2050**
Total population	-2.1	+1.2	+1.1	-4.3
(in thousands)	*-9642*	*+5444*	*+4980*	*-20066*
Children (0-14)	-19.4	-3.2	-8.9	-8.6
Young people (15-24)	-25	-4.3	-12.3	-10.6
Young adults (25-39)	-25.8	-4.1	-16	-8
Adults (40-54)	-19.5	+4.2	-10	-14.1
Older workers (55-64)	+8.7	+9.6	+15.5	-14.1
'Third generation' (65-79)	+44.1	+3.4	+37.4	+1.5
'Fourth generation' (80+)	+180.5	+17.1	+57.1	+52.4

Table 8 EU25 population change (%) (Eurostat projected)

1.2.2 Scenario 2: Open border

1.2.2.1 Hypothesis underlying the scenario

This hypothesis is a prospective policy scenario, based on the notion that an open and actively promoted immigration policy will be introduced which will change current demographic, migration and labour market trends significantly by 2030.

European societies become aware of the strong implications of their strongly ageing populations on the demographic, social and economic future. Political discussion mainly focus on the implications on shrinking labour markets, on financing of pensions of the strongly increasing number of elderly people, but also on the capacity of European societies for economic and cultural innovation. The European Union and quite a lot of its member countries actively change their immigration policy around the year 2010. Since that time, immigration from other continents, especially from Asia, Africa and South America is no longer strongly restricted, but regulated in more or less coherent immigration policies.

1.2.2.2 Driving forces

The main driving force leading to a change in migration policy has been the awareness of the demographic reduction. In fact, the problem of the ageing population and a shrinking working age population had become a real political shock after 2005 when politicians and the public of different countries in Europe became aware of the social, demographic and financial impacts which could occur in case of a continuation of the trend of falling total fertility rates and the reduction in mortality rates without any compensation through immigration.

1.2.2.3 Development of the scenario

The awareness of the demographic impact grew first in Spain, where a great number of unregistered workers from Northern Africa lived. Some time later Germany, where the immigration from the Republics of former Soviet Union diminished after 2000, decided to open the borders to immigrants from other regions. Hungary, where population had diminished for several years, followed. Finally, the European Commission decided to strengthen a new policy opening the border for the whole territory – even if a great number of amendments, in time, in geographical coverage and especially in skills demanded limited the extent of the decision.

This decision, even if it had been taken first under some contextual pressure such as the situation of boat immigration in the Mediterranean, migration on the Russian border and legalisation in Great Britain, has also been a consequence of imminent Turkish accession. The process has to been seen as the result of a collective awareness of the impossibility of maintaining a 'Fortress Europe' in face of a demographic and economic situation in which population decrease, a strong ageing process and loss of competitiveness would have altered the future of the continent. The intensity of the policy process was high, so that within a few years a majority of the population of most of the member states accepted the opening up of borders.

After 2010 and especially since 2015, net immigration rates increased in almost all European countries. Only after 2020 did some restrictions start to limit somewhat the liberal immigration policy. During the whole period since 2010, we can observe the following effects of the migrations on the total of population increase:

- For Europe as a whole, the process of aging population continued and accelerated during the 2020s. The most rapid growth of older cohorts is occurring in the oldest age groups – in particular those aged over 80 years. In other words, population aging is becoming 'deeper' with an accumulation of very old, and potentially, very frail people.
- The ageing process has somewhat been reduced by immigration, strong effects on population growth, on the age structure of the population and also on the tendency of feminisation.

The increasing immigration processes not only contributed to an influx of younger population during their active period, but also to an upturn in fertility, of the immigrants as well as that of the indigenous population. Thus, the dramatic demographic change projected around the year 2000 did not occur. On the other hand, the effects of an ageing population, of immigration and also of the migration patterns within Europe brought deepening social and spatial inequalities. In addition, immigration did not affect all the countries in the same way, and since regions of recruitment have been quite different, processes of integration, return to their country and exchange between the different contexts have varied. The disparities between the countries as well as between urban and rural regions accelerate for several decades, before new concepts of territorial development have been elaborated at the end of the 2020s.

1.2.2.4 Impacts

- **Demographic, economic, socio-cultural and EU policy impacts**

As mentioned, the demographic outlook for Europe for the 21st century has been the decisive factor of the change of immigration policy. Under these aspects, the 'open border' policy has been successful, since the age pyramid has been enlarged in the age groups of young adults and children. Of course, the number of elderly people has continued to increase and their number reached new records in absolute and relative figures. But the index of dependency did not grow any more after 2020. In a direct or indirect effect of the policy, the number of births and even the fertility rate re-increased after 2015, bringing a second effect of counterbalancing the ageing process of the European population. The large acceptance of immigration brought an increasing number of young mixed marriages – despite some reluctance of the endogenous population - and the maintenance of endogamy in some groups of immigrants.

Overall, the 2010s and 2020s have been a period of economic growth, which allowed the integration of a great number of new immigrants as well as the national population in the labour markets. Nevertheless, the strong increase of elderly people – the baby-boom generations born between 1945 and 1965 – put pressure on social welfare system, on the health sector and on changing demand for the housing sector, for tourism and leisure and in consumption. Immigrants concentrated – at least in relative terms – in the health sector, in tourism, in construction, but also in industry and production, which did not undergo the process of delocalisation as it was around the year 2000. In addition, the new immigrants created types of jobs linked to demand of their own population, especially in commerce, education and transport.

As well as immigration, higher fertility had an effect of reducing the work force participation of younger women. On the other hand, older adults, both men and women became more strongly integrated into the labour market, since the legal age of retirement has been rising in most countries, and since economic demand has been positive. This tendency has been underlined by the effect of a high qualified generation of older persons of working age born between 1960 and 1980. This generation has been highly motivated since they have lived through the experience of a difficult period of entrance to active life. There was an increase in the active population, higher activity rate also from elderly people and a growing percentage of immigrated work force, a lower productivity per working hour could be compensated by a stabilisation of social transfers (i.e. on unemployment, retirement).

Periods of high immigration are often characterised by increasing tensions between generations, between less qualified endogenous workers and new arrivals, especially skilled main force, between richer and poorer regions, but especially between immigrants and inhabitants in rapidly changing town-quarters. During the first decades of the 21st century, some of these divisions have been clearly active, especially the spatial ones. In general, despite the high number of new arrivals, ethnic conflicts have been quite rare, though some violent riots occurred around the 2010s, especially in some Eastern metropolises and in some old-industrial towns in Western Europe. In general, the quality of security did not worsen during the last 30 years, even if problems of integration touched many urban regions. The liberal immigration policy and the high financial efforts in integration in the national context allowed the maintenance of security at a level, which has been considered by the populations as satisfactory. On the other hand, integration in a local or national context of the whole immigrant population did not happen, especially among unqualified groups. English became the standard language in many social contexts, not only in tourism, multinational enterprises and research, but also in culture, commerce, transports and health sector. The tensions between generations often arose because the older generation has been composed, by 80 to 90% of nationals, while the young generation is of foreign origin by over 50%, in 'classical immigration countries' (Luxemburg, Switzerland), but also Germany, Sweden and Southern Spain. The political acceptation of the world-wide increase in migration and the opening of the borders of Europe related to the widely acknowledged variation in fertility rates between the Continents. But the increasing immigration had contributed to social tensions. High investments in the education system had to be foreseen, especially for basic school level, since immigrants started to be dominant in several metropolises and within them in a lot of quarters. Investments in public housing policy had to be reintroduced, since the demand on inexpensive apartments became chronically high. Strong immigration and internal migration within Europe strengthened the position of the English language, which not only increased its role as the dominant language for Europeans, but also for immigrants, especially for skilled persons, coming from China, Russia and the Arab countries.

Introducing migration as an instrument to compensate emerging deficiencies in the age structure, the EU policy had chosen to follow an active and proactive policy in order to intervene on the demographical structure. By choosing this path, the EU has also had to intervene in a series of accords with the Non-European countries which have been the origin of immigration, such as Central Asia, India, Pakistan, Indonesia, China, the Arab countries, Africa, Brazil and Spanish Latin America. These accords have been made both bilaterally as well as in a general facilitation of migration.

Positive net migration is composed of strong immigration, but also quite important flows of emigration and returns to the countries of origin. Accords on education bonuses have been given to countries attracting young immigrants as well and concordats for innovation transfers have underlined growing interdependency on a world-wide scale. Europe went through a series of political crises due to international tensions between Outer-European

countries, especially in the Arab world, in which the political interests diverged between some member countries. This has been especially the case after accession of Turkey.

- **Territorial impacts**

Territorial inequalities grew. Immigration from abroad but also within the Union tended to concentrate on the North, West and Southern countries of Europe, but neglected somewhat the Central and Eastern countries. The demographic evolution had been clearly in favour of urban and suburban regions, but not rural parts, especially not those with low accessibility. In this way, the 1980s and 1990s had been the last decades for a long time to show positive demographic evolution in rural areas. Thus, the demand for a continuation of the policy of structural funds has been expressed increasingly after 2015 – and it has been followed by measures to strengthen rural and peripheral Europe, especially in the South-East and East. Immigration from outside the Union shows some differences according to: country of origin, level of education, activity fields, groups of recruited immigrants, cultural activities and in housing demand. Differences are also given by main origin and destination patterns; Spain, France and Great Britain have continued to have privileged contacts with the former colonies of the 19th century and thus proposed integration in a known linguistic context. Differences between the European countries have been underlined by the variability of the immigrants: Spain and Portugal as destinations for South Americans (as well Moroccans), France for North and West-Africans, Italy and Greece for Eastern Mediterranean's, Northern and Eastern Europe from Russia, Iran and Turkey. Quite strong population growth in Western Europe, especially in France, as well as in Scandinavia, due to strong immigration and natural increase; slight population growth in Southern Europe, in Great-Britain, Germany, Poland and the Czech Republic due to immigration counter-balancing natural population losses; demographic stagnation in other Central European countries, such as Hungary and the Baltic countries, but also in Spain, where low natural increase has not been compensated for by net migration growth.

Ageing processes concerned some countries quite heavily with serious pension problems (such as France and Germany). Within the EU, some countries have been much more vulnerable to ageing than others. Immigration did not touch all European countries in the same way and it did not contribute in all regions to counterbalance natural losses. We can distinguish the following pattern, which have been dominant during the 2010^{s} and 2020^{s}:

- Quite a strong population growth in France, the Netherlands, in Scandinavia, as well as on the Mediterranean Islands (Cyprus, Malta) due to high immigration rates and positive natural increase;
- Population increase essentially due to a positive balance between births and deaths, but relatively low gains by migration: Ireland, Finland and in some extend Poland and Lithuania.
- High net immigration, but negative natural increase: Germany, Belgium, Czech Republic, Switzerland, Italy, Spain, Greece;
- Low net immigration and natural decrease: Baltic states, Hungary, Bulgaria,
- High natural increase and net migration losses: Turkey
-

1.2.2.5 Final image

In 2030, more older people than ever before are being supported for longer than ever before from a population of working age that are shrinking continuously in absolute size. In order to counterbalance this tendency, immigration from outside Europe has been encouraged by developing a new demographic policy of the European Union. This policy actively supported the arrival of immigrants, legalised illegal presence and tried to

encourage integration models. This policy had a positive effect on the age structure of most of European countries, which otherwise would have turned in a decreasing and strongly ageing spiral. The implication of the policy profoundly impacted the demographic structure of most of the member countries, the labour market and the social insurance systems. But immigration touched also the social, cultural and political life of Europe as well as the interrelations of Europe and the main regions of immigration. In addition, migration had very strong impacts on the countries of origin as well. During the twenty years that this policy has been applied, the character of immigration has changed, since the intensity of immigration diminished and international migration flows have become less unequal. Not only has re-emigration increased, but also more Europeans than before choose to spend part of their life elsewhere or to emigrate definitively. The integration of some 150 million new immigrants caused quite severe problems, especially in metropolitan areas, where social segregation and differentiation by origin became increasingly an issue. Nevertheless, the fact that new immigrants from different origins did not concentrate in distinct quarters, and that integration was in national contexts, as well as in English, ensured that strong conflict was avoided. We have to distinguish the impacts of the first years of the changing policy from that of the later adaptations, in which some violent reactions took place, parallel to a widespread social acceptation of a new European society. Currently, in 2030, back-lashes with some legal and social restrictions of immigration can be observed, but the experience of the last decades shows that this will probably be a transitory phase. Open border policy has also been accompanied by a re-increasing role of social welfare state in the domains of housing, social integration and health sector.

The strongest preoccupation of the migration process has been the strong spatial effects of these important population movements. At the larger scale, we observe some countries and regions with very limited immigration from abroad and some strong concentration in big metropolises. At the local scale, migration contributed to social and spatial segregation, even if these processes were not as important as they have been in North American metropolises around the turn of the century.

1.3 Scenario conclusions

1.3.1 Main issues resulting from the scenarios

The key issues arising from the first scenario 'Silver Century' are pension and budgetary changes, health and long-term care requirements and the challenges of a shrinking and ageing work force. For the second scenario 'Open Borders' the dominant issues are the high costs of integration, problems of segregated regions and quarters and also increased health care need.

Focusing specifically on themes which have a territorial impact, for the first scenario, changing demand for housing, welfare provision, commercial and transport infrastructure could have major ramifications for land use with a possible growth in popularity for polycentric organisation at the micro level as ease of access becomes more desirable. At the macro level though, for both scenarios, issues relating to migration show the most immediate and visible effect. Migration within the EU may influence the impacts of ageing at regional level if younger, more mobile people leave less developed regions for regions with a more attractive range of employment opportunities. Southern regions may also experience inward migration of older people drawn by the milder climate. On a regional level new urban rural divisions are likely to be strengthened as older people relocate to rural areas leading to problems such as a rise in house prices which gives additional cause for local young people to move to urban areas, contributing to problems of social exclusion.

One cause of rising rates of mobility among the 'young elderly' is the trend of early exit from the labour market. One generally accepted response to the ageing population is increasing the absorption of older adults into the labour force and possibly increasing the retirement age. Moves towards this may produce resistance from the 'grey vote', who may make their - statistically stronger voice – heard in a variety of other ways too. Forms of 'inter-generational conflict may become apparent in assessing the spending priorities of local governments, for example away from schools and towards health services. Spending patterns may similarly alter, impacting the domestic economy.

Policies designed to stimulate the birth-rate and provide replacement migration are likely to be the most controversial. Higher payments for second and subsequent children, for instance, may be considered unfair by those with one or no children, while explicit attempts to attract younger workers from outside the EU could exacerbate racial tensions in certain areas.

1.3.2 Implications for EU policies

Excluding migration as an instrument to compensate emerging deficiencies in the age structure, changes in the demographic structure of Europe by 2030 can only be enacted by policies designed to influence other non-demographic processes which have demographic consequences. These could target incentives to increase fertility. Alternatively, they could focus on ways of managing the economic and other consequences of an ageing population, possibly by aiming to:

- increase the work force participation of women[17]

[17] With the provisos given above, Part I, 2a which unless addressed could continue to contribute to falling fertility levels.

- increase the work force participation of older adults
- increase economic activity rates without increased labour force participation
- promote technical improvements which would lead to a rise in productivity irrespective of the demographic decline.

These policy objectives all involve a concentration on non-demographic factors, which affect the economic performance of the EU, which could be used to offset demographic trends. This may be more appropriate, firstly as demographic trends are so difficult to influence, secondly as it is the declining proportion of labour incomes and the growing concentration of wealth, as well as the shortening of the period of working life (in the baseline 'Silver Century' scenario) that are likely to contribute to a fiscal crisis in welfare provision - rather than just the ageing of the population per se.

Policy developments that may challenge this may well need to explore ways of integrating older people, both socially and economically, in order to bring benefits individually and collectively and lower projected social expenditure rises. In view of the objectives of the Lisbon agenda and its emphasis on the development of a knowledge economy, one issue may be how to harness the non-manual utilisation of older people positively in occupations where experience counts. Research by the European Population Committee found that older workers can be more flexible, readily trained and productive (where the work is not physically demanding) than younger ones and that their productive capacity is already 'grossly underutilised'. May it even be feasible that an ageing population, if well managed, may contribute better to the goals of sustainability as set out in the Gothenburg agenda?

Recently the Commission have expressed the hope that economic immigration will help to 'overcome short run labour shortages in several sectors' and be key to fulfilling the Lisbon objectives 'by 2010 and beyond' in view of 'ageing and related skills gaps'. They have also expressed the hope that it will help, in a broader way, the EU to cope with an ageing population and demographic imbalances and their impact on economic growth and other related problems[18]. However, with respect to migration flows, the scenarios suggest that without regulation of type and destination of migration from outside Europe and intra-European migration, existing imbalances will not be addressed to the degree hoped for. Rather concentration around existing MEGAs will increase, as will the de-population and more negative aspects of an ageing population in some Central and Eastern European regions and most peripheral areas across the EU. The issue of a continued lack of harmonisation of socio-economic policies at the meso level could further impact decisions for trans-national migration and may result in further imbalances. Agreements at the macro level on minimum income during parental leave, or leave to care for elderly relatives, might help to tackle this problem.

If a positive immigration policy is to be well managed, the issue of how immigrants are integrated into the EU must be high on the agenda[19]. Related to this, are the issues concerning the age profile of immigrants, their relative fertility rates and relative skill levels and the consequences these factors for both 'donor' countries and 'settlement' regions of the EU.

[18] EU-OECD Conference "The Economic and Social Aspects of Migration", Brussels 21-22/01/2003

[19] The need to focus on integration has been highlighted recently by the Commission Brussels, 3.6.2003, COM (2003) 336 final.

1.3.3 ESPON core indicators related to the scenarios

Structure	Total Population
	Male (percentage)
	Female (percentage)
	Median Age
	Total Population Development
	'Natural' Population Development
Distribution	Urban Proportion
	Population Density (Persons per sq. km)
	Sex Ratio (Male per 100 Female)
	Sex ratio
Growth indicators	Average Annual Growth Rate
	Life Expectancy at Birth
	Total Fertility Rate
	Total Period Fertility Rate
	Infant Mortality Rate
	Child Mortality Rate (<5, <15)
	Mortality Rate (General and Age, Sex and Occupation Specific)
	Morbidity Rate (General and Age, Sex and Occupation Specific)
	De-population
Composition change Indicators	Population under 15 (%)
	Population 15 - 64 Years (%)
	Population 65 & Above (%)
	Age Dependency ratio
	Sex Dependency ratio
	Potential Support Ratio
	Economically Active Population (%)
Migration indicators	Population density
	Net Migration (Immigration and Emigration/'gains and losses')
	Gross Migration (Immigration and Emigration)
	Migration by region and type of region (in-migration, out-migration), country, EU, pan-European, inter-continental
	Replacement migration (labour market measure)

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2. Thematic prospective scenario 'Transport'

Jacques Robert (Tersyn)

2.1 Scenario base 'Transport'

2.1.1 Present situation, trends and projections

The present situation of the European territory in the field of transport is characterised by :

- uneven levels of potential accessibility[20]. The most accessible regions by road to the population are quite identical with the Pentagon, while the least accessible are all located in the European periphery. It is remarkable that the largest part of the new member countries have an accessibility level similar to that of south-west France, northern Spain and Denmark, being largely higher than that of Portugal, Ireland, western and southern Spain. Considering accessibility by rail, the most accessible regions are largely contained in the Pentagon with some extensions towards East-Germany as well as towards the Rhone and Loire valleys in France. Areas with low accessibility by rail in the European periphery are more extended in the case of Spain, Bulgaria and Romania. Accessibility by air provides a completely different picture, compared with those on land transport accessibility. The map of Europe is converted into a patchwork of regions with high accessibility (those with one or more large airports) surrounded by regions with low accessibility. Low accessibility is not a concern only for a number of regions of the European periphery, but is also an issue for some regions located in the European core.

- imbalances of transport modes. European transport suffers from an imbalance between transport modes to the detriment of railways (mainly with regard to freight transport), of maritime and inland waterway transport. Road makes up 44% of the goods transport market compared with 41% for short sea shipping, 8% for rail and 4% for inland waterways. The predominance of road is even more marked in passenger transport with 79% of the market, while air with 5% is about to overtake railways which have reached a ceiling of 6%. Trends are favouring air and road transport. Between 1970 and 1998, the share of goods carried by rail fell from 21% to 8.4%. The emergence of low cost companies is a major factor in the revival of air transport. The map of air traffic flows in Europe has considerably changed in a few years.

- the predominance of national characteristics in the organisation of networks and corridors. It is possible to identify three main types of network and corridor morphology: centralised networks with a peripheral way (Iberian Peninsula), parallel networks (France, Italy, UK, Sweden, Finland), networks with a square pattern (Germany).

- the growing importance of East-West flows, complementing the traditional north-south pattern. While major flows of road and rail traffic used to show a pattern of corridor broadly

[20] Potential accessibility is based on the assumption that the attraction of a destination increases with size and declines with distance, travel time and cost (see ESPON Study 2.1.1. 'Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion'. Coordination CESA Tours 2004)

oriented in the north-south direction, a general re-orientation of new flows in the East-West direction has already begun during the 1990s. The recent EU enlargement has strengthened the East-West orientation of flows. It can however be observed that the cross-border permeability in central and eastern Europe, in particular along the external borders, sis still limited by a number of obstacles.

- the changing transport paradigm in the new member countries. During the 1990s, freight transport declined by 16% in the new member/accession countries, whereas freight transport activity in the EU-15 increased by 30%. Although the new member countries have inherited a transport system which encourages rail, road haulage increased between 1990 and 1998 by 43.5%. The rate of motorisation has sharply increased in the new member countries over the past 15 years.

- growing traffic congestion on major networks, in particular in the central regions. The past decade saw not only a worrying increase in traffic congestion in urban areas, but also a new phenomenon of congestion on the major axes of the Trans-European Transport Network, increasing the number and size of bottlenecks. Missing links in the infrastructure and a lack of interoperability within specific transport modes and for intermodal transport systems are all reasons aggravating congestion. While European integration and globalisation favoured the growth of exchanges and of traffic investments in transport infrastructure and systems declined over time. Overall investments in the TEN-T in the EU-27 amount to less than € 30 billion/year since 1996; so that more than 20 years would be needed to complete the network. All transport modes are affected by congestion.

As far as forecasts are concerned, various studies were carried out at EU level in recent years. Most studies contain several scenarios related to the nature and intensity of transport policies likely to be implemented in future. The baseline scenarios indicate both substantial increase of transport flows in the decades to come and significant evolutions in terms of modal shift. The transport forecasts of the TEN-STAC study (Trend+ Scenario)[21] reveal considerable growth rated of transport performance in the EU-27 countries between the base year 2000 and the year 2020: +31% for passenger x km and +75% for freight (tons x km). The study 'European energy and transport trends to 2030'[22] indicates that the structure of passenger transport is projected to undergo significant changes under baseline assumptions, with air transport being the fastest growing transport mode over the projection period, accounting by 2030 for 10.8% of passenger transport activity, compared to 5.4% in 2000. Public transport modes are projected to continue having a more important role in satisfying passenger transport activity in new member/accession countries over the projection period, compared with the EU-15, while the contribution of air transport activity will remain by 2030 at levels well below those projected for the EU-15. The structure of freight transportation is also projected to change considerably in future. Road transportation will gain significantly in terms of market share at the expense of rail. The share of rail transport will fall from 17.1% of total freight transport in 2000 to 11.2% in 2030. the share of inland navigation is also projected to exhibit a continuous, thought limited, decline over the projection period. Starting from a much higher share for rail freight transport in 2000, new member/accession countries are projected to remain heavily dependent on rail. In 2030, some 24% of freight transport activity in new member/accession countries will be satisfied by rail transport, whereas in the EU-15 the corresponding share will be just 9% According to these baseline scenarios, the costs caused by road congestion are expected to increase considerably in the coming decades at EU-27 level.

[21] TEN-STAC. Scenarios, Traffic forecasts and analysis of corridors on the Transeuropean Network. Coordination: NEA Rijswijk. 2004.
[22] European energy and transport. Trends to 2030. European Commission. 2003.

It must, however, be observed that in all EU-wide transport forecasts produced up to now, the sharp increase of oil price experienced over the past years, as well as future evolutions in this field, have not been taken into account.

2.1.2 Nature, evolution and impacts of EU transport policy

The EU transport policy is a multi-dimensional one. It refers to the development of transport infrastructure (mainly TEN-T), to the liberalisation of transport services, to the modernisation of transport technology, to the increase of transport security, to the development of sustainability etc. Although the EU transport policy was defined in the Treaty of Rome, it became really operational in the early 1990s.

The TEN-T was first agreed in the guidelines of 1996 as well as in the accession treaties in 2002. Total financial needs up to 2020 can be estimated at € 600 billion. Some major projects have now been completed, but in far too many cases, the national sections of networks are merely juxtaposed, meaning that they can only be made Trans-European in the medium term. The implementation of the TEN-T is confronted with considerable delays. As the White Paper on the European transport policy noted, six years after the adoption of the 1996-guidelines, barely 20% of the projects planned for the year 2010 have been completed. A crucial factor that has lead to delays has been the complexity of moving ahead with cross-border projects or cooperation. In order to speed up the process, the Commission has set up the 'Quick Start Programme' covering a range of decisions and immediate actions to develop the network.

The transport sector used to be one of the most protected economic sectors in the former European Economic Community. During the past two decades, the various transport modes were progressively liberalised: maritime transport, road haulage, inland waterway transport, air transport and presently rail transport. Generally speaking, transport liberalisation has generated numerous new transport services at lower price, as demonstrated by the low cost airlines.

The orientations towards a sustainable transport policy were first defined in the White Paper of 1993. The Gothenburg European Council of June 2001 asked that, in future, stress should be laid on the development of rail, maritime and river transport. The Commission's White Paper on European transport policy in 2010 also placed the re-balancing between different modes of transport at the heart of a sustainable development strategy. The implementation of the strategy involves a wide range of measures, such as market measures reducing the discrepancies in competitiveness between the modes (for instance road pricing, actions in favour of intermodality etc.). Despite the existence of numerous measures in favour of sustainable transport, the general evolution in the transport sector and the existing forecasts indicate that the level of success of the sustainable transport policy has so far been quite modest, as the fastest growing transport modes (air and road) are the least sustainable.

The EU transport policy also addresses more technical issues such as interoperability (mainly in the railway and air traffic control sectors), security, development of intelligent transport systems (ITS) etc. While a number of measures are efficient (ITS, security), others are facing serious delays (interoperability in particular).

At the level of national transport policies, a trend can be observed in a number of countries towards the development of new motorways, as a response to increasing demand in road transport. This is particularly true in the countries of central and eastern Europe which have important deficits in this field, but also in a number of western countries like Ireland, the Netherlands, France etc.

2.1.3 Main driving forces in the transport sector

a) Key factors behind the continued growth in demand for transport:

- for passenger transport, the determining factor is the spectacular growth in car use. The number of cars has tripled in the last 30 years, at an increase of 3 million cars each year. Although the level of car ownership is likely to stabilise in most countries of the European Union, this will not be the case in the candidate countries, where car ownership is seen as a symbol of freedom. By the year 2010, the enlarged Union will see its car fleet increase substantially.

- as far as goods transport is concerned, growth is due to a large extent to changes in the European economy and its system of production. In the last 20 years, we have moved from a 'stock' economy to a 'flow' economy. This phenomenon has been emphasised by the relocation of some industries — particularly for goods with a high labour input — which are trying to reduce production costs, even though the production site is hundreds or even thousands of kilometres away from the final assembly plant or away from users. The abolition of frontiers within the Community has resulted in the establishment of a 'just-in-time' or 'revolving stock' production system.

- the progress of the economic integration in the EU, including the successive enlargements;
- in the case of air transport, the main factors of traffic development are the recent liberalisation as well as the related development of low-cost companies.
- the introduction of new transport technologies, such as high-speed trains (induction effect).
- the fact that transport users do not always cover the costs they generate. Indeed, the price structure generally fails to reflect all the costs of infrastructure, congestion, environmental damage and accidents.

b) Main factors of increasing congestion on a growing number of transport axes:

- saturation on some major routes is partly the result of delays in completing trans-European network infrastructure.
- the poor organisation of Europe's transport system and failure to make optimum use of means of transport and new technologies.
- the increasing rate of motorisation in the countries of central and eastern Europe

c) Main factors of territorial imbalance in accessibility:

- market-driven development of infrastructure. In outlying areas and enclaves where there is too little traffic to make new infrastructure viable, delay in providing infrastructure means that these regions cannot be properly linked in.
- low level of intermodality and of adapted transport services in the more remote regions.
- selective development of major infrastructure axes in the new member countries of central and eastern Europe, favouring the accessibility of large cities and of western regions in these countries at the expense of that of the more rural and remote regions (tunnel effect)

d) Main factors of imbalance in transport modes:

- insufficient consideration of social and environmental costs generated by road traffic;
- insufficient competitiveness of alternative transport modes, such as railways, waterways and maritime transport.

- political priorities given to raod transport in a number of countries

e) Main factors likely to modify and even counteract present trends:

- Increasing energy price (mainly oil and oil products) which could have detrimental impacts on mobility, on economic development and especially on the road and air transport modes;

- The recent enforcement of the Kyoto Agreement which prescribes a reduction of greenhouse gas emissions;

- Population ageing which may modify the mobility patterns

2.1.4 Identification of scenario hypotheses

The evolution over the past decade has shown a significant discrepancy between the Community objective of sustainable transport and the real evolution of modal shift which is in favour of air and road transport, the least sustainable transport modes. Existing forecasts indicate that present and past trends are long lasting and will not converge with the objective of sustainable transport. The efficiency of the EU transport policy may therefore be questioned. New elements have to be added to this. The weakness of economic development in Europe since the end of the 1990s has weakened the objective of sustainable development, so that the national transport policies emphasize again the development of motorway networks. While this is understandable up to a certain extent in the new member countries where motorways hardly existed up to recent times, substantial motorway programmes are also being implemented in a number of old member states. In a context of sharply increasing oil price, such policies raise the question of their long-term impact, both in terms of accessibility and of environment. On the other hand, the lack of efficiency of the EU transport policy in terms of modal shift in favour of environmentally-friendly transport modes =calls for strengthening the tools, measures and procedures through which this policy is implemented. It seems therefore accurate to investigate the territorial impacts of two opposite policies:

- new EU/national transport policies focussing in priority on the development of motorway networks in order to better respond to present and future transport demand;

- strengthened sustainable EU/national transport policies which will emphasize environmentally-friendly transport modes and counteract road and short-distance air transport. Stronger decoupling between economic development and transport growth seems however to be a prerequisite for this scenario.

2.1.5 Sources of information

The transport scenario base is a compilation of information originating mainly from following documents and reports:

White Paper. European transport policy for 2010: time to decide. European Commission. 2001.

Energy and transport. Report 2000-2004. European Commission. 2004

Intelligent transport systems. Intelligence at the service of transport networks. European Commission. 2003.

Intelligent transport systems. Results from the transport research programme. European Commission. 2001./

Freight intermodality. Results from the transport research programme. European Commission. 2001.

European transport networks. Results from the transport research programme. European Commission. 2001.

Sustainable mobility. Results from the transport research programme. European Commission. 2001.

Communication from the Commission 'Cohesion and transport'. 1998.

Report of the high-level group on the Transeuropean Transport Network (Van Miert Report). 2003.

European energy and transport. Trends to 2030. European Commission. 2003.

ESPON Study 1.2.1. 'Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion'. Coordination: CESA Tours. 2004.

ESPON Study 2.1.1. 'Territorial impacts of EU Transport and TEN policies3. Coordination: Institut für Regionalforschung. University of Kiel. 2004.

TEN-STAC. Scenarios, Traffic forecasts and analysis of corridors on the Transeuropean Network. Coordination: NEA Rijswijk. 2004.

2.2 Thematic prospective scenarios

Transport scenarios

Under the theme 'Transport', two prospective policy scenarios are presented, corresponding to rather opposite hypotheses, one favouring road transport as a response to existing and forecast demand, the second being orientated, on the contrary, towards the objectives of the Kyoto Agreement and of the Göteborg Strategy. These scenarios aim at illustrating the contradictory context in which the EU and its member states presently are, with some countries developing strongly their motorway networks to alleviate traffic congestion while the Kyoto Agreement has just been enforced and efforts have now to be developed to ensure sustainable transport.

2.2.1 Scenario 1: 'More investments in motorways'

2.2.1.1 Scenario hypotheses

European integration has been characterised by rapidly growing transport flows, both in the freight and passenger sectors. Available projections indicate that this trend is long-lasting and will be strengthened by the recent EU enlargement and by the forthcoming ones. Considering that modal split towards rail and maritime transport has not really been successful and that there is a clear trend in favour of road transportation in general, but in the new member countries in particular, the EU and national policies decide to make maximum use of the existing capacities of road transport infrastructure and to expand it. The traffic forecasts of the TEN-STAC study are considered as realistic and investments in the road sector should contribute to alleviate congestion with regard to strongly increasing transport flows. The scenario assumes that increase in fuel price will be moderate after 2005 and will not be detrimental to the development of road transport. This means that either increase of crude oil price will be moderate or, in case the price of crude oil will seriously increase, it will be compensated by a corresponding decrease of taxes on oil products.

2.2.1.2 Driving forces

Factors leading to the increase of road transport flows are, among others:

- the increasing mobility of people and the increasing rate of motorisation, in particular in the new member states of Eastern Europe;

- EU enlargements and further globalisation (intensification of economic exchanges); relocation of economic activities in the new member countries;

- delays in the extension and improvement of the TEN-T;

- insufficient competitiveness of alternative transport modes (railways, maritime transport;

- lack of success in decoupling economic growth from growth of transport flows

In the policy field, the driving forces are related to the expansion of the European motorway network and, more generally, to the optimisation of the use of the road/motorway networks as a response to the increase of traffic demand.

2.2.1.3 Contextual elements of the decision to increase investments in motorways

By 2006, the EU had for the fifth year a low rate of economic growth. The mid-term assessment of the Lisbon Strategy had revealed at the end of 2004 that the targets of European competitiveness were not to be reached without a serious reconsideration of the efficiency of EU policies, following in that some conclusions of the Sapir Report published in early 2003. the increase of the unemployment rate resulting from the progress of globalisation and in particular from the acceleration of enterprise relocation towards low-wage countries outside Europe, was a determining factor for the reconsideration of all EU policies as to their economic efficiency.

The EU Transport Policy was carefully and extensively examined. This examination revealed paradoxical aspects. On the one hand, the realisation of a Transeuropean Network and the liberalisation of transportation had been considered at the time of the adoption of the Single Act in 1986 as a key element of European economic development. This had been confirmed by the Commission's 1993 White Paper on growth, competitiveness and employment. The Brussels European Council of December 1993 had adopted a series of important decisions to speed up the implementation of the TENs, leading to the priority projects defined in Corfou and Essen in 1994. The Decision of July 1996 on Community Guidelines for the development of the TEN-T had enlarged the list of priority projects of Community interest. By 2003, total investment needs (including the Pan-European corridors) were estimated at more than 600 billion Euros.

On the other hand, assessments had revealed considerable delays in the implementation of the TEN-T, despite the fact that a number of ambitious projects had been realised. Another important issue was also that the 'ideological' change in the EU Transport Policy which occurred in 1992 in favour of a more environmentally-friendly transportation in Europe (introduction of the concept of 'sustainable mobility' in the White Paper of 1992) had not led to convincing results. Despite significant policy efforts (promotion of maritime, railway and waterway transport, introduction of road pricing etc.), road transport continued to increase at much higher speed than the other transport modes. Available forecasts had shown that this trend was long-lasting and that road transport flows would continue to increase at high rates, whatsoever conventional policy measures would be.

A tense debate took place at EU level and also within the member states involving those wishing to protect the environment and quality of life along the lines of the Göteborg Strategy of 2001 and of the Kyoto Agreement and those considering that present and future congestion of the transport networks would severely handicap the economic development. A determining argument was that the revival of the economy in the new member states of central and eastern Europe was precisely based on (or at least largely conditioned by) the accelerated development of road transportation, departing from the use of the dense, but obsolete railway transportation systems. In 2007, a EU Decision was finally taken to rapidly develop the European motorway network through ambitious investments. Member states would play a decisive role in the implementation of the strategy.

2.2.1.4 The motorway investments strategy

Main objectives of the motorway investments strategy adopted in 2007 was to reduce and prevent congestion on the European main networks (motorways and dual carriage ways). This included the elimination of bottlenecks, mainly in urban regions and in border areas, but also the connection of peripheral and/or landlocked regions to the European markets. An additional objective was therefore to contribute to improving accessibility of the whole European territory through motorways.

The expansion of the European motorway network was accompanied by measures aiming at limiting the environmental impact of road traffic, in particular the introduction of stricter norms for engine emissions and significant R&D efforts in the development of new vehicle propulsion technologies, using less fuel as well as other types of fuels (hydrogen, electricity, biofuels). Other accompanying measures aimed at strengthening the development of Intelligent Transport Systems in a variety of fields, but mainly in order to improve the guidance of traffic with a view to reduce bottlenecks and to increase security.

The strategy considered that one of the main causes of traffic congestion was the superposition on the same networks (motorways, dual carriage ways) of long-distance and regional and local traffic. It therefore encouraged the lower-tier authorities (regions, municipalities) to promote public transportation and to improve secondary networks in order to divert as much as possible local and regional traffic from the motorways, in particular during the peak hours.

The key element of the strategy was the financing system. When the first estimates of the investment volume were realised (end of 2007), the figures obtained were much higher than those previously envisaged for the completion of the TEN-T (around 600 billion Euros). In addition to the projects of 'Community interest' which had a clear cross-border or transnational dimension, the strategy also included numerous motorway projects in highly urbanised and densely populated regions, because the reduction of congestion in these areas would be highly beneficial to long-distance transit transport of European significance. This is why the total investment volume estimated nearly reached 1500 billion Euros.

Needless to say that public resources alone would enable the implementation of only a tiny share of this investment volume. It was therefore necessary to develop a highly sophisticated system of financial engineering based on public-private partnerships. This made possible to maintain the principle of road pricing. Its objective was less to divert traffic from the motorways than to ensure the viability and profitability of investment projects. Tariffs for users were conceived as flexible and highly dependent upon the context. In the cohesion countries, EU subsidies (structural funds, cohesion fund) were used in public-private partnerships to reduce the level of tolls charges to users. This was considered as particularly important to ensure the viability of projects in countries with a low purchase power. In West-European countries, the level of EU subsidies was either very low or even non-existing, but the EU provided a public guarantee to loans in order to motivate banks, investment funds and other financing institutions to join the programme. The European Investment Bank also played an important part in the implementation of the strategy. Bonds were issued to mobilise a broader financial basis, both inside and outside the EU. A Regulatory Authority was set up, composed of representatives of the public sector (EU, states) and of the PPPs to monitor the implementation of the strategy, the economic viability and profitability of projects, the level of tolls and to provide advice and solutions to emerging problems.

The main idea was however to maintain road pricing at a moderate level in order not to divert traffic towards the secondary networks. There where EU subsidies were not available, national resources were injected into the PPPs, in order to limit the level of tolls. The system

of financial engineering also comprised an instrument of financial equalisation between the PPPs, making possible for the Regulatory Authority to transfer a certain amount of revenue resources from the most profitable PPPs to those which were facing difficulties in terms of viability, while maintaining moderate levels of tolls.

2.2.1.5 Implementation of the strategy

The first steps of the strategy consisted in the concentration of EU support to motorway projects, at the expense of other transport infrastructure, in order to accelerate the realisation of projects which were already in the pipeline. The development of new motorway projects, from the planning phase to the end of realisation was however very time consuming. The first projects envisaged in 2007/2008 were not yet concretely implemented in 2015. Almost a decade was devoted to the planning and construction activities before the real benefits of the strategy became noticeable. In densely populated regions, specific difficulties arose at the stage of planning new motorways. Strong protests were expressed by the local population concerned by the potential environmental impacts of the projects. Negotiations took a long time and numerous specific (and expensive) solutions had to be elaborated (underground motorway sections, specific equipments against noise etc.).

During the period before 2015, a number of projects which had been launched in the early 2000s were completed, but this was not sufficient to absorb congestion. The saturation of various major corridors increased, generating a series of problems. Long-distance traffic used more and more the secondary networks and night traffic of trucks became generalised. The environmental impact on densely populated regions was high. People and enterprises stated relocating out of the most congested areas. They chose locations with still satisfactory accessibility, but outside the densest areas.

After 2020, the speed of projects realisation increased and new motorway sections were opened to traffic every year. Only the most ambitious projects (basis tunnels under the Alps, the Pyrenees, the Carpathian mountains) needed more time for their implementation. In maritime basins, (Baltic, Mediterranean, North Sea, Atlantic, Black Sea), the new motorways reached most medium-sized and large ports, so that numerous new ferry lines were developed.

2.2.1.6 Impacts

- **Impacts on the transportation systems**

As indicated above, the real impacts of the strategy were noticeable only after 2015, while up to 2015, traffic flows had continued to regularly and substantially increase. Two phases can therefore be identified. Up to 2015, the transportation system in Europe worsened because of increasing congestion on a growing number of axes and corridors. After 2015, congestion progressively decreased, but to a lesser extent than expected, because the induction effect of new infrastructure on traffic generation went on increasing, in particular in the new member states. Traffic intensity (measured in tons x km or passenger x km) increased substantially because of higher trip generation and, in particular, growing trip lengths. European society became more traffic dependent: increasing individual mobility reflecting the preference for variety in leisure occupation, shorter working weeks and more frequent -although shorter – holidays with a larger transport content, multiple car ownership in households leading to greater freedom. In freight transport, the average volume or weight of consignments diminished, creating an increasing fragmentation of flows, including the growing incidence of direct home delivery from telephone and Internet purchasing. The progress of globalisation in the world production and trade system,

reinforced by increasing integration and regional specialisation in the European Union's Single Market, provided additional elements in the growing transport intensity.

By 2030, the traffic situation on major axes and corridors had improved, compared with the situation in 2010 and 2015, although a number of bottlenecks remained. Much worse was the situation on secondary networks. These had hardly been improved, because financial resources were concentrated on the motorway network. The general increase in mobility and transport intensity created serious congestion and environmental problems in wide areas of the European territory, also quite far away from the motorways.

- **Macro-economic impacts**

The macro-economic impacts of the strategy have been quite significant and they started rather quickly after the decision about the strategy was taken in 2007. The huge investment volumes carried out generated a large amount of construction works which in turn generated employment, turnover and tax revenue. Traffic demand being high, tolls revenue made possible the re-reimbursement of loans and the refunding of bonds without major difficulty.

Another dimension of the macro-economic impacts, which developed however only after 2015, was the reduction of congestion and the higher efficiency and productivity of transportation which acted economically as a reduction of transport costs in the whole production systems and therefore increased the GDP of the European Union and of individual countries. Along the same line, the improvement of accessibility of peripheral and landlocked regions contributed to integrate them better into the European single Market and to increase global European output. Positive macro-economic impacts were also noticeable in the sector of motor-car industries, including R&D and new technologies.

The positive aspects of macro-economic impacts were however somewhat outweighed by the increasing imports of oil in a context where the external energy dependency of Europe was seriously increasing.

- **Regional, environmental and territorial impacts**

Considered from a Europe-wide perspective, the strategy favoured in the long range the development of more peripheral regions and therefore, polycentricity. Discrepancies in accessibility were seriously reduced, even if the density of motorway networks remained much higher in the Pentagon than in European peripheries. The strategy made also possible the development of motorway networks linking various maritime basins and avoiding the Pentagon. North-South axes were built between the Baltic States/Poland and the Adriatic and Black Sea basins. East-West axes were strengthened linking the Atlantic/North Sea ports to the new member countries of central and eastern Europe.

At meso-scale, the situation worsened up to 2015. The number of congested axes and corridors increased, mainly in the Pentagon, but also in and around urban regions in more peripheral areas. Transit countries like Germany, Denmark, France, Switzerland were particularly affected. In the productive sector, increasing congestion constrained intra-sectoral exchanges, access to final markets as well as the just-in-time approach. A number of changes in the productive and logistic structures became necessary. Productive activities progressively left dense urban and metropolitan regions to relocate in intermediate regions in and around the pentagon, from where main markets as well as suppliers were still accessible through less congested main and secondary networks. As such strategies prove not to be sufficient, the splitting of production structures over large (sometimes Europe-wide) areas is progressively being given up by more and more companies. Main enterprises, subsidiaries and suppliers are being regrouped again in locations which are easily accessible

from each other. This evolution benefited to the economy of areas with intermediate centrality, but was detrimental for peripheral regions. It was also detrimental to main ports which had not sufficiently developed railways and waterways as hinterland connections.

As far as the population of dense urban and metropolitan regions as well as corridor areas is concerned, it was more and more inclined to move away. Most favoured locations in less congested areas were however locations near public transport stations. More and more retired people left urban and metropolitan areas to relocate in attractive rural areas.

After 2015, a number of improvements in the networks had considerable impacts, in particular in densely populated and congested regions, but also in the countries of central and eastern Europe. Thanks to the new motorways, the level of traffic congestion decreased in the English Midlands and the South-East, in the Benelux, in the Rhein-Ruhr and Rhein-Main regions, in the densely urbanised East-West corridors north and south of the Alps, in the corridor linking the Benelux to the Paris region, in the Rhone valley, in the corridors along the Mediterranean coast etc.

At local level, the crossings and access points of the modernised motorway network became preferred locations for new activities. Increasing rates of motorisation favoured however the progress of suburbanisation and dispersal of settlements. Congestion on secondary networks accentuated this trend, in particular in densely populated regions. Adjacent rural areas with less traffic density became attractive locations for both people and activities, provided reasonable access to the motorway network was ensured.

Impacts of the strategy on the environment have been far from positive. As far as the emission of greenhouse gas was concerned, the evolution went in a direction totally opposite to the Kyoto Agreement. Despite technological progress which significantly reduced the fuel consumption and gas emission of engines, the considerable increase of traffic flows, which had doubled and even tripled on numerous corridors by 2030, compared with the situation in 2005, resulted in strongly growing CO^2 and NOx emissions. Emissions were not limited to areas bordering the motorway networks. Increasing traffic and congestion on secondary networks disseminated emissions widely throughout the European territory.

In addition to gas emissions, the strategy generated important damages to natural areas. Because of protests from the population as to the location of new motorways, these were mainly built in rural and natural areas, where population density is low. A number of new motorways were also built in mountain regions, affecting the natural heritage of numerous valleys. Coastal regions were also damaged, in particular in Mediterranean regions, where the mountainous character obliged to build the new motorways rather close to the coastline, generating pressure on settlements and on highly valuable landscapes.

2.2.1.7 Final images

The scenario provides two different images:

- an intermediate image around the year 2015 with increasing traffic congestion, in particular in densely populated regions, resulting in deteriorated living conditions. Concentration of population and activities in and around the Pentagon had progressed. Areas with intermediate accessibility, adjacent to urban regions or not too distant from them were becoming prosperous in terms of business location, but were facing increasing land-use conflicts and emerging environmental problems. This included also the hinterland of main and second-rank ports.

- a final image around 2030 with quite different characteristics. Growth and wealth have progressed towards the European peripheries along the most important corridors, as a

result of increased accessibility through more developed motorway networks. In the countries of central and eastern Europe, only major corridors and related large cities (in particular in the western regions) have benefited from an increase in accessibility, while more remote regions in the east as well as rural areas largely dependent upon obsolete secondary networks remain weakly accessible. The volume of investments carried out has had a significant impact on the revival of he European economy. Economic development is widespread along the grid of the motorway networks, favouring the crossings and access points to motorways. Suburbanisation and dispersal of settlements have further developed. Secondary networks are quite saturated. The environmental impacts are strongly negative, both as far as emissions and damages to natural areas are concerned.

2.2.1.8 Main issues resulting from the scenario

The scenario shows which spatial evolutions would result if the projected increase of road traffic throughout the EU (demand projection) would be made possible through a substantial development of the motorway network throughout Europe. The scenario shows clearly that significant economic benefits would result from such a strategy, which would however be considerably outweighed by the intensity of resulting environmental problems. The scenario points out that benefits in terms of transport situation would not really emerge before 2015. In between, the increase of traffic congestion would however have wide territorial consequences: deterioration of the environment and quality of life, reduction of mobility, increase of transportation costs in production/distribution processes, changes in location patterns, both for enterprises and population and therefore impacts on inter-regional disparities. The scenario suggests the existence of traffic thresholds (and therefore of congestion thresholds) which are likely to generate 'chain reactions' in the behaviour of economic actors, in particular as far as location patterns are concerned. According to existing traffic projections, such thresholds could be reached on numerous corridors between 2010 and 2015, while the situation will improve afterwards when the implementation of the motorway strategy shows its first substantial results.

2.2.1.9 Impacts for EU policies

The scenario is based on the assumption that a considerable change takes place in the EU Transport Policy, backed by similar orientations in the transport policy of all member states. Based on alarming traffic forecasts, in particular as far as demand for road transport is concerned and considering the very insufficient results of the policy of 'sustainable mobility' carried out since the mid 1990s (promotion of environmentally-friendly transport modes), the EU decides in 2007 to implement an ambitious programme of motorway construction. Key instrument of this strategy is a sophisticated system of financial engineering based on public-private partnerships. The implementation of the strategy calls for coordination with EU regional and environment policies, in order to optimise the economic benefits (productivity of new infrastructure) and to minimise the environmental impacts (Natura 2000 Network in particular)

2.2.1.10 Summary

The scenario is based on the hypothesis that EU and national policies decide to make maximum use of the existing capacities of road transport infrastructure and to expand it, considering that modal split towards rail and maritime transport has not really been successful and that there is a clear trend in favour of road transportation in general, but in the new member states in particular. An ambitious motorway investments strategy is adopted in order to reduce and prevent congestion on the main European networks. Specific financial engineering based on public-private partnerships was developed. Considered from a Europe-wide perspective, the strategy favours in the long range the development of more peripheral regions and therefore polycentricity. At lower levels, a significant reduction of

traffic congestion can be observed, in particular in highly urbanised regions, accompanied however by a significant progress of suburbanisation. The impacts of the strategy on the environment are far from positive, with a strong increase in greenhouse gas emissions and with significant damages to natural areas.

2.2.2 Scenario 2: 'Decoupling economic development from the mobility of people and goods'

2.2.2.1 Scenario hypotheses

The scenario is based on a combined strategy which aims on the one hand at enforcing the provisions of the Kyoto Agreement and of the Göteborg Strategy (reduction of greenhouse gas emissions and further environmental protection) and on the other hand at moving the European economy towards more knowledge-based components according to the Lisbon Strategy. A clear complementarity exists between these two dimensions: decoupling economic development from the mobility of people and goods works undoubtedly in favour of the environment, but cannot rely exclusively on transport policies. It has to integrate economic policy elements along the lines of the Lisbon Strategy. Policy measures are taken to limit road and short-distance air transport and to promote alternative transport modes.

2.2.2.2 Driving forces

In the field of transport policy, the main driving forces are the policy measures taken at all levels to discourage the use of cars and trucks, both for long-distance and for regional and local transportation of people and goods as well as those taken to reduce air transport on short distances. Specific policy measures encourage and promote alternative transport modes with lower environmental footprint.

In the field of economic policy, a series of measures are taken along the lines of the Lisbon Strategy in favour of a competitive knowledge-based economy likely to develop more immaterial economic functions and to have a positive impact on the reduction of freight flows.

In the field of trends, the main driving forces are the continuation of the globalisation and European integration processes generating significant increases in transport flows.

2.2.2.3 Contextual elements of the strategy

The strategy consists of the implementation of decisions taken long before the year 2005, but which had not been successful earlier. This is the case for the Kyoto Agreement, the Göteborg Strategy and the Lisbon Strategy. Surveys and assessments carried out for the period 2000-2005 indicated that the reduction of greenhouse gas emissions in Europe had not been sufficient, largely because of the strong increase of transport flows. The Kyoto Agreement having been ratified, its enforcement called for efficient measures aiming at the reduction of greenhouse gas emissions.

A similar situation prevailed in the case of the Lisbon Strategy. The mid-term assessment carried out in 2004 clearly showed that progress of the European economy in terms of growth rate was weak, compared with that of other large economies (USA, China) and that the move towards knowledge-based activities was too slow. It was considered that Europe urgently needed acceleration in the process towards a more immaterial economy in order to

reduce the negative impacts of globalisation which materialise in increasing unemployment and enterprise relocation outside Europe.

This context led from 2005 onwards to a series of decisions related to significant changes in the EU transport and economic policy (including its industrial, technological and regional dimensions), along the lines of Kyoto, Göteborg and Lisbon. The decisions were prepared during the 2005-2007 period and their implementation started in 2008.

The EU policy measures were backed by similar initiatives within the member states, at the various politico-administrative levels. Respecting the principle of subsidiarity, the vertical harmonisation of policy measures resulted mainly from conviction and consensus.

2.2.2.4 Elements of the strategy

At EU level, the main measures taken in the field of transport policy concerned the revision of the TEN-T. A new list of priority projects was established, focusing on the development of the HST network, on the rehabilitation and modernisation of conventional railways, in particular in the new member countries of central and eastern Europe, on the promotion of rail, waterway and maritime freight transport, as well as of intermodal transport. Projects concerning motorways or related to regional air transport were excluded, with the exception of those which were already under construction. In addition to the budget of the TEN-T, resources from the structural funds and from the cohesion fund were allocated to the implementation of the revised list of priority projects. In the case of particularly large projects likely to generate revenue, EU resources were also used to support public-private partnerships. The volume of EU resources allocated to technological development and R&D in the field of new transportation systems and less polluting engines was significantly increased.

Joint agreements were concluded between the EU level and the member states concerning matters of national competence, but necessitating for efficiency reasons, a good harmonisation at EU-wide scale. In this context, it was decided to apply high levels of road pricing, not only on motorways, but also on numerous roads of national and regional importance, where the introduction of road pricing was technically possible. In addition to this, it was decided to increase taxes on fuel, gasoline and kerosene, which came above the natural price increase of crude oil. Specific taxes were also introduced on short-distance air transport.

It was agreed that the additional revenue from road pricing and taxes would be allocated to the development of public transport networks and systems and to the promotion of transport modes with lower environmental footprint (support to investments; application of low tariffs).

Finally, the EU and the national authorities decided to jointly organise large-scale awareness-raising campaigns about the negative environmental impacts of road and air transport, targeting both European citizens and enterprises.

The lower-tier authorities (regions and municipalities) were invited to promote public transportation at regional and local levels through positive measures (development of public transport networks), benefiting from subsidies of the EU and national levels. They were also invited to discourage motor-car traffic in cities through the introduction of high tariffs for motor-car parking in city-centres, while the park-and-ride systems were promoted.

The link between the new transport policy and the economic policy along the lines of the Lisbon Strategy was ensured by a strong promotion of ICTs and related services. The objective was not only to give impetus to economic development, but also, with equal

importance, to substitute e-services to physical mobility. Campaigns for the development of home-working ware also carried out. In this respect, specific EU actions were to define a regulatory framework for electronic communications, to encourage the spread of ICTs, to create conditions for efficient e-commerce and to support European leadership in mobile communication technologies.

The promotion of the knowledge-based economy implied also a number of other policy measures. These aimed first at boosting EU, national and private spending on R&D up to 5% of GDP. In this respect, one of the related objectives was also to make Europe more attractive for high-level researchers and to avoid that many young scientists continue to leave Europe on graduating, notably for the US. A system of mutual validation of national quality assurance and accreditation processes was developed, reducing the administrative obstacles to mobility of researchers in Europe. Measures were also taken to facilitate the entry of researchers and their dependants from outside the EU through simplified, fast-track work permit and visa procedures. The funding of research institutions and universities was reconsidered and substantially improved. Measures were taken to promote and strengthen the creative interaction between universities, scientists and researchers on the one hand and industry and commerce on the other, in order to drive technology transfer and innovation. The strategy included also measures related to education and qualification, aiming at adapting education and training systems for the knowledge society and at fostering lifelong learning.

2.2.2.5 Implementation of the strategy

The implementation of the measures decided in 2007/2008 was not immediate. Some measures could be implemented in the short-term, others needed a quite long period before they became effective. In fact, it was a process that developed and intensified during the period considered.

In the field of transport policy, the first measures to be implemented concerned the progressive increase of prices and tariffs: road pricing, taxes on gasoline, fuel and kerosene, tariffs for car parking in cities. Such measures, which were by far not popular and created numerous tensions, had a quite rapid impact on the behaviour of people and economic actors and influenced directly the transportation market. Their progressive intensification convinced the transport users that the new policy was long-lasting and that it was worth envisaging long-term solutions, notably in terms of locations, activities etc.

Among the changes which could be rapidly observed, there was in first place a more intensive use of public transportation, both at local/regional level and also for long-distance trips. The income of public transportation companies increased and they could invest more in expanding the networks and improving the quality of services. A second important change was the intensification of e-commerce, e-services and home-working. This contributed to significantly reduce mobility at local/regional level.

Modal changes were less rapid in freight transport. Although all manufacturing industries and trade companies had noticed a significant increase in transport costs for their products, modal changes, departing from road transportation, implied the availability of equivalent services in other transport modes or in the field of intermodal transport. Such services were not immediately available. Structural evolutions had to take place in the organisation of railway and maritime companies. Important investments were necessary in infrastructure development and modernisation as well as in rolling stock. A favourable factor was that the increase in costs of the road transport mode made the other transport modes more competitive and therefore profitable. After 2015, freight transport in Europe had taken a different shape. The share of road transport had started to decline, in particular for long-distance haulage.

Structural changes in the European economy were driven by both the progress of globalisation and the new economic policy. The importance of traditional activities, using heavy raw materials, declined significantly. This affected mainly the new member countries of central and eastern Europe, but also a number of regions with traditional manufacturing industries in western Europe. The European economy specialised more and more in products with high added value and technological content as well as in immaterial production. The requirements in terms of transportation were significantly modified. Speed, flexibility, reliability became very important factors. Capillarity in the final access to customers was also an increasing requirement. New transport services had to be created, in which logistics, combined and intermodal transport had a growing importance. High speed freight trains were operated, as well as high speed maritime transport.

2.2.2.6 Impacts

- **Impacts in the transport sector**

Up to 2015, the nature of transport flows did not change significantly. The impact was mainly concentrated on the volume of flows and on transport modes used. The increase of transport costs, which was soon observable after the new policy was adopted, had a rather quick impact on the volume of road passenger transport, which decreased. In general terms, the mobility of people also decreased. The period up to 2015 was more problematic for freight transport, because the transport volumes continued to increase in a context which was constraining in the field of road transport (higher costs, strong decrease of infrastructure investments). Traffic congestion on the road and motorway networks continued to increase during that period, although this was attenuated by the fact that more and more people used public transport and much less their motor-car for daily commuting and also for long-distance trips. This increased somewhat the capacity of roads and motorways for freight transport. Another factor which worked in the same direction up to 2015, was the lower level of economic development which resulted from the new transport policy in relation to freight transport costs.

After 2015, the transport situation became more sustainable. This resulted from a combination of various factors. The new policies in transport and economy had generated structural changes. The move towards a more immaterial economy has contributed to moderate the volume of freight transport flows. In addition, the nature of flows also had changed, with more products having lower weight and higher added value. A number of significant investments in transport systems had been carried out (infrastructure, rolling stock, intermodal facilities etc.). The HST network had strongly expanded, at least on connections enabling profitable services. In the UK, the Midlands as well as the cities of Edinburgh and Glasgow were connected. In the Iberian Peninsula, the HST network connected Barcelona, Madrid, Sevilla, Lisbon and Porto to the rest of Europe through two connections on both sides of the Pyrenees. In the Nordic countries, the HST triangle Copenhagen, Oslo, Stockholm was completed and connected to the rest of Europe through the 'Vogelfluglinie' bridge. The HST connection from Munich to Vienna, Bratislava and Budapest was in operation, as did the HST line from Berlin to Warsaw. Zagreb and Ljubljana were connected to Milan through Trieste and Venice. A number of HST connections had replaced former short-distance air connections. The public transport networks of metropolitan areas and medium-sized towns had been modernised and enlarged. The motorways of the sea had finally become a reality, thanks to new technologies in the maritime sector which made this transport mode competitive.

In the new member states of central and eastern Europe with more traditional manufacturing industries, specific problems arose because transport needs increased while the railway networks were obsolete and the motorway networks were weakly developed.

Priority was given to the rapid modernisation of railways and this factor played an important part in the development of long-distance rail freight transport and intermodal transport at Europe-wide scale, especially on East-West corridors.

At the end of the period considered (around 2030), the spiral of exponentially growing traffic flows had lost of its energy and the situation had stabilised in quantitative terms, while significant qualitative changes had taken place in the transport systems themselves.

- **Macro-economic impacts**

Various elements of the new policies had macro-economic impacts, sometimes in opposite directions. The increase of transport costs had negative macro-economic impacts for a number of years until the necessary structural adaptations in terms of production, locations, alternative transport systems etc. were made. This created difficulties for numerous enterprises for which transport costs represent a significant share of turnover and brought additional constraints to the existing challenges of progressing globalisation.

These negative macro-economic impacts were however progressively outweighed on the one hand by the important investment volumes made in alternative transport systems, which generated employment, tax revenue and progress in transport technologies and, on the other hand, by the emerging knowledge-based economy which generated numerous innovations and patents as well as significant amounts of added value in economic outputs.

At the end of the period considered, economic development was progressing at a satisfactory rate and the growth differential with the USA had become smaller, while the transport situation was under control. The decoupling strategy between economic development and the growth of transport flows, in particular on roads and motorways, had been rather successful.

- **Regional, environmental and territorial impacts**

At Europe-wide scale, the regions which were most advantaged (or less disfavoured) in economic terms by the new transport and economic policies, were those easily accessible by long-distance railways, HST, waterways and maritime transport. These are mainly regions with large metropolitan areas within the Pentagon, but also outside of it. In the European periphery, regions and cities with large ports were comparatively less disfavoured.

The regions most disfavoured were those the large-scale accessibility of which was largely dependent upon road and air transport. Numerous peripheral regions belonged to this category (Ireland, Scotland, parts of the Iberian Peninsula, southern Italy, Greece, northern periphery, eastern parts of the new member countries), but also a number of more centrally located large rural areas (such as the French Massif Central, the French and Belgian Ardennes), quite distant from main axes and corridors. In the new member countries, the new transport policy was a particular economic handicap in the short and medium-range. Economic development could not progress as strongly as expected, also because the penetration of the knowledge-based economy was less rapid than in Western Europe. The modernisation of the railway network and the development of intermodal and maritime transport progressively favoured the accessibility of large and medium-sized towns as well as the development of port regions.

All this resulted in an increase of disparities related to large-scale accessibility at European level and worked generally against polycentricity.

At meso-level, regions with dense railway networks or important commercial ports have been favoured. Intermodal platforms developed there, connected to the railway, waterway

networks and ports. Networks of towns and cities emerged under the effect of improved inter-urban public transportation. In the productive sector, the spatial de-concentration of manufacturing and service activities (back office functions) out of metropolitan areas slowed down. Activities concentrated in locations with good accessibility by railway, but also around large ports, along waterways etc. Important innovation-oriented clusters developed in numerous European regions, but mainly in the Pentagon. Migration of population towards rural areas (retired people in particular) did not significantly slow down (although dependence upon road transportation is higher in rural areas), because the price of dwellings in cities strongly increased (push effect). The major pattern of territorial evolution at meso-scale has been one of nodal densification along corridors.

At more local level, and in particular in urban areas, motor-car related suburbanisation slowed down. In the periphery of large cities and metropolitan areas, a concentration of residential and productive functions took place around the stations of public transportation networks. These networks were significantly expanded. The concentration of settlements generated strong increase in land value. Demand for housing in urban areas increased significantly and prices also, because commuting by car became very expensive. Urban derelict land was rehabilitated. There was also a strong demand for nature and recreation areas at immediate proximity of cities.

In remote or peripheral rural regions, small and medium-sized towns were much less prosperous. Being largely dependent upon road transportation, their attractiveness decreased. A number of them were negatively affected by the relocation of activities induced by the need to reduce transportation costs.

The new transport and economic policies were highly beneficial to the environment and quality of life, in particular in the long range. The level of greenhouse gas emissions was significantly reduced and natural areas were better protected against further developments of the road and motorway networks as well as against suburbanisation and dispersal of settlements. There was however stronger pressure from recreation and leisure activities on natural areas located in the vicinity of cities. Because of less widespread use of motor-cars in tourist activities, these tended to become more spatially concentrated. This was somewhat detrimental to the development of soft tourism and to rural areas which were used to draw additional income from their natural and cultural heritage.

2.2.2.7 Final image

In the long range (around 2030), the final image of the European territory shows networks of compact cities well interconnected through high-capacity and high-speed railways. These cities are surrounded by nature and recreation areas. Long-distance commuting by car to large cities has become the exception. Suburbanisation trends also have been strongly reduced.

Rural areas are generally less populated than they were in 2005, with the exception of those which are particularly attractive for retired people. Settlements in rural areas are however less dispersed, to take advantage of public transportation services.

Considered at a wider scale, disparities among European regions are stronger than in 2005. Growth has favoured the cities of the pentagon as well as a number of other large cities outside of it, in particular those with large ports or good railway connections at reasonable distance from main markets. Numerous regions of the European periphery have a weak development rate and even decline. The peripheral regions of central and eastern Europe are however less disadvantaged because of their extensive railway networks which have been substantially modernised.

2.2.2.8 Main issues resulting from the scenario and impacts on EU and other policies

The scenario is a policy scenario aiming at discouraging the development of road and short-distance air transportation through strong policies including a wide range of measures. It does not rely only upon transport policy, but also upon efficient instruments to implement the Lisbon Strategy, because transport policies alone will never achieve the decoupling between economic development and the growth of transport flows. The scenario shows that success in this field can be achieved up to a certain extent and in the long range if coherent and substantial policies are applied at all levels. As numerous items among the measures envisaged are not really popular (at least for some segments of the European population) the question can be raised in how far such a scenario is politically realistic. The scenario shows also that the impacts of such policies go far beyond the reduction of air pollution and greenhouse gas and the limitation of climate change. Impacts can also be observed on the relative accessibility of the respective European regions and therefore on the evolution of inter-regional disparities in Europe. In order to avoid negative evolutions in this field, transport and economic policies should be accompanied by other public policy measures, in particular in the field of regional policy (in order to counteract territorial imbalances), urban planning (in order to counteract land price speculation, to promote better integration of urban functions and to limit short-distance mobility etc.), governance (stronger cooperation between local authorities, administrative levels and sectoral administrations).

2.2.2.9 Summary

The scenario is based on a combined strategy which aims on the one hand at enforcing the provisions of the Kyoto Agreement and of the Göteborg Strategy (reduction of greenhouse gas emissions and further environmental protection) and on the other hand at moving the European economy towards more knowledge-based components according to the Lisbon Strategy. Policy measures are taken at all levels to discourage the use of cars and trucks, both for long-distance and for regional and local transportation of people and goods and to reduce air transport on short distances. Specific policy measures encourage and promote alternative transport modes with lower environmental footprint. The transport strategy is accompanied by measures of economic policy likely to favour the knowledge-based economy and to develop more immaterial economic functions. The implementation of the strategy shows negative macro-economic impacts in the short-term (increase of transport costs), but high competitiveness in the long-term. At Europe-wide scale, the regions most advantaged are those easily accessible by long-distance efficient railways, H.S.T., waterways and maritime transport. These are mainly regions with large metropolitan areas within the Pentagon, but also outside of it. The regions most disfavoured are those the national and European accessibility of which is largely dependent upon road and air transport, numerous peripheral regions belonging to this category. At meso-level, regions with dense railway networks or important commercial ports are favoured. At more local level, the evolution is in favour of compact cities, suburbanisation trends slowing down. The new transport and economic policies are highly beneficial to the environment and quality of life, in particular in the long range.

2.2.2.10 Possible ESPON Indicators for the transport scenarios

Numerous ESPON core-indicators can be used in the context of these scenarios, such as:

- Income per capita, GDP per capita
- Population growth
- Net migration rate
- Unemployment rate

- Passengers in airports
- Transport network by mode
- Transport node by mode
- Travel time by spatial level and transport mode
- Daytime accessibility by transport mode
- Network distance to linear distance ratio
- Proportion of main lines connected to digital exchange
- ADSL lines as a proportion of total main lines
- Proportion of exchanges with co-located equipment
- Availability of Internet services with local rate charges/unmetered access
- ADSL subscribers per 10 000 inh.
- Proportion of households with broadband Internet access
- ICT tele-communication
- Tourist capacity
- Market accessibility potential by spatial level and transport mode
- Travel time by spatial level and transport mode
- Travel costs by transport mode
- Average speed to markets
- Average time to markets
- Impact of accessibility change on GDP per capita
- Impact of accessibility change on Equivalent income measure of user benefits
- Impact of accessibility change on employment.

3. Thematic scenarios 'Energy'

Jacques Robert (Tersyn)

3.1 Scenario base 'Energy'

3.1.1 Present situation, trends and forecasts

3.1.1.1 EU growing external dependence in the field of energy supply

The EU is relatively poor in conventional energy reserves. However, this fact has not affected the rise in energy demand over the past decades and is not expected to act as a brake on consumption for the foreseeable future. As a result, Europe is increasingly dependent on energy imports. Looking at the situation for the various energy commodities, the situation is the following:

- the EU imports around 80% of its oil. With the foreseeable depletion of North Sea oil reserves and still growing demand, external dependence would rise, under baseline hypotheses, up to 90% by 2020. Main suppliers are presently OPEC countries.

- gas import dependence of the EU is presently 40%. It is expected to rise to 66% by 2020. Main suppliers of the EU are Norway and Russia. Although new suppliers are entering the market (North Africa, Middle East, Central Asia etc.), dependence on Russia is considerably increasing as a result of EU enlargement.

- as far as coal is concerned, the enlarged EU still has substantial reserves (UK, Germany, Spain, central and eastern Europe), but imported coal is far cheaper than domestically produced coal (four times cheaper in the case of German coal). Production in Europe is falling and is likely to do so, in particular in the new member states of Central and Eastern Europe. As a result, coal imports into the EU are increasing although demand is decreasing.

- Europe is poor in nuclear resources (uranium). EU demand for uranium has stabilised at about 20 000 tons per year. Future trends in demand are unclear, given the uncertain future for nuclear power in several member states. Demand for uranium in the EU will increase if demand for nuclear electricity significantly increases. This will create greater dependence on external resources (from Russia, Canada, Australia).

3.1.1.2 Strategic energy issues at world level

The increasing external dependence of Europe for its energy supply implies that strategic issues at world level are of considerable importance for the future of Europe.

In the world context, the most strategic energy commodity is oil and the issue is the evolution of the relationship between global supply and demand. As far as world oil demand is concerned, it is strongly growing under the influence of large emerging economies such as China, India, Brazil as well as of other developed economies like the USA. Presently, oil demand is higher than supply. This explains the sharp increase of crude oil price since 1999 ($9/barrel in 1999; $60/b by mid 2005). Constraints to the rise of present oil production (which amounts to 78 million b/d) are numerous: the steady reduction of large oil discoveries since the 1970s, the decreasing level of investments in oil search and

exploitation as well as in refining capacities, wars and conflicts etc. Looking at the future, the evolution of the oil sector is even more serious because of progressive depletion of oil resources. According to a number of experts, a geological process of oil production peaking at world scale is likely to happen between 2010 and 2020. This does not mean that oil resources will be totally depleted, but it implies that world oil production, after a period of 'plateauing' will regularly decrease, independently from the level of investments made to increase production. This process is related to the specific geology of oil fields and to the fact that the conditions of exploitation of remaining reserves are much more difficult and expensive than those which prevailed up to now. The combination of declining oil resources with regularly increasing demand at world scale is likely to generate extremely high oil prices and even oil scarcity after the oil peaking process has occurred. Because of the role played by oil and oil products in the European economy, the impacts of oil production peaking may be rather severe.

Gas reserves are, compared with oil, relatively well distributed around the globe. The former Soviet Union is the major source of gas reserves, with the Middle East a close second. Other major reserves are spread in Asia-Pacific, the Americas, Africa and Europe. Worldwide, the prospects for gas supply are relatively good in the short term with a depletion/decline point coming in perhaps 20 years or so. This will depend upon the rate of global gas consumption. In the long range (by the year 2030), however, gas production peaking at world scale will most probably have taken place and the situation will be similar to that of oil.

Almost 80% of world coal reserves are concentrated in North America, Asia-Pacific and the former Soviet Union. Reserves in Europe, based on caloric value, are estimated at 72 billion tons of coal units (of which 70% is hard coal). Coal reserves are being used at a far slowest rate than oil and gas.

Current annual world uranium is 31 000 tons, compared with needs of some 60 000 tons. Secondary supplies (stocks, military material, recycling) cover the gap. Since around 1984, substantial quantities of uranium, coming from inventories, USSR or CIS countries, or from uranium no longer needed for defence purposes, have been put on the market, resulting in an oversupply situation and a substantial price decrease. These secondary resources have been largely exploited and uranium price is likely to increase again. In addition, demand is higher than the production of conventional uranium at world scale, so that significant expansion of nuclear energy production would be confronted to limitations and obstacles in the medium range.

3.1.1.3 Potentialities for renewable energy sources

The contribution of renewables to energy production across the EU is around 6%, of which hydropower represents 4% (2/3). Renewable energy sources are currently unevenly and insufficiently exploited in the European Union. Some countries, such as Austria, Sweden, France and Italy have a large renewables sector. Some, such as Germany, have intensive programmes or legislation in favour of renewables and some have little exploitation of renewable resources. Outside the EU, both Norway and Switzerland have significant renewable resources, mainly hydropower.

Large-scale hydropower is the largest renewables producer. It is the best exploited and the most mature. Within the EU, hydropower supplies cover around 14% of electricity demand. Most economically feasible sites have been exploited in Europe. Reserves still exist in small-scale hydro (< 10 MW) for local decentralised generation. A growth of some 2500 MW is anticipated in the EU by 2010. Further potentialities exist in the offshore sector (wave and tide energy). Technologies still have to be developed.

Installed capacity for wind energy has more than doubled during the 1990s and the same happened over the past five years. There is potential for further strong growth. A quadrupling of market potential by 2020 is possible thanks to offshore installations, greater capacity wind turbines, large dispersed wind farms etc.

There is also significant potential for solar, thermal collectors which produce low temperature heat for domestic applications. Installed capacity is increasing, but paradoxically, more in the northern half than in the southern half of Europe. Photovoltaic electricity production is on a very small scale in the EU. Cost is a decisive factor. Installed capacity has not grown as quickly in the EU as in the rest of the world. It is however estimated that a significant market potential exists, as high as 2000 MW by 2010, compared with 200 MW in 1999.

As far as biomass is concerned, potential is very significant and there are numerous applications. Biomass is used for the production of heat and/or electricity, for instance in CHP plants (Combined Heat and Power). Biomass will also be more and more used to produce biofuels for the transport sector (mainly bio-diesel and bio-ethanol) as complement or substitute to oil products..

Geothermal energy depends on similar technology to the oil industry. 'Hot dry rock' technology aims at 'mining' heat of 200-250°C which is available in many places in the EU at a depth of 5000 m. The installed capacity in the EU has risen gradually in the 1990s and is likely to do so, but the market potential by 2010 is unlikely to exceed 2700 MW. As far as heat pumps are concerned, there is significant potential for the heating of dwellings and offices. It is however necessary to take account of the real energy efficiency of such technologies (ratio between energy produces to primary energy consumed), which is less favourable than the ratio energy produced/electricity consumed.

3.1.2 EU energy policy

The objectives of the EU energy policy are:

- to ensure security of the energy supply through managing the growing external dependence of the Union in this sector;
- to facilitate closer integration of the Community energy markets, so as to improve the competitiveness of European industry, without in any way neglecting the safety, quality and durability of energy equipment, or public service objectives;
- to implement an energy policy compatible with sustainable development objectives, particularly through more rational use of energy and the development of renewable sources;
- to promote research and technological development in the energy sector.

More specifically, the EU promotes both the development of alternative energy sources (renewables), of new technologies in the energy sector and of energy saving measures (programmes Altener, Save etc.).

Among the possibilities for curbing down energy demand, the strategies promoted concern the development of new generations of vehicles with higher fuel efficiency or with alternative fuel systems, the increase of energy efficiency in industrial plants, the reduction of energy consumption in buildings etc. The achievement of the reduction of energy demand depends upon the level of energy price. The current sharp increase of oil prices is particularly favourable to the implementation of energy saving measures.

The EU energy policy promotes and supports the development of all forms of alternative renewable energy sources (wind, solar, biomass etc.), both in the field of R&D (Framework programme, Altener etc.) and in the field of investments (structural funds).

EU support also addressed the development of emerging technologies. This is particularly the case for hydrogen and related fuel cell technologies which may have numerous applications, in particular in transport, heating etc. It is however essential to consider that hydrogen is not a new energy source, but a new energy carrier. Hydrogen production requires significant amounts of energy and environmentally-friendly techniques for mass production of hydrogen are not yet available. Significant R&D and experimentation are still necessary.

Other emerging technologies promoted by the EU are those of decarbonisation. New technologies are being developed for the capture and sequestration of CO2, which could have a significant impact on the ability to continue to use fossil fuels safely and cleanly. Fossil fuel use can be made cleaner and more efficient by improving the processes for electricity generation from coal. There are numerous technologies – at a different stage of development – which make coal more attractive as a fuel for electricity generation and thus are of relevance to the security supply debate. Furthermore, these technologies could open up new markets for European industry in other parts of the world.

The promotion of 'gas to liquid' technologies has the potential to reduce costs of transport over long distances by converting natural gas into synthetic crude (a middle distillate fuel). A new process adds oxygen to natural gas, thus producing synthetic gas which is then liquefied. The resulting crude can be transported via existing oil pipelines and is particularly attractive for diesel applications. It has the advantage over conventional diesel of far lower emissions.

Finally, the EU supports technological development in the nuclear sector, both in nuclear fission technologies and in thermonuclear fusion. Current technological developments relating to reactors concentrate on the simplification of systems and introduction of passive measures, under acceptable conditions of economic viability. Efforts to increase the reliability and safety of generators and to reduce the production cost concentrate primarily on water reactors. Other nuclear fission technologies are also being supported, such as Fast Neutron Reactors (FNR), High Temperature Gas Reactors (HTGR), Accelerator Driven Systems (ADS) with applications for the transformation of nuclear waste. Subject to technical breakthroughs, nuclear fusion could, in the very long-term (at least over 50 years from now), become an inexhaustible source of energy and reduce considerably the problem of nuclear waste. The development of this technology requires world wide collaboration between the most industrialised countries (ITER experimental project).

The Council Decision 96/391/EC of 28 March 1996 laid down a series of measures aimed at creating a more favourable context for the development of trans- European networks in the energy sector, thus creating the conditions for the development of co-operation projects within regions in different continents (mainly Europe, Africa and Asia). In this context some 74 projects of common interest have been identified. The European Investment Bank, the European Investment Fund, ECSC and EURATOM also provide financial support in this sector.

It must however be observed that EU energy policies, although acting towards the reduction of external dependence in energy supply, have so far never drawn the attention on the process of oil production peaking and about the tragic impacts which may result from it.

3.1.3 Main driving forces in the energy sector

3.1.3.1 Sharp increase in world energy prices (mainly oil)

The main driving force leading to a sharp increase in world energy prices is the emergence of a strong imbalance between energy supply and demand at world scale. This imbalance is caused by the cumulative impact of various factors:

On the demand side:

- the main factor of increase is the strong economic development of large emerging industrial countries, such as China, India, Brazil etc. Smaller industrialising countries also contribute to increasing energy demand. Insufficient energy savings in large industrialised countries (USA in particular) work in the same direction. Presently, global daily oil demand is at around 78 million b/d and is growing at 2.25% per year, which is far above the annual 1.4% which prevailed during the 1988-2002 period.

- demand for conventional primary energy sources is rising (oil and gas in particular). In the EU, this means an increase in imported energy and therefore an increase in external dependency as well as a greater exposure to the globalisation of the energy markets (competition with other large energy importers);

- in the EU, the transport and tertiary sectors are largely responsible for the increase in energy demand. The EU enlargement is likely to generate more intense transport flows and therefore higher energy demand.

On the supply side:

- in the short/medium term, the main factors of restriction are war and terrorism (Middle East, Nigeria), the policy of production monopolies (OPEC), economic troubles (Russia) etc.

- in the longer term (after the mid 2010s) oil production is likely to peak for technical reasons and to cause a disastrous disruption between oil supply and demand.

- in the EU, the contribution of renewable energy is still very modest (6% in total, out of which 4% originate from hydro-electricity). Prospects for a significantly stronger contribution of renewables in the coming decade are not encouraging, mainly because of the amount of investments necessary. The strong increase in oil price could however boost new investments in renewables;

- new technologies are presently being developed in the field of energy production, but they will generally need considerable time to become mature and operational (nuclear fusion for instance). Hydrogen is an energy vector and not a source of primary energy. Significant amounts of electricity are necessary to produce hydrogen.

- within the EU, energy market opening has associated a decrease in energy prices either for households or for industry. Most of the EU energy policy measures will impact territorial development through energy prices variation.

A logical consequence of increasing imbalance between energy supply and demand is the increase of energy price. This is already obvious in the oil sector. Gas prices, which are

indexed on oil prices, are progressively following the trend. Through substitution effects, other energy sources are also likely to become more expensive.

3.1.3.2 Technological evolution

The energy sector is subject to a wide range of technological evolutions which will have considerable impacts in the coming decades, both in the field of the modernisation of 'conventional' energy systems and in that of the development of emerging technologies. Numerous technological evolutions will take place in the field of renewable energy sources and their exploitation. It must however be considered that technological evolution will only be a partial response to the problems of growing imbalance between energy demand and energy supply which may result from oil and – at a later stage – from gas depletion.

3.1.3.3 Environmental regulations

The enforcement of the Kyoto Agreement will have important impacts on the energy sector, as far as the limitations of emissions are concerned. The use of fossil energy will be affected by the new Kyoto targets.

3.1.3.4 Evolution of the energy efficiency of production systems

The energy efficiency of the European economy (share of energy consumption in total GDP) has significantly improved since the oil shocks of the 1970s. This results from the adoption of energy saving measures and of energy efficient technologies. It also results from the structural changes in the European production systems (abandonment of heavy industries which are highly energy consuming and development of high-tech industries which produce higher added values with far less energy consumption. This trend is likely to continue and even to be accelerated. High oil price generates investments in energy efficient production techniques. It will also accelerate the structural transformation of the European economy towards amore technology and service-based pattern.

3.1.3.5 Climate change

Climatic conditions have important impacts on energy consumption patterns. Climate change with longer periods of high temperatures in summer time generate higher energy consumption for cooling offices and dwellings in a number of regions of southern and even central Europe . Climate change also has impact on energy production systems. Sustained drought in southern Europe has significant negative impacts on the production of hydro-electricity, because of lack of water in barrages. Acceleration of climate change will not be neutral in energy terms.

3.1.3.6 EU external context

The growing external dependence of the EU for its energy supply gives a new dimension to the EU external policy. Energy supply in Europe is becoming an integral part of geopolitical relationships. In case of oil depletion and scarcity, it is likely that international tensions will emerge. Peaceful solutions will have to be looked for at highest level.

3.1.4 Towards scenario hypotheses

A wide range of possible hypotheses for prospective scenarios can be envisaged in the energy sector, in particular as far as technological evolution is concerned. It must however be considered that the present period is characterised by considerable changes in energy prices (mainly oil), a factor which is likely to significantly modify the energy paradigm in

Europe. Territorial impacts of such a change will be considerable, because energy is a transversal factor which affects most functions reflected in territorial organisation. As oil price and availability will be the major driving force (or constraint) in the change of energy paradigm, it seems appropriate to develop scenario hypotheses along two alternative possibilities related to the oil sector:

A first possibility to be investigated is the steady increase in oil price resulting from growing imbalance between supply and demand at world scale, with the occurrence of the oil production peaking at a late stage (2025-2030), so that the largest part of the study period will be characterised by sufficient oil availability at high prices. In such a context, significant substitution possibilities will be developed (renewables etc.) and energy savings will be carried out with high priority. This will correspond to a 'smooth', but nevertheless substantial change in the energy paradigm;

A second possibility is that oil production peaking will take place at a much earlier stage (between 2010 and 2020), as expected by numerous experts. In this case, the 'transition' period (between now and oil production peaking) will be much shorter and a significant part of the study period (broadly between 2015 and 2030 and further) will be characterised by extremely high oil prices, but also by oil scarcity. There will be wide, negative impacts on the economy which, in turn, could have dramatic consequences on territorial organisation.

3.1.5 Information sources

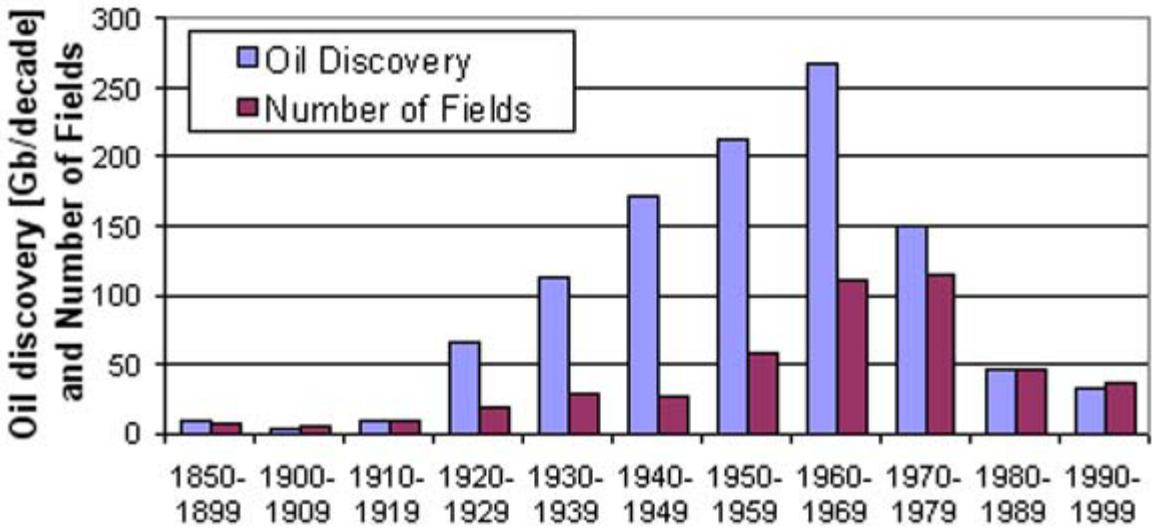
The scenario base is a compilation of information originating mainly from:

Green Paper. Towards a European strategy fort the security of energy supply. Main document and Technical document. European Commission. 2001.

World energy, technology and climate policy outlook. WETO 2030 study. European Commission. 2003.

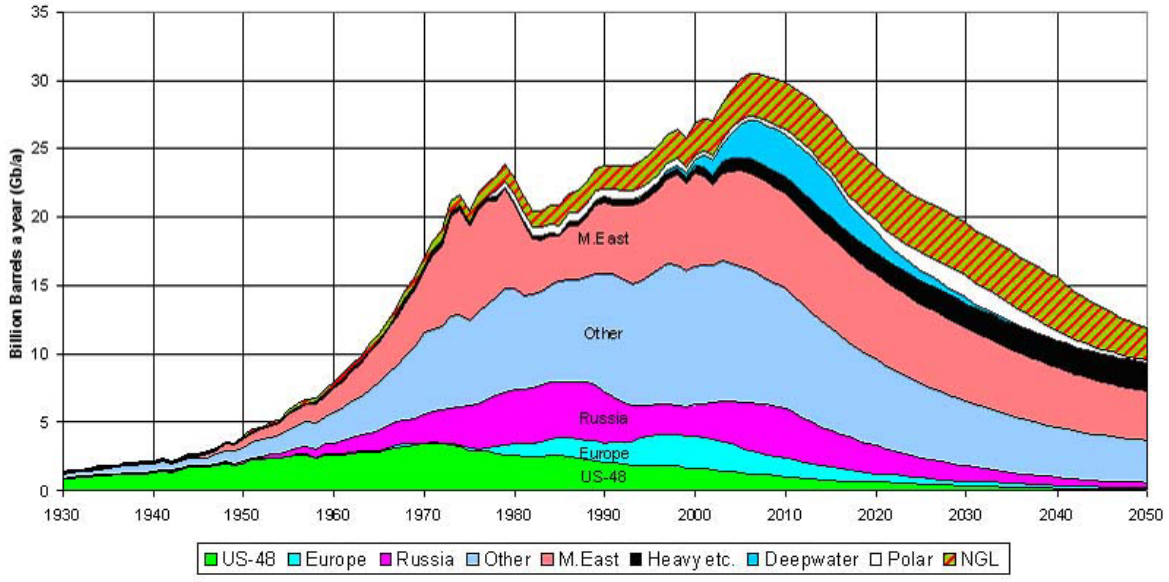
ESPON Study 2.1.4.: 'Territorial trends of energy services and networks and territorial impact of EU energy policy'. CEEETA. SIR. 2003.

Study on energy supply security and geopolitics. CIEP. European Commission. 2004.



Source : University of Uppsala (*Hydrocarbon Depletion Study Group)*

Figure 1 Giant oil field discovery per decade



Source: University of Uppsala (*Hydrocarbon Depletion Study Group)*

Figure 2 Oil and gas liquids – 2004 scenario

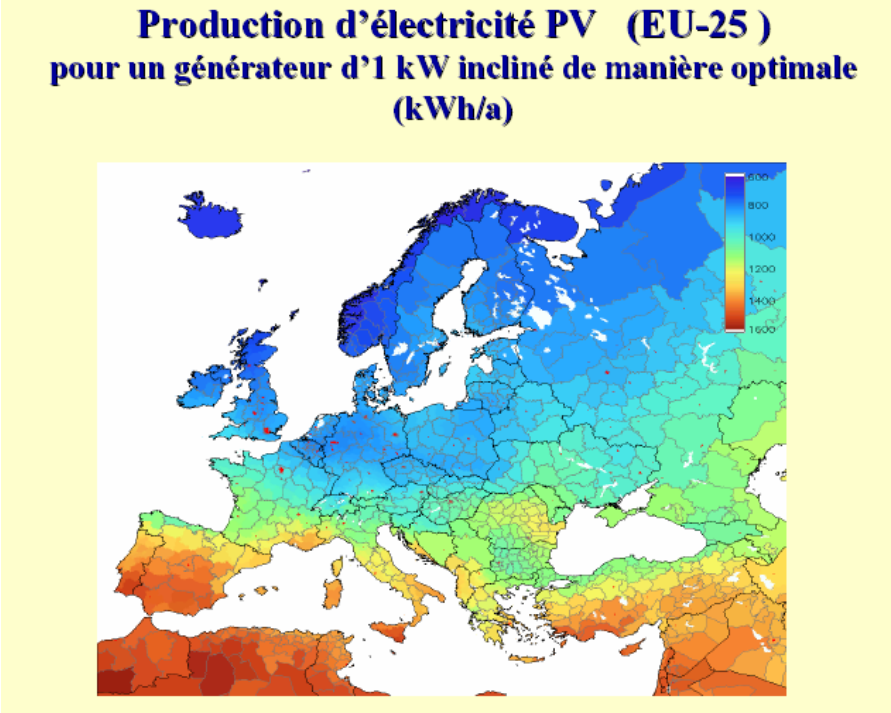


Figure 3 Potential resources in solar energy in Europe

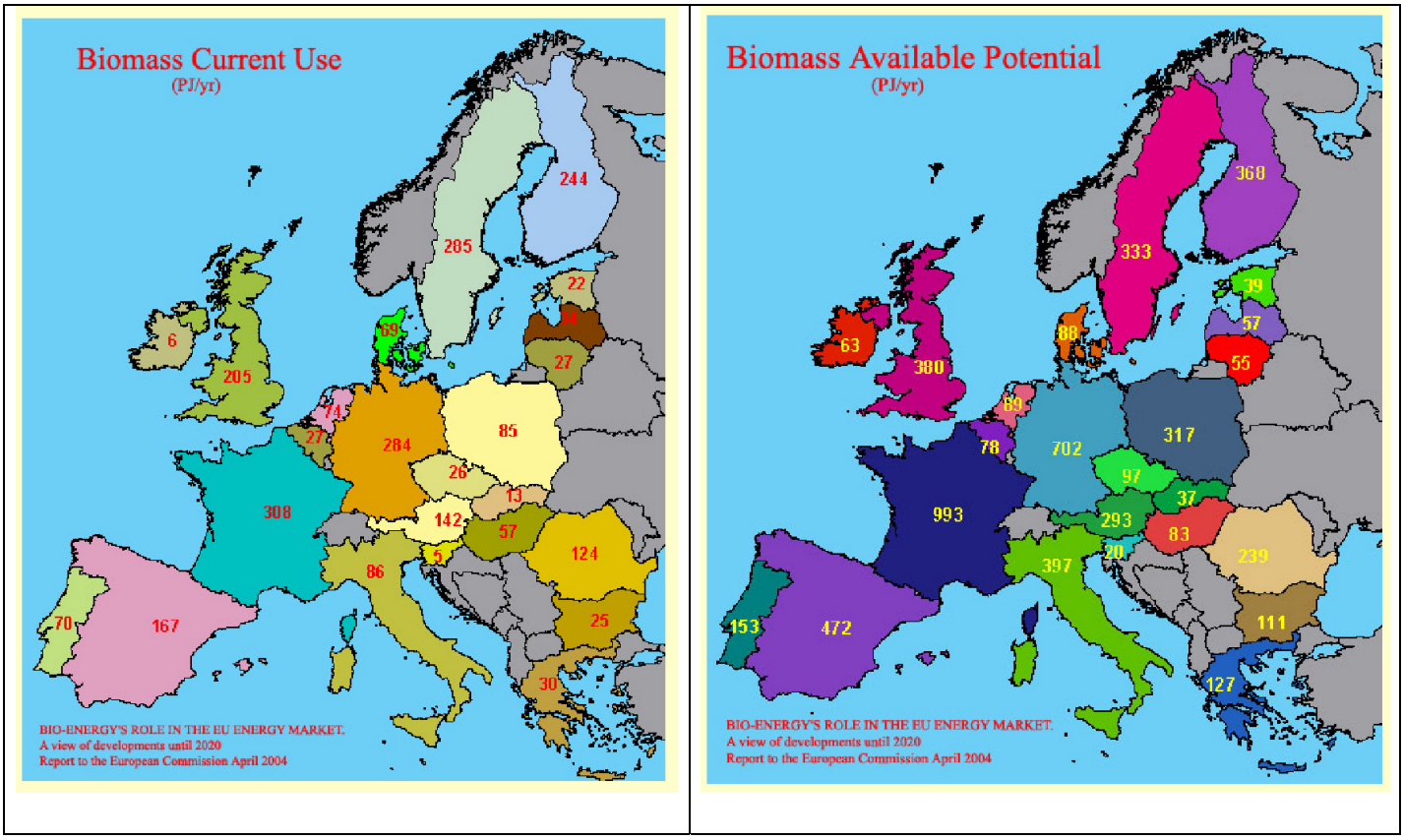


Figure 4 Biomass: current use and potential (Source: European Commission)

3.2 Scenarios

3.2.1 Prospective thematic energy scenario 'Europe in a context of high energy prices'

3.2.1.1 Scenario hypotheses

The main hypothesis of the scenario is that energy prices will be substantially higher in the coming decades than they were in the past ones, mainly because of growing imbalance between energy supply and demand. Renewable energy sources will strongly develop, but will only cover a modest part of needs. A number of conventional energy sources such as coal and nuclear energy will be reactivated and strengthened. New technologies making possible the production of large energy quantities at cheap price will not have become mature before 2030. It is however assumed that the oil peaking process will not take place before 2030.

3.2.1.2 Driving forces

The main driving force leading to a sharp increase in world energy prices is the emergence of a strong imbalance between energy supply and demand, in particular in the oil sector. This imbalance is caused by the cumulative impact of various factors:

- on the demand side, the main factor of increase is the strong economic development of large emerging industrial countries, such as China, India, Brazil etc. Smaller industrialising countries also contribute to increasing energy demand. Insufficient energy savings in large industrialised countries (USA in particular) work in the same direction. Presently, global daily oil demand is at around 78 million b/d and is growing at 2.25% per year, which is far above the annual 1.4% which prevailed during the 1988-2002 period.

- on the supply side, constraints are the fact that new giant oil fields, representing significant amounts of reserves, were not discovered over the past three decades, that oil reserves are mainly located in regions subject to political troubles and wars (Middle East, Central Africa) and that production monopolies such as OPEC pursue a policy of high prices. An additional short/medium term constraint is the insufficient capacity of oil refineries at world scale.

With increasing integration in energy supply systems, world energy prices will be more and more dependent upon the price level of the most volatile price factor: oil price.

3.2.1.3 The dynamics of high energy prices and their economic impacts

In the early 2000s, the price of crude oil had been regularly increasing. Up to the beginning of the war in Iraq in 2003, oil price increase had not been considered as a serious issue. On the contrary, it was the price level of the year 1999 ($9/barrel) which was considered as unusually low. The price level in early 2003 (around $25/barrel) looked more normal. During the second half of the 1990s, Europe did not draw significant benefits from the low price level of crude oil because the exchange rate between the European currencies and the USD (crude oil is paid in USD) was unfavourable.

In the early 2000s, the low growth rate of the European economy resulted less from the increase of oil price (which was compensated by the strengthening of the Euro in relation to the USD) than from the fact that precisely the re-valuation of the Euro became a constraint

for exports from the Euroland. The sharp increase in crude oil price, which started by mid-2003 to reach a first culmination at $55/barrel one year later and $60/b in early 2005 was taken seriously by economic operators for the first time since the oil shocks of the 1970s. Although Europe's economy was apparently in a better position than in the 1970s to absorb oil shocks (the energy intensity has significantly declined since the mid-1970s and the Euro has been regularly progressing in relation to the USD), growth rates of the economy remained low when compared to those of the USA and in particular of China and other emerging economies. Already at the end of 2004 it became clear that the time of cheap energy was over. Too many factors worked in the same direction: war and troubles in the Middle East and elsewhere (West Africa, Venezuela), increasing oil consumption in the Far East (China, India..), OPEC's policy etc.

The price of crude oil continued to increase with a number of ups and downs caused by speculation (hedge funds in particular) and other factors (irregular level of oil reserves in industrial countries, seasonal variations of demand etc.). By 2010, oil price had reached $ 85/b, by 2020 $120, to reach $ 200 by 2030.

The price of gas had followed a similar trend, partly because of automatic price indexation and partly because of a transfer of demand from oil to natural gas. Electricity had also become much more expensive. The development of energy transport infrastructure at EU level, including also better connections with external energy exporting countries and progress in energy-related technologies strongly contributed to the unification of the energy market in Europe and to the increase of substitution possibilities. This, in turn, resulted in widespread price increases among all energy sources.

The macro-economic impacts of this evolution have been significant. The increase of oil and gas price caused a deterioration of the trade balance of the EU, because of higher external energy dependency and higher energy taxes in Europe. Energy-intensive industrial activities became less and less competitive. A number of them were closed down. Others attempted to find a renewed competitiveness through relocation outside Europe. The growth rates of the European economy remained low, although the energy intensity went on diminishing. Economic interactions at global scale added to the pressure on the European economy. Although oil and gas producing countries accumulated enormous profits, these were only partially recycled in the global economy because of political tensions and troubles, in particular in the Middle East. In addition, the European economy also suffered indirectly from the impacts of high energy price on emerging economies which generally had very energy-intensive production systems and were even more energy-dependent than Europe was. Economic development in these countries became more difficult and European exports towards these countries were significantly affected. A major difference with the energy crises of the 1970s was that, in the new situation, energy demand did not stop growing at world scale, mainly because of the needs of large emerging economies. The imbalance between limited supply possibilities and steadily growing demand had a long-lasting character. In this context, reducing the European dependence on energy imports became an absolute priority. Both energy savings and the development of new energy sources and energy carriers (such as hydrogen) were politically strongly supported. Short-term measures for more efficient energy savings were adopted in various fields. Thermal insulation of buildings was improved, both in the case of dwellings and offices, in order to reduce the costs of heating in winter and of cooling in summer. Demand for smaller cars using less fuel increased and public transportation became very popular. More structural strategies were also developed and implemented. These required however significant investments and their impact became really substantial by the year 2010.

Investments in renewable energy sources expanded exponentially in a variety of fields. In the housing sector, solar energy was progressively introduced everywhere where benefits could be drawn from the reduction of oil, gas and electricity consumption. More and more

hot water was produced by solar thermal equipments, the use of which became rather widespread. The development of technologies in this field made solar thermal techniques attractive, even in regions with unfavourable climatic conditions. The profitability of photovoltaic techniques remained less attractive as long as the price of electricity was reasonable. The liberalisation of the electricity market was completed in the EU in the late 2000s and growing electricity demand brought with it strong price increase by 2010. It became then quite profitable for households to derive part of their own electricity consumption from photovoltaic sources.

Windmill parks were built, particularly in coastal and hilly landscapes. A number of conflicts arose with environmentalists who were in favour of paying greater attention to the protection of landscapes. New generations of windmills were developed with less environmental impacts, in particular as far as noise is concerned.

Biofuels became quite popular. The strong increase of oil price made them rapidly profitable. Remembering that Rudolf Diesel had demonstrated his invention at the World Show in 1900 in fuelling his engine with peanut oil, the promoters of biofuels started using plant oil, crop wastes and wood to run cars, buses and lorries. The amount of transport fuel coming from crops increased significantly, but has been constrained by the considerable size of agricultural areas necessary to produce reasonable amounts of biofuels. In the case of rape, an hectare of arable land cannot produce more than 1.45 tonnes of biofuels per year. A real competition started between those who wished to use arable land for fuel production and those who fought to maintain sufficient food production in agricultural areas. Environmental risks generated by intensive rape production were considered as serious enough to limit its territorial expansion. The EU target of having by 2010 6% of transport fuel originating from crops could hardly be reached for that reason.

Biofuels for transportation purposes have not been the only use of biomass in the energy sector. New technologies made also possible a more widespread use of wood and methane gas for heating, in particular in rural areas.

Geothermal energy was also more seriously developed. Its use has however been limited to specific locations where the underground has the properties required. In those places, efficient district heating systems could be developed.

In addition to renewable energy sources, new technologies made possible the use of new energy carriers such as hydrogen. After a period of intense R&D and experimentation activities, hydrogen-powered engines (fuel cells) became more and more used from 2010 onwards. The main problem which had to be solved was the creation of a network of hydrogen supply stations. The production of hydrogen requires however considerable amounts of energy (electricity, natural gas). As electricity demand had already significantly increased as a substitute to other energy sources, the price of electricity had also reached high levels. The same applied to gas prices. This became a major constraint to the generalisation of the use of hydrogen as energy vector.

The strong increase in electricity demand brought with it a passionate debate on the future of nuclear energy. Although largely rejected by the European population in the early 2000s, the expansion of the production of nuclear electricity found progressively more and more supporters in the late 2000s, in particular when new generations of nuclear power plants appeared (using MOX fuel or high temperature technologies). Because of the political sensitiveness of this issue, only a limited number of new nuclear power plants were built. The complexity of such projects was the main reason why they did not become operational before 2015. Phasing out strategies remained limited to a small number of countries which had to import more and more electricity from their neighbours. The increasing obsolescence of a large number of power plants became then a serious issue, not only in the new

member countries of Central and Eastern Europe, but also in the EU-15. By 2015, a number of decisions were pending in this field, but could not really be taken because of political resistance.

Simultaneously, R&D and experimentation efforts had also been concentrated on emerging technologies such as clean coal technologies (including gasification) and nuclear fusion. Most of these technologies are however promising only in the long term (in particular nuclear fusion which is still at the stage of basic research and will necessitate several decades of coordinated world wide efforts to be utilised as a significant source of energy). In the case of clean coal technologies, in addition to R&D efforts, the volume of necessary investments was responsible for the fact that these technologies could not become operational at a significant scale before 2015. The high level of investment costs involved was also a constraint for their competitiveness.

The use of traditional fossil energy sources, in particular coal, has not been abandoned. Coal production in the enlarged EU was re-activated there where the mines had not yet been closed and where conditions for exploitation were technically and economically acceptable. This was the case in a number of countries of Central and Eastern Europe as well as in the UK. In addition, larger quantities of coal were imported. Coal was mainly used to fuel conventional power plants and, to a lesser extent, for heating. New technologies made possible the reduction of emissions. More and more combined heat-power plants (CHP), fuelled with oil, gas or coal were also built, because of their high energy-efficiency compared with traditional plants.

During the whole period up to 2030, the definition and implementation of new strategies in the energy sector has been confronted with controversial environmental issues. On the one hand, the reduction of oil and gas consumption, the reduction of the energy intensity of the economy, the development of renewables and of biofuels (which do not reject through combustion more CO2 than the crops have absorbed from the atmosphere) and even the development of nuclear electricity were in line with the Kyoto Agreement and contributed to the reduction of emissions of greenhouse gas. On the other hand, a number of aspects in the new energy strategies have been a source of concern and even of serious tensions within the European society: the development of wind energy with its impacts on landscapes, the development of biofuels in relation to its competition with food production, the revival of coal use in energy production in relation to emissions and in particular the strengthening of nuclear energy production in relation to log-term aspects of human health and security.

Not only in Europe has the situation of energy supply generated impacts and tensions in the field of the environment. The fast-rising price of oil and natural gas has created a tidal wave of new power plants fired by coal. By the end of 2004, China was on track to add 560 coal-fired plants, India 210 and the USA 72. Altogether, those three nations were to add 325 000 megawatts by 2015, burning about 900 million extra tons of coal each year, in turn emitting 2.5 billion tons of CO2 into the atmosphere. By doing this, china and the USA took advantage of their huge coal reserves (equivalent to 250 years of supply in the case of the USA). In addition, approximately 60 other nations (the most important in this respect being Malaysia, Japan, Indonesia, Thailand, Turkey) have been developing in the same period another 350 coal-fired power plants. Needless to say that there was no chance to reach the norms of the Kyoto Agreement. On the contrary, in terms of global CO2 emissions, the situation in 2030 has strongly worsened when compared with that prevailing in the early 2005. The emergence of clean-coal technology was not rapid enough to prevent the worsening of the global environmental situation.

3.2.1.4 Regional and territorial impacts of high energy prices

At European scale, peripheral regions the economy of which was strongly dependent upon transportation, were losing competitiveness because no major substitution possibilities to road transportation were possible. Because of higher fuel price, EU and national policies maintained road pricing at a modest level. In some countries, the level of pricing was variable, according to the regions: it was higher in central and urbanised regions and lower in more peripheral and rural regions. Taxes on fuels were however not reduced, because of their income effect on national budgets.

The share of transport costs in the final cost of products originating from peripheral regions increased as did the final price of these products. This explains their loss of competitiveness. Most affected regions were those of Ireland, Scotland, the Iberian Peninsula, southern Italy, Greece, the northern periphery, as well as a number of peripheral regions of Central and Eastern Europe. Not only freight transport costs were affected by the increase of energy price, but also the costs of passenger transportation. Once again, peripheral regions were most negatively affected because of their higher dependency upon car and air transportation. Low-cost air transport could not be maintained over years and airfares progressively increased again. This trend worked against polycentricity at global European level. The gap between the welfare level of the Pentagon and that of regions outside of it widened. Location preferences were more and more given to regions from where the transport costs to markets and suppliers could be maintained at a reasonable level.

Not only peripheral regions with high transport costs were disadvantaged by increasing energy prices, but also regions with traditional industrial and quite energy-intensive production. Basic activities such as the transformation of raw materials (steel plants, aluminium production) and of intermediate products were particularly affected. A number of plants were closed down, others were re-located outside Europe. Many of the most affected regions belonged to the countries of Central and Eastern Europe. Western Europe was however not left out of this trend. A number of regions with industrial tradition, both within and outside the Pentagon, also lost activities and jobs.

Climatic factors also played an important part in the territorial impacts of higher energy prices at Europe-wide scale. Mediterranean and, to a lesser extent Atlantic regions, which are known for their mild winters, attracted more and more people, in particular retired ones from numerous European countries, in particular from the Nordic countries, but also from regions with a rather continental climate. Population ageing in Europe favoured this trend.

At intermediate scale (meso level), territorial impacts of high energy price could be observed both in the field of renewable energy and in the settlement structure.

A number of European areas were and still are particularly favoured as far as renewable energy is concerned. These are in particular the Mediterranean – and more generally – the southern European regions in the case of solar energy and the coastal and hilly regions in the case of wind energy and hydroelectricity (tide water turbines). Regarding biomass and the production of biofuels, regions with large and fertile agricultural areas or with wide forests were more favoured than others. More specifically, regions with a humid climate have been more involved in the production of biomass and of biofuels than regions prone to drought. Taking all factors together, the number of European regions with no resources at all, or with modest resources in the field of renewables, is rather limited, but disparities among regions in this specific field are significant. The availability of renewable energy resources (such as climatic factors) has not been by itself a factor of economic or demographic distinction, but in combination with other factors (economic endowment, quality of life, accessibility etc.), it certainly has been. Migration flows towards regions with

attractive climatic conditions or the development of tourist activities in these regions have brought with them wealth and jobs.

Regarding the impact of high energy prices on the regional and interregional dimension of the settlement structure, it could be observed that large and medium-sized towns were preferred to regionally dispersed settlements which are too much dependent – as far as mobility is concerned – from the motor car.

At local scale (micro level), similar trends could also be observed. A clear move away from suburbanisation and towards more compact cities has taken place over the decade. Settlement systems are more and more coupled with public transportation. Urban and housing policies have favoured more energy-efficient types of settlements and buildings, making possible additional energy savings and increased use of renewables. Large recreation areas close to the cities and accessible through public transportation were developed. More retailing shops within and close to housing areas have been opened, making possible purchasing a wide variety of goods without using cars. In place where geothermal resources are available, powerful district heating networks were implemented. Home working has been strongly developing, as well as other types of ICT applications such as the access to public and private services, e-shopping, educational and cultural programmes etc.

By 2030, the components of the European territory have substantially changed, compared with the situation in 2005. In general terms, the European economy had been handicapped by the increase of energy price and growth rates had remained modest. The internal structure of the European economy had however changed significantly. While energy-intensive production sectors had progressively been abandoned, the immaterial economy had strongly progressed and Europe has become the world leader in technologies related to renewable energy and to new energy systems. This compensated for the loss of more traditional activities. Just like after the oil shocks of the 1970s, the European economy had made a 'quantum leap' in qualitative terms. High energy price had worked more efficiently in favour of the Lisbon Strategy – as far as the structure of the European economy is concerned - than political prophecies and wishful thinking.

Regional disparities had increased, but not following exactly the pattern which prevailed before the increase of energy price. In general, peripheral regions became economically more disfavoured, with the exception of a number of southern – and to a lesser extent Atlantic – regions with good climatic conditions which attracted numerous people (in particular retired ones) and the related services, as well as small footloose companies, mainly of the ICT sector.

A stronger concentration of activities has been observed in the Pentagon which attracted more and more young qualified people from European regions where the economic prospects were less favourable.

A large part of rural areas, where soil and climatic conditions are adequate, were used for the production of biofuels, sometimes at the expense of food production. The landscapes of numerous coastal and hilly areas have been invaded by windmill parks. New conventional and nuclear power plants were built, often coupled with hydrogen production plants. In central and eastern Europe, the evolution of rural areas was in part less affected by high energy prices, because 'deep' rural areas were less dependent upon fossil energy and had been using traditionally renewable energy (biomass) and horse power in agriculture. In more 'modern' rural areas, in particular in regions where large parts of the land was in the hands of foreign investors, arable land was shared between energetic crops and intensive food production.

Settlement systems became again more compact and also more energy-efficient. Not only the building techniques were improved, but also the distribution of urban functions, so as to diminish the need for mobility. Public transportation systems became the real backbone of settlement expansion and re-structuration policies. Densification of settlements in coastal regions, in particular Mediterranean ones, became a real problem, adding to the landscape damages caused by tourist development in the 1970s and 1980s and by the development of windmill parks.

The increase of road traffic flows remained more modest than the forecasts of the early 2000s, mainly because of the increase of transportation costs.

3.2.2 Prospective thematic energy scenario 'Europe after oil production peaking'

3.2.2.1 Scenario hypotheses

The main hypothesis of the scenario is that a process of oil production peaking at world scale will take place shortly after 2010. This process which has been forecast by various experts of oil geology since the 1950s, will result in a situation where world oil production will start declining after a few years of 'plateauing', whatever the volume of investments will be to increase production. This will happen in a context of growing oil demand at world scale. Until the occurrence of the oil production peaking process, the context will be similar to the preceding scenario 'Europe in a context of high energy prices'. After oil peaking, the situation will be radically different, with not only extremely high oil prices, but also the possibility of oil scarcity at world scale (widening gap between supply and demand and therefore tensions among countries to access to oil reserves). Furthermore, not only oil production is likely to peak, but also gas production broadly 10 years later, thus during the 2020s. The scenario considers that oil and gas peaking will have very important macro-economic impacts in Europe and therefore also significant territorial impacts.

3.2.2.2 Driving forces

The scenario combines various types of driving forces. Those concerning the growing imbalance between oil supply and oil demand are the same as in the preceding scenario. Those related to the process of oil production peaking are of geological nature, combining the internal morphology of oil fields and the various techniques available for oil exploitation. The process of gas production peaking is similar, but of more simple nature, being mainly related to the level of gas pressure within natural reservoirs.

3.2.2.3 Towards the end of the oil era

It was not before 2004/2005 that Europe realised that the era of cheap oil (and therefore of cheap energy) was over. Up to 2010, the price of oil increased more or less regularly with ups and downs. The increase in the capacity of refineries as well as investments in oil exploration and exploitation after 2005 made possible to stabilise the price of crude oil despite steadily growing demand. This suggested the impression that the oil crisis was under control. In fact, it just made possible to exploit more rapidly the existing and non-expanding oil reserves.

Daily production of crude oil grew from 78 million barrel/day in 2005 to 85 million b/d in 2010 and then stabilised, although investments for oil exploitation and exploration remained sustained. The 'plateauing' stage of world oil production was reached, just as that of the north American oil production had taken place in the early 1970s and that of the north sea oil production in 1999/2000. It was exactly the same process. Only the scale had changed.

While the price of crude oil had reached $85/b in 2010 (the increase of hardly $30/b between 2005 and 2010 had been just as important as during the short period 2003/2005), it started to increase more strongly because of growing oil demand in a context of stable production. In 2015, it reached $200/b. After five years of 'plateauing' during which newly discovered oil fields came into exploitation and other ancient oil fields came to an end, daily world production started to decline. Up to 2020, the rate of decline was modest (daily production amounted to 80 million b/d in 2020). Production decline accelerated then, to reach 55 million b/d in 2030, while the world economy could have absorbed 90 million b/d. With nearly $600/b, crude oil had become a luxury product which could no more be used for routine economic functions.

After 2015, the steady degradation of the quality of oil produced could be observed in almost all regions having passed the peak and posed additional challenges for the existing downstream infrastructures, in particular refineries.

Up to 2020, natural gas was substituted to oil as a primary energy source in a number of uses such as domestic and office heating, power plants, petrochemical industries and partly transportation (busses, lorries etc.). While the fact that the discoveries of oil peaked in the 1960s has been an accepted knowledge, the fact that the natural gas discoveries peaked in the 1970s has been for a long time a well hidden secret. Already in the 1980s and 1990s, gas consumption was more important than gas discoveries. The peaking of gas production did not occur globally before 2025, but numerous individual large gas fields had peaked earlier. Europe had become strongly dependent upon gas imports and had to face the consequences of very high gas price as well as economic and political tensions on the international gas market.

Up to 2010, a number of adjustments were made in European production systems, starting with substitution processes in primary energy sources and including also energy saving measures in manufacturing industries up to the abandonment of very energy-consuming activities.

Real macro-economic impacts were however clearly perceived when oil production started to decline after the period of 'plateauing'. After 2015, oil became a scarce and expensive resource and the whole industrial economy which had prevailed during the 20th century, based on cheap oil, became suddenly obsolete. Impacts were numerous:

- in many sectors, industrial production which used oil not only as an energy source, but also as a raw material for the production of a wide variety of products (plastic materials, synthetic textiles, components for motor-cars, home and office equipments, telecom instruments, chemical and pharmaceutical products etc.) was severely affected. Oil was maintained as raw material only in the production of expensive products with high added-value (pharmaceutical products, electronic components etc.). In other sectors, production had to be deeply re-structured on the basis of both more traditional and very innovative products. The production of alternative basic products (metals such as steel, aluminium, copper etc.) is also dependent upon large quantities of energy. Production costs increased for almost all processed raw materials and basic products.

- in all sectors, production costs increased significantly, generating substantial inflation and affected employment severely. Very high unemployment rates became the rule throughout Europe, generating in the most affected regions, social unrest. Europe entered into long-lasting recession.

- transport costs became so high that 'global' production systems lost their competitiveness, not only in Europe but in most industrialised countries. Production systems were re-organised so as to minimise transport costs, both for intermediate and final products;

- industrial, energy-intensive agriculture became also less and less competitive. Agricultural production had to be re-structured, with less energy consumed by machinery, by the production of chemical fertilizers (ammonia etc.) and by final transportation of food products. The production of biofuels became a priority. Areas which had previously been left out of production through set aside measures were again cultivated, as far as soil fertility and climatic conditions enabled it.

- despite the recessive context, some sectors strongly developed, in particular all those related to alternative energy systems, telecommunication services, new ways of life resulting from the new context, new materials etc. These sectors generated numerous employment opportunities, but not sufficiently to counteract new unemployment generated by the economic recession.

The new member countries of central and eastern Europe were more severely affected because the energy efficiency of their economies was lower and their production structures were characterised by a higher share of low to medium technology activities when the economic recession started after 2010. Furthermore, they had largely abandoned the exploitation of their coal reserves and replaced coal by the import of natural gas. The needs for adjustment were extremely high while resources to implement them were limited.

The new situation had also considerable geopolitical impacts. In the Middle East, oil and gas exploitation took place more and more under military protection in order to prevent sabotage and other terrorist acts. Most sensitive elements in terms of security were the oil and gas pipelines, as well as ships transporting oil and gas.

Tensions between countries and groups of countries were significant, in particular East-West tensions between the large energy consumers. The terms of numerous long-range bilateral agreements on energy supply, which had been concluded before 2010, could not be respected because of price increase, oil scarcity, international competition and own needs of various oil and gas producing countries. This was particularly the case between the EU and the Russian Federation, and in other cases as well. Speculation, short term interests' coalitions became generalised.

Developing countries and emerging economies were particularly suffering from the scarcity and high price of oil, because their productive systems remained quite energy-intensive. Most of them were too weak to play a serious part in the international competition for oil and gas reserves and, more generally for energy resources, considering the new features of that competition, with its military and strategic aspects. Only those countries with large coal reserves could draw benefits from the situation, using a part of these reserves for their own needs and exporting another part at high price towards the developed world.

In a context of increasing tensions, the EU's strategy was to strengthen and secure its partnerships with its immediate neighbours producing energy, in particular around the Mediterranean (Algeria, Libya etc.).

3.2.2.4 Regional and territorial impacts

The oil shocks of the 1970s, which could be absorbed through a reasonable amount of economic adjustments, were only modest economic events compared with the situation prevailing from the mid 2010s onwards. The main consequence was a disruption of the globalisation process.

At European level, the functioning of the Single Market was severely disturbed. Long-distance economic exchanges of goods were decreasing. This affected not only heavy products with low added value, but also a variety of consumer and investment goods (food products, equipment, machinery etc.). Not only intra-EU exchange flows decreased, but also EU's imports and export flows. In addition to the increase of transport costs, the general recession was responsible for this. Europe had to significantly re-organise its economy on a more self-sufficient basis. Relationships between the pentagon and the peripheries became less strategic.

The new paradigm was a re-organisation of production and consumption systems at meso-scale, in order to minimise transport costs. Regional specialisation at European scale lost of its importance. Heterogeneous production systems developed at meso-level. Large urban concentrations became again more dependent upon the surrounding rural areas. A revival of poly-cultural and more labour-intensive agriculture could be observed throughout Europe, combined with the sustained production of biomass for energetic purposes (biofuels etc.)..

Numerous urban citizens who became unemployed in the context of the general recession, moved towards rural areas in order to develop a more self-sufficient way of life (family agriculture, energy production from biomass, development of endogenous resources etc.). Not only regions with favourable climatic conditions benefited from this trend, but also a number of remote rural areas where agricultural and other activities had previously been more or less abandoned. This contributed also to diversify the demographic structure of these rural areas prone to strong population ageing and to depopulation trends.

In terms of energy production, regions with still exploitable fossil resources (coal, brown coal, peat etc.) were again brought into exploitation. Technologies for using these fossil resources were further developed in order too increase both the environmental protection and the energy-efficiency. The environmental debates which strongly developed before 2015, were attenuated after the oil production peaking by the new situation of energy prices and emerging scarcity. Less resistance was expressed as far as the development of nuclear energy, biofuels and wind energy is concerned. A real conflict of interest emerged however between the production of biofuels and food production, because food production became again a strategic factor. Solar energy systems were very widely developed and implemented throughout Europe. In general, the environmental context worsened in a number of fields (for instance through the intensive use of coal and brown coal, through the proliferation of wind mills etc.); but it improved in other fields (through the reduction in intensity of traffic flows, through the increased use of public transportation, through the development of solar energy etc.).

Large cities became less and less attractive, because high unemployment generated security problems and social tensions. The most distant suburban areas were abandoned by a large part of the population of working age and were left to retired people with low mobility. Medium-sized and small cities were favoured for a number of reasons, among which the need to reduce expensive daily mobility.

Long-distance mobility for recreational purposes (implying the use of cars or airplanes) had been progressively given up, not only because of transportation costs, but because of the reduction of the purchase power. Stronger pressure on recreation areas more easily accessible from large towns was generally observed.

After more than a decade of chaotic re-structuring and re-organisation in the new context, Europe was, by the year 2030, progressively adapting to new forms of living and working. The organisation of economy and society has radically changed. The territorial image of Europe by the year 2030 was again quite different from what it was in 2015. On the one

hand, the economic depression had left serious damages in a number of regions where urban population had partly moved towards other regions and partly moved towards rural areas. On the other hand, the excesses caused by rapid globalisation in the early 2000s have slowed down, limiting congestion in transportation and the de-structuration of productive systems (agriculture, manufacturing industry). Concentration trends within the pentagon had slowed down, and even reversed to the benefit of less urbanised regions and of areas with favourable climatic conditions. A number of remote rural regions were re-populated on a self-sufficiency basis. The organisation of economy and society at meso-scale (regional and interregional areas, including those with a transnational dimension) had progressed. By 2030, Europe was still extremely vulnerable, but it was progressively moving towards more sustainable forms of development which were very different from those envisaged in the 1990s and early 2000s.

In the countries of central and eastern Europe, more severely hit by the requirements of the adjustment process, stronger pressure was put on rural areas, first because rural employment was higher than in western Europe when the economic recession started and second because unemployment in large cities grew more strongly, causing migration towards rural areas, in a similar way as in the early 1990s when the breakdown of planned economies took place. The 'deep' rural areas were however less affected by energy issues, because they were traditionally less dependent from hydrocarbon fossil energy, relying more on renewable energy sources.

3.2.3 Main issues resulting from the scenarios

Both scenarios show that the era of cheap energy is over and that Europe will face very important challenges to ensure its energy supply. The first scenario (which is the most optimistic or the less pessimistic) calls for stronger policies in the field of energy savings and for the accelerated development of renewable energy sources. It also calls for settlement and transport systems less dependent upon the road transport mode. The increasing territorial imbalances will also have to be addressed by public policies in a context of low economic growth. The scenario indicates that more expensive energy may generate on the one hand benefits for the environmental quality (solar energy, biomass, more sustainable transport modes, more compact cities), but may also have detrimental impacts, for instance if conventional primary energy sources such as coal continue to be used or are even expanded in energy supply. A strong political debate will develop about the necessity or not to strengthen nuclear energy production (new generation of nuclear power plants).

The second scenario raises different issues as soon as the process of oil (and later, gas) production peaking has taken place. It does not eliminate the policy requirements suggested by the first scenario, in particular as far as the accelerated development of energy savings and of renewable energy sources is concerned. It shows however that renewable energy sources and the reactivation of conventional energy sources will not be sufficient to cover all energy needs and that extremely high energy prices are likely to generate a severe economic recession. Furthermore, strong competition will develop in rural areas between the production of food products and that of energy products. The situation will be a completely new one, being very chaotic, with numerous tensions inside and outside Europe. The main objective of the scenario is less to provide a precise description of this situation and of its evolution than to raise awareness about the occurrence of oil peaking (which will anyway happen; the only question is when?) and about its dramatic impacts.

3.2.4 Impacts for EU policies

As far as the first scenario is concerned, EU policies in transport, energy, regional development and environment will be primarily addressed (energy savings, promotion of renewable energy sources, environmental constraints, territorial imbalances).

In terms of policy implications, the simple fact that oil peaking will anyway occur (most probably before 2030 but possibly after) should also lead European political authorities to immediately start massive R&D programmes in order to investigate in depth the potential impacts of such a situation and to develop substitution fuels and to promote alternative systems (mobility, transportation, heating, industrial production). Another objective of the scenario is to draw the attention on the relationships existing between the systems of energy supply and the organisation of economy and society in its territorial dimension. Numerous public policies will be addressed by the occurrence of oil and gas production peaking. If one assumes that the strong economic recession and related troubles will have no fatal impact on the existence of EU institutions, EU policies such as Transport, Energy, Environment, Regional Policy, CAP, External Relations etc. will be concerned and will require significant adaptation. Further EU enlargement processes will probably be stopped after oil production peaking, because of political and economic tensions resulting from the recession.

3.2.5 Indicators

Numerous ESPON core-indicators can be used in the context of the scenario, such as:

- Income per capita; GDP per capita;
- Productivity;
- Net migration rate;
- Unemployment rate;
- Daytime accessibility by transport mode;
- Travel costs by transport mode;
- Impact of accessibility changes on GDP/capita;
- Impact of accessibility changes on unemployment;
- R&D expenditure;
- Electricity production by power source;
- Final energy consumption by energy type and consumption sector;
- Energy prices for industry

3.2.6 Main ESPON studies useful for the elaboration of the scenarios

Valuable information can be derived mainly from two ESPON studies:

- ESPON study 2.1.1.: Territorial impact of EU Transport and TEN policy;

- ESPON study 2.1.4.: Territorial trends of energy services and networks and territorial impact of EU energy policy.

3.2.7 Summary

The evolution of energy prices (in particular oil) over the past years indicates that there is a significant change in trends and that high energy prices will have in future a sustainable character. The prospective (roll-forward) scenarios aim at investigating the macro-economic and territorial impacts of the new trend, taking as assumptions that oil prices (and that of other primary energy sources as well through substitution effects) will continue growing more or less regularly but substantially. The first scenario 'Europe in a context of high energy price' assumes that the process of oil peaking will not take place before 2030, but that oil price increase will nevertheless be sustained and substantial until then. Numerous adjustments will have to be made in the economy and their territorial impacts will be significant (less polycentricity, more compact cities, decline of the importance of road and air transport). The second scenario 'Europe after oil production peaking' assumes that oil production will peak around the mid 2010s (followed by gas production peaking around 2025), despite significant investment to increase production. In a context of steadily growing oil and gas demand, Europe will be confronted to a serious economic recession. The territorial impacts will be different from those suggested by the first scenario, with stronger pressure put on rural areas and a loss of attractiveness of large cities related to increasing unemployment and social tensions. In both scenarios, the new member countries of central and eastern Europe will be more severely hit by the new energy context.

4. Thematic scenario 'Economy'

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4.1 Scenario base – Economy

4.1.1 Present situation and trends

4.1.1.1 Current state of affairs

Europe is one of the developed regions of the World where the level of per capita income is more than three times higher than the World average. But, taking into account the entire ESPON space, it is only 70% of the US level and lower than that of Japan. The desire to improve European economic performance has driven EU policy over a long period and has led to the Lisbon process at the beginning of the current decade. The US achieves higher per capita GDP through both higher labour productivity and higher employment input. This should imply that there is room for the EU to grow faster than the US through the assimilation of existing technology and organisational practices and through increasing activity rate. But convergence came to an end at the beginning of the 1980s and has remained unchanged since. Productivity increased more dynamically in Europe, but it was 'compensated' by weak employment performance and falling working ours. By 2000, about one third of the difference in per capita GDP can be attributed to lower European labour productivity, one third to fewer working hours and one third to lower employment rates. In 1970, all of the difference could be attributed to lower labour productivity.

Contrary to the post-war period where growth and catching up with the US could largely be achieved through factor accumulation and imitation, innovation at the frontier has become the main engine of growth. This in turn called for new organisational forms, less vertically integrated firms, greater mobility both intra- and inter-firm, greater flexibility of labour markets, a greater reliance on market finance and a higher demand for both R&D and higher education. However, these necessary changes in economic institutions and organisations have not yet occurred on a large scale in Europe and, in addition to the problem of low demand in Europe, it is this delay in adjusting the institutions, which accounts partially for Europe's growth deficit.

4.1.1.2 Current territorial differentiation

At the beginning of the modern age, economic disparities within the regions of Europe were rather moderate. The overwhelming majority of the European economic landscape was agricultural. Here disparities depended on the geographic conditions, the quality of the soil and on the density of rural population. Disparities began to increase with the advent of industrialisation.

After the Second World War, regional concerns moved on to the policy agenda. There were many reasons for this. One was the increasing emphasis across Europe on equality issues and questions of redistribution. At the same time, the severity of the regional problem increased in many countries, with moves away from agriculture and downturns in traditional

heavy industry resulting in both unemployment in problem regions and significant migratory flows to major urban centres. The result was the emergence of a regional policy in the 1950s in a political and social climate where government was considered to have an important role in redistributing economic activity. The central pre-occupation of regional policymakers during this period was convergence.

The economic climate changed markedly from the start of the 1970s, starting with oil crises. Western Europe encountered a long-term slowdown in economic growth, with sluggish increases in productivity, inflationary pressures, restricted investment, persistent widespread unemployment and pressures on state budgets. The political agenda moved against active government intervention, especially regarding direct subsidies to firms.

Since the mid-1980s, new concepts of regional development began to emerge. The competitiveness of economies was increasingly attributed to the ability to innovate. Technological and organisational changes were altering the way in which companies organised their activities, both internally and with suppliers and customers.

The challenge for regional development has been to respond to the increasingly complex map of regional and local problems. The policy response has been a new type of regional policy concerned with the strategic management of regional development. The most important part of this new policy has been the reform of EU level regional policy and the reform of the Structural Funds in 1988-1989. With this reform, the European Union seriously embarked on a regional cohesion policy to reduce these disparities.

However, significant disparities remain: even where catching up is occurring relatively fast, the full process can take a generation and in new member countries much more. In addition, although most regions may experience at least some convergence, their performance varies widely.
The situation regarding unemployment is even less positive. Unemployment in the EU25 hovers around 10%, which is roughly equivalent to 20 million people. Unemployment is concentrated in some regions, while others are hardly affected. The closing of the GDP gap that has occurred in the last one and half decade in the less developed regions is predominantly due to increases in productivity growth, rather than higher employment.

4.1.1.3 Major future trends

Among the several trends observable in the European economy, we have selected three major themes for closer examination.
1. Globalisation and internationalisation of the European economy;
2. Demographic developments;
3. Information and Communication Technologies and increasing income gaps in European society.

4.1.1.4 Globalisation and internationalisation of the European economy

In the last decades, the expansion of international trade and international investment far outpaced the growth of output and income. This expansion is caused by decreased transaction costs. On the other hand, technological improvements have led to significantly lower transport and communication costs. On the other hand, successive multilateral agreements have significantly brought down the barriers to trade. Clearly, countries have become more integrated in world economy during centuries. But this has not been a continuous process.

The WTO member states have removed a number of major trade barriers in manufacturing, while the Single Market Programme of the European Union has gone far beyond that by

removing many other trade barriers through the establishment Community wide standards and combating market-disrupting practices like state aid. This does not imply that integration cannot proceed much further. National borders still exert a large impact on trade. The creation of a single currency in the European Union may help to make borders less important as barriers of trade – something that has not yet fully materialised

There are, however, also uncertainties concerning the further liberalisation of world trade. One of the uncertainties for the future is whether the WTO negotiations will eventually come to a successful conclusion. The other major uncertainty is the volatility of international financial markets. Today huge flows of money move across the globe and react to even the smallest differences in profitability. The flows of short-term capital can suddenly change direction and lead to wild fluctuations in exchange rates.

In any case, as the results of project 3.4.1 have shown, the European economy is still very introverted, with the total of exports plus imports from outside the ESPON space representing less than 15% of GDP. Considering that trade is measured in prices and GDP in value added, one can safely conclude that less then 10% of the GDP of the ESPON space is traded with the outside world.

4.1.1.5 Demographic developments

The demographic challenge of the future finds its roots in the past. It is related to the 'baby boom' following the Second World War and a structural decline in fertility rates thereafter. In the next ten or twenty years, the share of the population above 65 years will be much higher than it is today. Hence, the old-age dependency ratio will more or less double in the next 30 years.

Ageing is first and foremost a problem of distribution between young and old generations, and this has clear economic ramifications. Unless productivity rises significantly or other forms of taxation (on other revenues than labour) are put into place, the tax burden of the young working generations will rise, sometimes dramatically. The estimation falls into the range of 3-5 % of GDP in the majority of EU countries. The problem of an increasing tax burden on young working generations is reinforced by an other factor: namely increasing public expenditure on health care. Considering that old people 'consume' the most part of health care services, the increase in health care expenditure will be in the range of 1-3 percentages of GDP between 2000 and 2030.

4.1.1.6 Information and Communication Technologies

The growing importance of knowledge for economic development will accelerate the structural change of the economy. *New, knowledge-based sectors*, for example, bio-, nano-, material- and ICT, will significantly influence the economic growth and productivity growth, whereas the *'old' branches* will undergo either a deep restructuring or a decline in the course of globalization pressure. The impact of the knowledge society to a large extent does not result from few high tech sectors, but more from the *use of the advanced technologies*, developed in the leading high tech-branches, *in all sectors of the economy*.
During recent decades low-skilled wages have lagged behind high-skilled wages in a number of countries, while the unemployment rate among the low-skilled has risen more sharply. This divide between skill levels may intensify in the coming decades. Changes in technology – especially the widespread application of ICT – could raise the demand for skilled workers, raising the skill premium and, thereby, increasing income inequality.

4.1.2 Existing relevant EU policies

There is no economic policy conducted at the EU level as such. Instead, there are various policy sectors and policy ambitions that are directly related to regulating or bolstering the European economy. The Lisbon Strategy, first articulated in 2000, is a good example of a Community wide economic policy objective. Implementation of this strategy will transpire via various sectors, the most important being regional policy, R&D and competition policy.

4.1.2.1 Regional policy

Regional policy is one of the oldest policy sectors of the EU. Although the aims of regional policy have changed over time, the primary objective has been to reduce regional disparities and stimulate employment in order to allow the different regions in Europe to compete on an equal footing in the common market. At present, it commands the second largest budget of the EU (after the agriculture) and issues subsidies in the form of co-financing for mainly infrastructure, land development and human resource development. It is difficult to quantify the physical impact of regional policy, due to a problem of isolating causality, but anecdotal evidence does seem to suggest an impact on governance — cross-border cooperation has become more common, as has attention for sustainable development. A positive economic development of recipients is generally acknowledged (job and GDP growth). Currently, the line set out for the next structural funds period (2007-2013) shows some more inclination to address more Lisbon-based objectives (Competitiveness Objective). In addition, pressure from affluent member states to reduce budgets and increase effectiveness is also manifest. This may pave the way for employing the structural funds as a means to implement the Lisbon strategy.

4.1.2.2 R&D policy

European-level support for scientific research stems from a 1957 agreement to coordinate efforts in nuclear research, but only really got off the ground in the 1980s with the initiation of the Framework Programmes. FPs seek to stimulate economic development indirectly by funding basic research and unprofitable yet useful (long term) knowledge activities. Generally universities and multinational corporations have profited from the FPs, and they have helped the EU its raise its level of R&D spending. However, as is painfully clear by the midterm review of the Lisbon strategy this is still lower than Europe's main competitors. In any case, R&D will figure prominently in any scenario of Lisbon implementation. On the other hand, the FPs may also come under fire of competition policy, if they stray too far from supporting non-competitive basic research and attempt to directly push the Lisbon goals.

4.1.2.3 Competition policy

The aim of EU competition policy is to help the internal market to function by ensuring that a level playing field exists. Main activities involve reducing state aid, liberalization and privatization of state-owned companies and regulating mergers to prevent monopoly formation. Currently, the liberalization of the services sector is on the agenda, which is highly relevant for the Lisbon strategy since the knowledge-based economy is largely services related. The success of competition policy is linked to that of the common market where, between 1958 and 1972, trade between member states grew three times faster than outside. In the process, however, competition policy sometimes comes into conflict with other policy sectors. Both R&D policy and regional policy, which also offer targeted subsides to businesses, walk a very fine line between serving community wide goals and offering state aid.

In conclusion, these three policy fields— among others naturally, but for the purposes of expediency only these have been selected — offer some tools for Lisbon. Changes in governance, embedding ideals of competition in the institutional framework at the local level can be achieved via regional policy. This can also be utilized to link strategic areas and jobs via infrastructure investments and training programmes. R&D is employed as direct stimulation, and competition to end unfair practices that hamper growth. As indicated, there is also a very delicate balancing act between concerns of regional equality, economic competitiveness and free trade in the main sectors relevant to the Lisbon strategy.

4.1.3 Driving forces and scenario hypotheses

The thematic scenarios for the economy that were created in the context of ESPON 3.2 are of the prospective policy type. This means that the independent variable is EU policy. For this reason, much attention will be paid to the decision to adopt a particular kind of policy strategy, the various measures implemented to this end, and, finally, the impacts these may have on social and economic cohesion and spatial development. Because the intent is to examine the effects of different policy directions, as many ancillary variables will held as constant as is possible. In all scenarios it will therefore be assumed that globalization, that is the ongoing intertwining of international networks and economic relationships, will continue to increase. In addition, the rise of the knowledge, information or creative-class economy will also be assumed to continue in each scenario. Finally, that the EU agricultural budget will continue to be reduced under pressure of budgetary constraints, environmental concerns and successive WTO negotiations.

The scenarios are arranged along two axes. These represent the two economic policy concepts that should have the largest impact on the spatial development of Europe: efficiency and competitiveness on the one hand, and equity and cohesion on the other. These axes will be discussed in turn.

4.1.3.1 Equity and cohesion Axis

Over the past decades, economic, social and territorial cohesion policy became one of the most important policies of the European Union, representing about 36-38% of the Community's budget expenditures. There can be no doubt, economic and social cohesion objectives of the EU played a very significant role in some countries' development. Though with different intensity and with different financial resources, member states also wanted to further mitigate internal social, economic and territorial disparities in development and income. As a result, EU and national 'cohesion type' policies have played a decisive role in Europe's development in the last half century.

The formulation and implementation of equity considerations and cohesion policies were always accompanied by criticisms and debates. Criticisms became louder especially in the last years. Cohesion policy has been made out to be one of the scapegoats for not achieving the Lisbon objectives. The debates on the future of cohesion policy are manifold and far from conclusive. Ongoing discussions include: what share of the Community budget should be spent for these purposes? How large circle of countries and regions should benefit from cohesion measures? Should cohesion support be limited in time? What kinds of projects can be funded using cohesion support?

The horizontal axis of the system of coordinates represents the equity and cohesion dimension. The left side indicates a lower level of cohesion policy and the right side a higher level. The place of a particular policy mix along this axis depends not only on the size of financial means available for cohesion and social equity purposes however. It depends also

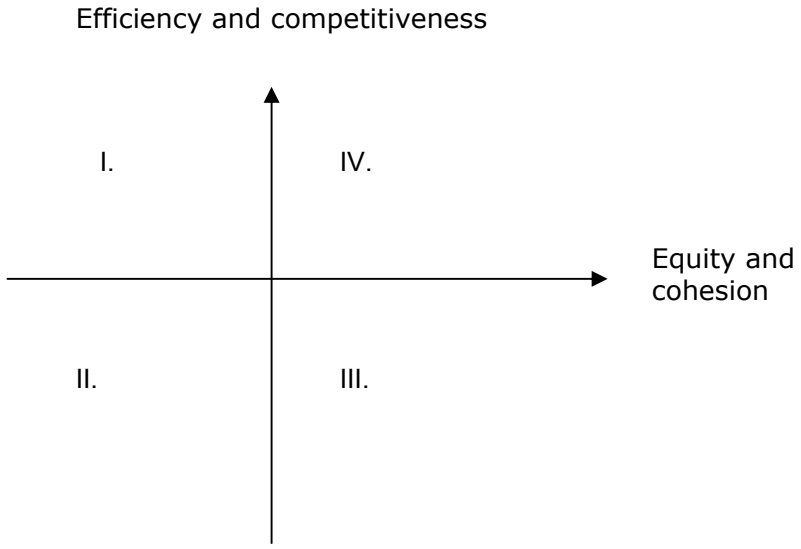
on the importance, attached to these policies, on their being more targeted, concentrated and on their system of delivery.

4.1.3.2 Efficiency and competitiveness Axis

Competitiveness has become the key notion in the economic policy of recent times. It includes not only economic efficiency, but innovation, marketing, flexibility, structural change and risk management as well. Several recent studies demonstrated that Europe's lagging behind the US in GDP per capita is attributable less to productivity per working hour (efficiency), rather to the lower working hours per person employed, to the lower employment level, to the lower level of innovation, to the smaller share of fixed capital accumulation, to the lower expenditure on R&D, to the small amount of venture capital, to high taxes and to the low level of labour and capital mobility. To achieve improvements in all these weaknesses needs substantial changes in microeconomic and macroeconomic policies, in the system of welfare services and in governance methods and practices. All these are included in the dimension of the vertical axis representing efficiency and competitiveness.

4.1.3.3 Scenario logic

The four segments of the system of coordinates, divided by the axes, represent the four scenarios of European economic policy developments and their spatial impacts. The four segments represent: I. Higher efficiency and competitiveness – lower equity and cohesion; II. Lower efficiency and competitiveness – lower equity and cohesion; III. Lower efficiency and competitiveness – higher equity and cohesion; and IV. Higher efficiency and competitiveness – higher equity and cohesion respectively.



4.1.4 Sources of information

The list below includes only the principal sources of the scenario base. Several other sources were considered and utilised. Their complete list is to be found in the bibliography attached to the scenario base.

For the description of secular development trends of the World and European economy the basic source was the book written by Angus Maddison: *The World Economy: A Millennial Perspective*, published by the OECD in 2001. In the description of the present macroeconomic situation, we largely utilised the study 'An Agenda for a Growing Europe' prepared by the High Level Group in 2003 under the chairmanship of Professor André Sapir. The description of the regional situation and development was based first of all on the *Third Report on Economic and Social Cohesion,* published by the European Commission in March 2004. An important source was the Discussion Paper of the European Policies Research Centre at the University of Strathclyde, Glasgow *Benchmarking Regional Policy in Europe*. Furthermore, we utilised the study, written by the European Investment Bank 'A survey of socio-economic disparities between the regions of the EU' (Daniel Moucque), and two articles of Christian Vandermotten (*Une nouvelle typologie économique des regions eurpéennes* and *Les disparités spatiales en Europe et leurs Évolutions: 1960-2000*). Finally, for the description of future trends, we utilised as basic source the study written by Ruud de Mooij and Paul Tang *Four Futures of Europe* (2003) at the Dutch Centraal Planbureau.

4.2 Scenarios

4.2.1 Logic of scenario selection

For such huge, multifaceted and complex systems as the European economy and European spatial development an infinite number of development scenarios can be outlined and described. The four scenarios described below represent four of these infinite possibilities. They have not been selected randomly; they have a systemic relationship to each other. This is because, when developing scenarios, it is important to make the different alternative futures distinct from one another, immediately identifiable and plausible.
Importantly, the scenarios are of the **prospective policy type**. This means that the independent variable is EU policy. For this reason, much attention will be paid to the decision to adopt a particular kind of policy strategy, the various measures implemented to this end, and, finally, the impacts these will likely have on social and economic cohesion and spatial development. Because the intent is to examine the effects of different policy directions, as many ancillary variables as possible will be held constant. In all scenarios it will therefore be assumed that globalisation, that is the ongoing intertwining of international networks and economic relationships, will continue unabated. In addition, the rise of the knowledge, information or creative-class economy, discussed at length in the scenario base, will also be assumed to continue in each scenario. Other crucial economic variables, such as the exchange rate between the dollar and euro, stock market performance, shifting global fortunes between world regions will be excluded from the analysis (or held constant in all scenarios) in order to isolate the impact of policy.
A few preliminary remarks are in order regarding the selected axis-system methodology. Ideally, the typology created by the axes would exclude all reference to specific policies or policy objectives (e.g. the Lisbon strategy) as these are continually modified, and exclude any notion of success or failure since this would clearly give a priori biases regarding desirability: this must be discovered after the scenario exercise, rather than be assumed beforehand. This being said, the two axes have not been selected arbitrarily in terms of EU politics. In fact, the underlying rationale for this choice can be found in the European

Union's own approach to promoting economic development. Perhaps the best statement regarding the ambitions of the European Union in terms of the economy can be found in the Lisbon/Göteborg strategy to become by 2010 'the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment.' This dual emphasis on efficiency/competitiveness on the one hand and equity/cohesion on the other comprises the underpinnings for the two scenario axes (we have chosen not to include sustainability/respect for the environment as an independent variable in our analysis). Furthermore these two axes are conventionally positioned against one another as a simple trade-off, but we will show that they are better viewed as dimensions that are not necessarily mutually exclusive. Before presenting our scenario sketches, this method will be elaborated further with a brief description of the two axes.

4.2.1.1 Equity and cohesion axis (horizontal)

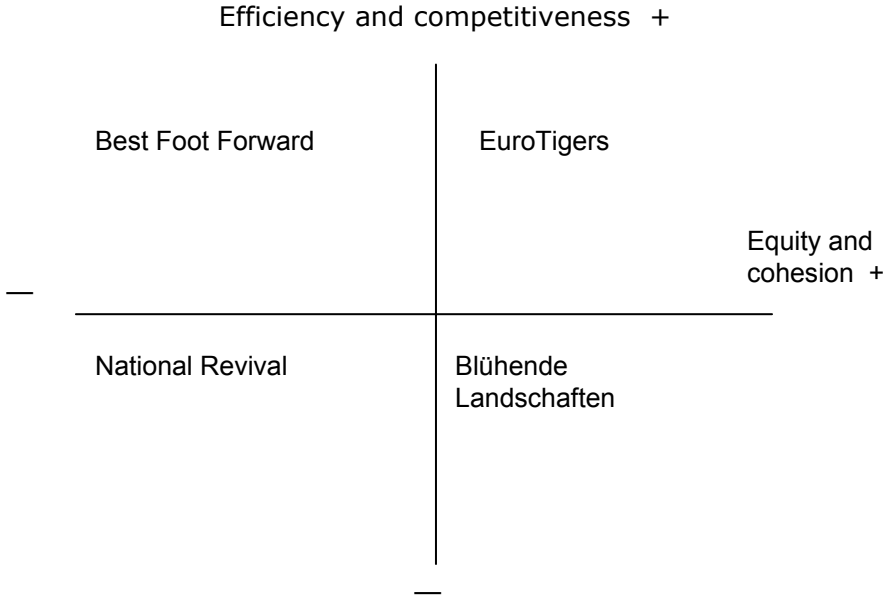
The horizontal axis of the system of coordinates represents the equity and cohesion dimension of the scenario. A high score on this axis therefore implies that these kinds of redistributive policies will be given priority over other economic measures. There is a specific history to this approach: EU and national 'cohesion type' policies have played a decisive role in Europe's development in the last half century. Over the past few decades, regional policy became one of the most important policies of the European Union, and now represents over 35% of the Community's budget expenditures. The formulation and implementation of equity considerations and cohesion policies have always been accompanied by debate.[23] Nevertheless, the EU's economic and social cohesion objectives have played a very significant role in some countries' economic development, not in the least because they demand similar investments on the part of the member states. Member states also wanted to mitigate internal social, economic and territorial disparities in development and income, though with different intensity and with different financial resources.

4.2.1.2 Efficiency and competitiveness axis (vertical)

The vertical axis of the system of coordinates represents the efficiency and competitiveness dimension of the scenario. A high score on this axis will imply policy priority being given to stimulating economic growth via improving efficiency and competitiveness. This reflects the current zeitgeist in economic policy circles. Several recent studies have demonstrated that Europe's lagging behind the US in GDP per capita is less attributable to productivity per working hour, and more to the fewer working hours per person employed, lower employment level, lower level of innovation, the smaller share of fixed capital accumulation, lower expenditure on R&D, the small amount of venture capital, high taxes and finally low labour and capital mobility. To achieve improvements in all these areas, substantial changes have to take place in microeconomic and macroeconomic policies, in the system of welfare services and in governance methods and practices. All these are included in the dimension of the vertical axis representing efficiency and competitiveness.

[23] These debates are related, on the one hand, to the future dimension and resources of these policies: what share of Community investment should be spent on these purposes, what should their share be in the Community budget? How effective are they in achieving their goals? On the other hand, the orientation of cohesion policy is also debated: who and what should be supported? Should it be restricted to infrastructure, environment, education and culture — as many experts suggest — or should it be extended to the support of job-creating business enterprises as well? How large a circle of countries and regions should benefit from cohesion measures? Should cohesion support be limited in time?

4.2.1.3 Visual depiction of scenario logic



The four segments of the coordinate system, divided by the two axes, represent the four scenarios of European economic policy developments and their spatial impacts. The four segments represent:
High efficiency/competitiveness — low equity/cohesion (Best Foot Forward)
High efficiency/competitiveness — high equity/cohesion (EuroTigers)
Low efficiency/competitiveness — high equity/cohesion (Blühende Landschaften)
Low efficiency/competitiveness — low equity/cohesion (National Revival)

Again, these scenarios are *prospective policy scenarios*, because they explore the impacts of changes in some important national and community priorities. The dimensions of the axes represent the importance and priority of individual policies. Their measurement by exact quantitative indicators is rather difficult though we shall try to quantify them when possible.
To facilitate the analysis, the most important policy areas affecting the economy in which the EU has competence will be considered in more detail in the scenarios. Competition (internal market) policy, regional policy and R&D policy will play a particularly important role in the scenarios because they directly relate to economic development. It is therefore important to note that some policies undergo periodical revisions rather than continual adaptation. Since the 1980s, regional policy has been defined by 'structural fund periods', and R&D policy by consecutively numbered Framework Programs. At the end of each term, the policy is evaluated and modified in order to increase effectiveness, adapt to changed circumstances or to achieve different policy goals, making the transfer date significant. It should be stated that these periods are roughly five years, but have different starting dates so that they do not necessarily run parallel to one another. Therefore, decisions on, for example, regional policy in one year, can affect the decision on a framework programme a year or two later. An indication of how periods can interrelate is presented in the table below.

	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
SF			1	2	3	3	4	5	6	6	7
FP		1	2/3	3/4	5	6	7	8	9	10	11

Table 9 Structural Funds and Framework Programme policy periods

4.2.1.4 Territorial impacts of scenarios

Of course, the scenarios are much more complex than the duality that the axis structure implies. The economy of Europe is impacted by various policy sectors, such as agriculture, competition, transport and the environment, which cannot always be placed unambiguously within the dimensions of equity and efficiency.
Since only the integrated scenarios will be supported by the MASST model, only certain qualitative and rather guarded statements will be made here regarding *expected* results. In addition, although the regional economic impacts will be the primary point of attention, interfaces with other territorial areas will be addressed. These include demography (i.e. migration), environment (quality and change in policy), transport (congestion and model split), and rural areas (functional change, vitality).

4.2.1.5 Organisation of scenario sketches

Since the four scenarios are prospective policy scenarios, the emphasis is on the driving forces leading up to the decision to adopt a particular strategy, the specific package of policy measures designed to implement it, and its effects. To aid readability and comparability, each scenario sketch is organised identically, according to the structure presented below.

1. Scenario hypothesis
2. Driving forces
3. Contextual elements
4. Strategy
5. Implementation
6. Developments and events (storyline)
7. Impacts
8. Territorial image of 2030
9. Summary and conclusions

4.2.2 Economy Scenario 1: Best foot forward

This scenario describes a situation where the EU pursues a strong policy in favour of economic competitiveness. Well-performing regions and sectors are bolstered in order to allow them to achieve an internationally elite status in the global knowledge economy. Matters of cohesion and sustainability are secondary.

4.2.2.1 Scenario hypothesis

As indicated in the scenario base, the economic competitiveness of Europe is seen as increasingly tenuous in a context of rapidly developing Asian competitors, a dominant North American block that continues to attract the best knowledge workers, conflicting sectoral policies, outdated social welfare systems and looming ageing of the population. Following the publication of the 'Kok report' on the discouraging progress of the Lisbon strategy in late 2004, it is clear that drastic measures need to be taken to reverse the trend towards stagnation (EC, Facing the Challenge, 2004). It is also acknowledged that a clear gap still exists between Europe and Japan and the United States in levels of investment in R&D. The scenario assumes that the level of globalisation will continue to rise in terms of market liberalization (WTO), movement of labour (knowledge workers) and capital (footloose industries). In addition, the scenario excludes the possibility of a major collapse of the world economy through war, disease, natural disaster or market failure, assuming that global trade will continue to rise. The importance of the knowledge economy for the European economy is also taken as a given for the coming period.
The basic hypothesis of this scenario is that efficiency considerations will gradually dominate European and national policies. Europe consequently follows the objective of catching up with the US and the Far East in respect to competitiveness and growth. The rate of investment will be increased and investment will go mainly to high-tech and competitive sectors of the economy. Institutions, regulations and policies which are regarded as obstacles of competitiveness and catching-up, will be revised and reforms serving growth and competitiveness will be implemented. Other government expenditures will be restricted, which will have an impact on social, employment, environmental and cohesion policies. Simultaneously, business environment will be improved: corporate taxes will be reduced, new entries into the market will be facilitated, and excessive regulations (e.g. concerning employment) will be reduced. State aid will mainly support R&D and innovation. The obstacles of the mobility of capital and labour will be reduced, taxation will be harmonised in a relatively low level.

4.2.2.2 Driving forces

Since all scenario sketches have policy as the main independent variable, 'driving forces' represent here the factors that put pressure on the policy arena to maintain, strengthen, modify or abolish a particular policy strategy. The main driving forces of this scenario are the ambitions of the Lisbon strategy coupled with the publication of disheartening progress reports thereof, effects of European expansion, globalisation and increasing pressure from international competitors in the knowledge economy.

Political climate: the sobering 2004 midterm review by the High Level Group chaired by Wim Kok placed Lisbon once again at the top of the European agenda. The conclusion was clear: 'The Lisbon strategy is even more urgent today as the growth gap with North America and Asia has widened, while Europe must meet the combined challenges of low population growth and ageing. Time is running out and there can be no room for complacency. Better implementation is needed to make up for lost time' (quoted in COM (2005) 24). Meanwhile, there is evidence, from ESPON among others, of the problematic and sometimes counterproductive functioning of CAP.

Enlargement: while the effects have not yet been felt, the incorporation of ten new members with a GDP per capita just of 46% of the EU25 figure will have profound impacts for EU sectoral policy (particularly CAP and regional policy), which could place an unwanted strain on the EU budget, compromising efforts for boosting competitiveness.

Globalisation: the ongoing opening of international markets (WTO) further exposes Europe to its competitors, heightening the imperative for achieving the Lisbon objectives. As knowledge becomes capital, competition will increasingly take the form of attracting and securing the best knowledge-intensive industries and workers.

4.2.2.3 Contextual elements of the decision to place Europe's 'best foot forward'

As stated, in this scenario the tenets of the original Lisbon strategy, to become the most competitive knowledge-based economy in the world, constitute the main point of departure. In the context of questionable progress on the Lisbon strategy, the enlargement is particularly problematic. Most new member states are hardly competitive even within the context of Western Europe, let alone with Asia and North America. This will be exacerbated by the entry of Bulgaria and Romania in 2007. There is a growing apprehension among the more affluent members that the political weight of the new entrants in the Commission and Parliament may result in more emphasis on redistribution. This is evident on an individual level with measures such as restricting migration from the N10 and the phased implementation of CAP in the new member states, and some elements (more prominent role for Lisbon in the *Third Cohesion Report*) of regional policy. By 2005, there was a growing awareness among core member states that they must band together if a programme of economic competitiveness is to be preserved: akin to the 'Europe of two-speeds' discussion the year before. For this reason, some cohesion-oriented policies will have to be sacrificed in order to enable the EU to put its 'best foot forward'.

Core countries conspicuously espousing the 'best foot' philosophy include the United Kingdom, Austria, the Benelux, Sweden and Finland — and particularly the business sector in these countries. Sympathisers but not overt proponents include France and Germany as both countries contain some elite regions, but also some clearly lagging ones as well (Britain, despite the fact it clearly has lagging regions, also has a more liberal tradition than Continental countries). Countries such as Italy are divided on the issue, whereas Ireland, Spain, Portugal and Greece are opposed on economic and ideological terms (all have experienced the benefits of cohesion policy). Although the strategy will not benefit all regions equally, the citizens of Europe also seem convinced of its necessity: according to the 2004 Eurobarometer Report, for example, 'European public opinion is ready for solutions in order to foster growth and address crucial issues like unemployment or the future of pensions' (EC, *Eurobarometer on Lisbon Agenda*, 2 Feb 2005). Public opinion also shows that a 'vast majority' believes that a knowledge-based society is the best way to deliver this.

4.2.2.4 The 'best foot forward' strategy

Employing a 'back to basics' argument, the coalition successfully pushes through a programme to realise Lisbon by concentrating its resources on its main assets. There is already some indication of support for this in the wake of the conclusions of the midterm review of Lisbon: 'Lisbon's overburdened list of policy objectives has obscured the importance of these actions which can drive productivity growth' (COM(2005)24, p. 13).
The strategy entails massive injections of funds into technology development, education in hard sciences, support for ICT infrastructure and the like in order to bridge the investment

gap between the EU and Japan and the US. The 'best foot forward' is an intensely pro-EU strategy, as the European level will be relied on to deliver many of the changes via regulation and financial support. It is also emphatically Europhilic in nature as it wishes to champion the best aspects of Europe, allowing the EU to act as a beacon for the best minds on the globe.

Since the ultimate goal is to attract and retain the world's best human capital in the knowledge economy, additional investments will be required to further enhance the quality of facilities and amenities in Europe's most competitive regions. This means that the European Union must 'ensure that our universities can compete with the best in the world' (COM(2005)24, p. 9). Already some specific measures are being proposed such as the creation of a European Institute of Technology. However, the 'best foot forward' strategy goes further: funds must be directed to disseminating an image of Europe's elite universities as a unified alternative 'ivy league' rather than an archipelago of excellence, as they are now commonly perceived. Educational credentials are standardised and streamlined throughout Europe, and rankings published regularly. The most successful institutions are rewarded with 'EU top' status, entitling them to additional funding and other benefits. The latter include, for example, preferential treatment in land-use conflicts regarding their physical expansion, relaxation of immigration laws in order to draw top professionals and students, and programmes for benefit packages (subsidised travel and housing schemes) for students and staff. Additional funding would be earmarked towards research facilities and networking activities designed to attain spillovers.

Since the central regions (Pentagon) are currently the main driving forces and carriers of Pan-European growth and competitiveness, most of the investments will be directed to these areas. These are also the regions with the highest level of 'creativity' as understood by Florida (2002). EU subsidies will therefore be provided for improved infrastructure in the Pentagon (to counteract congestion) and to dynamic companies and organizations (universities) engaged in the knowledge economy. Information and resources will be pooled in order to construct a powerful MegaEuroRegion with the critical mass to attain and remain at the top of the world knowledge economy. In order to finance this, the structural funds will be increasingly directed towards the objective defined in the *Third Cohesion Report* 'Competitiveness for growth and employment', and will be explicitly tied to the Framework Programmes for stimulating R&D. Related to this, the budget of DG Research will be increased substantially, and tied to supporting programmes that contribute to economic competitiveness. On the other hand, CAP funding will be reduced dramatically. Aggressive competition policy will also be pursued to ensure that labour, goods and services are allowed to flow freely in Europe, on the assumption that this will further enhance the competitive position of top locations. In addition, spatial measures are taken to improve the attractiveness of the core area of Europe (or at least offset some of the negative spatial consequences of economic development) for knowledge workers (Florida, 2002).

Finally, globalisation is harnessed to launch knowledge-intensive firms into the 21st Century by means of proactive stimulation packages. Measures include selective tax cuts, information production and sharing schemes, selective migration policies, and exemption from certain (e.g. environmental, labour market) restrictions. Policies target large organizations with proven success or certain dynamic sectors such as information technology.

4.2.2.5 Implementation of the strategy

This section will provide a short summary of the various interventions into strategic decisions and sectoral policies that are required to realise the strategy outlined above.

EU budget. In this scenario, the taxing potential of national governments will be seriously restricted and this will have an impact on their willingness to contribute to the community budget. National contributions to the community budget will be reduced to 1 percent of GDP, or even below this level in longer term. The structure of the expenditures will gradually, but in the long run substantially, change. The share of agriculture and cohesion policy will be substantially reduced, while the share of expenditures under the heading 'Competitiveness for growth and employment' will substantially increase. The share of R&D and of external policies will also increase and private sector R&D will be encouraged via tax credits.

Agriculture: as CAP subsidies do not promote economic competitiveness in a knowledge economy — indeed agriculture is viewed in this scenario as increasingly archaic and irrelevant — the budget will be reduced substantially (the enlargement has added urgency to this, as the N10 include many poor agricultural areas). Pillar 1 support is abolished entirely, and Pillar 2 subsidies are granted to areas in which they will produce maximum amenity in top locations.

Competition: one of the main aims should be to make the Single Market more dynamic. It means better coordination between regulatory and competition policies to encourage market access for new entrants and to introduce a more pro-active policy to support labour mobility. State-aid regulations will be lifted for certain kinds of industry, particularly knowledge-intensive small business start-ups; this was the thrust of the Communication 'Working together for the Lisbon Strategy' (COM(2005)24, p. 8). On the other hand, state aid should be strongly discouraged if it interferes with or inhibits private-sector investment (see EC, *EMAC Speech Neelie Kroes*, 3 Feb 2005). In addition, the EU has to remain vigilant that promotion of elite organisations and sectors does not stifle healthy competition, and therefore existing anti-trust legislation and rules on public procurement will remain vigorous. This scenario also calls for intensifying the freedom of movement of jobs, labour and capital in Europe, as it is estimated that 'completion of a single market in services should lead to an increase in the GDP level by 0.6% and of employment level by 0.3% in the medium-term' (COM(2005)24, p. 29).

Enlargement will progress dynamically in this scenario. The West Balkans, Turkey and perhaps the Ukraine will be members already in the late 2010s and, perhaps, further countries will join the EU (Belarus, Moldova, some countries of the Caucasus, some Maghreb countries) in the 2020s. The main motives of enlargement will be to increase the market and political considerations: to ensure a stable political environment for the European economy. The heterogeneity of the European Union will further increase. The political resistance to enlargement by the more affluent member states will dissipate with the knowledge that Community resources are being directed primarily to elite areas, rather than cohesion. The new entrants, denying the aid received by other new member states in the past, orient themselves towards benefiting from the common market.

Environment and nature: insofar as environmental directives may harm competitiveness, exemptions are provided. Particularly the Framework Directive on Water and Natura2000 will be relaxed in areas in which it is difficult to meet standards without incurring great costs. Similar selective implementation/repeal will apply to air, soil and water quality and noise pollution. If possible, however, the EU will compensate elite areas for these costs in order to maintain environmental quality.

R&D: this is viewed as one of the most vital spearheads for the Lisbon strategy. Budgets of the Framework Programmes are increased dramatically, infused by links to the structural funds and CAP reductions, allowing the EU to meet and perhaps even exceed Lisbon targets of 3% of GDP (and bringing it in line with Japan and the US). According to the Commission, for example, 'an increase in the share of R&D expenditures in GDP from 1.9% to 3% …

would result in an increase of 1.7% in the level of GDP by 2010' (COM(2005)24, p. 29). As it is acknowledged that R&D is just one aspect of the knowledge economy, the activities of DG Research will be adapted to support other forms of innovative research as well. In fact, the Commission arrived at this conclusion as well: 'by far the largest productivity effect comes from the absorption of the results of foreign R&D' (EC, *2004 European Competitiveness Report*, p. 10), rather than being the source of this R&D. A similar conclusion was drawn empirically for the Netherlands by Raspe *et al* (2004). At any rate, the theme of FP6 (Information Society Research) could be carried on into the future in this scenario. As a result of relevant policies, R&D investments undergo a considerable increase (the 3% objective, set up by the Barcelona summit, was reached in the meantime) and, what is not less important, these investments show a growing efficiency. Tax credits will be introduced to enhance R&D investments in the private business sector, particularly for start-ups.

In general terms, the approach at the EU and national level to boost investment in R&D undergoes a paradigm shift, away from subsidies which are designated to subsidize a priori certain key technology towards creating a general R&D friendly environment, in combination with a competition-based system of funding for the best research ideas. Although the process of speeding up productivity growth is very complex and goes far beyond ICT, the latter doubtless shapes an essential ingredient on this path towards higher productivity. The significant increase in spending for R&D in combination with a growing efficiency of these investments will allow to make European high tech sectors more competitive, and a number of European high-tech industries will become world-wide leading in terms of front-end technology and economic success. Among the beneficiaries, promoted by the newly established EASR, primarily are the high-tech clusters in highly agglomerated spaces inside and outside the European Pentagon, where a critical mass of universities, research institutions and firms of relevant industries is already given and where intensive collaboration between them (to transmit the [tacit] knowledge) does already work and must not be created 'artificially'.

The initiatives to increase and more effectively use R&D investment will go along with initiatives to improve the skills in line with the requirements of the emerging knowledge society. First priority is given to policies which create better conditions for the attraction and retainment of top research personnel towards/in Europe. Fast-track working permissions for non-European top-researchers as well as non-bureaucratic visa regulations will facilitate the attraction of the 'best brains' towards Europe. Complementary reforms aimed at an improved funding of universities, particularly on favourable remuneration conditions for top researchers, will be supportive when it comes to the attraction of urgently needed top personnel for R&D. Moreover, reforms of Europe's educational system, particularly at the university level, will come into force, allowing more competition among universities to attract the most talented students and scholars.

At the European level, regulations will be introduced for the mutual recognition of qualifications and for mutual granting of the entitlements foreseen in the different national social security systems. These latter topics were even mentioned in the so called Kok report in the middle of the first decade (2004) as remaining obstacles for an intra-European exchange of well educated researchers (see Facing the Challenge [2004]: p. 20). The above described policies in the field of university education and research will create a strong competition among the universities where some of them will come up as 'elite universities'. As a result of these developments with respect to the education system, Europe will re-gain its attractiveness as a location for the 'best brains', and moreover, the reforms at the university level will lead to a relatively broad supply of highly educated 'knowledge-workers'. This class of well-educated people will enjoy high incomes and good employment chances. For the highly qualified workforce the capability to use advanced ICT is 'standard', while people with low skills, who earn only low incomes, are excluded from the benefits arising from ICT. Thus, Europe continues to show signs of digital divide.

Regional policy: the Structural Funds will remain important, but will be increasingly employed strategically towards supporting initiatives that facilitate the creation and maintenance of elite regions. Funds to assist innovative firms in areas with dense knowledge networks are included in regional policy under the motto 'linking innovative potential to geographical advantage'.
Transportation: congestion on roadways and rail in top regions is to be expected, given the additional economic activity. Member states must ensure that this will not undermine community investments by investing in mass transit solutions, (underground) road bypasses and multimodal transport.

4.2.2.6 Developments and events (storyline)

In June 2005, the European Council principally approved the financial perspectives and the regulations of Structural and Cohesion Funds for the period 2007-2013. For the first time in the history of European integration, this budget allocated significant funds not only to agricultural and cohesion objectives, but also to objectives such as growth, innovation and competitiveness. The new 'Competitiveness for growth and employment' fund was the most dynamically increasing item of the EU budget, nevertheless, its share remained modest (20%) in comparison to total expenditure even in the last years of the programming period.
The real break occurred in later. After a rather unambitious and pragmatic Dutch presidency in 2004, which concentrated on 'cutting red tape' and managing daily operations following the enlargement and completion of the Draft Constitution, the political climate in Europe seemed ripe for a more visionary course. The Luxembourg presidency attempted to prepare this, but saw its hopes dashed at the eve of its term with the resounding defeat of the Constitution in French and Dutch referenda. The British term was mired in political battles over the reform of the budget, but the Austrian term placed the Lisbon agenda once again at the centre of European politics. The Finnish presidency took this forward in late 2006. As the 2010 deadline loomed ahead, the Lisbon imperative gained more and more support amongst the populace and policy leaders.
The decisive change in economic policies occurred between 2010 and 2014, during the preparation of the next programming period. Governments, especially those of the larger and wealthier member states, realised that, if they wanted to prevent a fatal lagging behind of Europe, they had to implement radical policy measures. Moreover, politically, they stand better to profit from this policy change.
The next financial perspective, for the period 2014-2020, reflected these radical changes. The share of agricultural expenditures ('Preservation and management of natural resources') decreased to less than 15 percent of the EU budget. The budgetary share of cohesion policy decreased radically – to 25 % -as well. More than half of the EU budget became allocated to the objectives of promoting overall European competitiveness and growth (to the R&D sector, to promote business infrastructure, etc.).
European governments also took steps to facilitate the emergence of an efficient and productive economy. Publicly provided welfare provisions were limited to social assistance. Insurance against labour market risks was reduced and partly shifted to the market and social partners.
Despite the radical reduction of the resources of European Cohesion policy, the Eastern member states – as a whole – converged gradually to the European average. This happened because rapid institutional reform and a catching up of technology took place also in these countries. Indeed, there was a dramatic surge of foreign direct investment flows into the Eastern regions of Europe. As a result, European Cohesion policy, starting from 2020, was abolished at all.
Member countries arrived to an agreement concerning harmonised taxation only in the early 2010s. Accordingly, old, big member countries lowered radically their tax rates, while new members raised them moderately. In sum, this resulted in an overall tax reduction in Europe, which raised the competitiveness of European firms, but restricted the budgetary manoeuvring space for governments substantially.

Competition within the European economy substantially intensified from the early 2020s. Flexibility rose at the expense of commitment in economic relations. Free trade in agriculture and services was fostered. This called for substantial restructuring in Europe. For instance, agricultural sectors with little added value contracted significantly. The same happened to textiles in a number of countries. Although this entailed substantial changes, European economies became sufficiently flexible to cope with these changes.
In the meantime, a radical enlargement of the European Union and especially of the European Economic Area took place. In 2007, Romania and Bulgaria, in 2012, with a new 'big bang', all countries of the Western Balkans became members of the European Union. The main driving forces of enlargement were economic and political factors. European enterprises required new markets for their products and markets for secure investments. They wanted new and cheap labour for their new plants and outlets. On the other hand, they wanted stable political environment for the European economy. In the 2010s Switzerland and Norway joined the Union without difficulty. In 2020, Turkey, the Ukraine, Moldova, Armenia, Georgia and Azerbaijan became members of the European Union. In the same year, the EU signed free trade agreement with Russia, all former Soviet republics in Central Asia, with the countries of the Maghreb, Mashreq and the Levantine coast. In 2030, a European Union of 700 million inhabitants and a European Free Trade Area of 1,2 billion people, became a decisive factor in the World economy. But even so, they represented only 7,6 and 13 percent of the World population, respectively. The Far East, Japan, China, Southeast Asia and India with 3 billion inhabitants and with a rapidly growing economy had become serious competitors on the World markets. Hence, the European Union, the United States and Latin America agreed upon a 'backdoor free trade' agreement in 2025. The transatlantic economic integration actually had gone beyond a free trade agreement: it led de facto to a single market in which a large number of formal and informal barriers to trade were removed through mutual recognition. This holds in particular for the service sectors. This significantly fostered growth in the ICT sector in Europe.

4.2.2.7 Impacts

In the discussion of impacts in the four scenarios, this will be done, whenever possible, in terms of Pentagon vs periphery (macro), EU15 versus N10, North vs. South (former cohesion countries) and rural vs urban.
The expectation is that successful implementation of the 'best foot forward' strategy will produce a moderate gains in overall **economic growth**. The improved competitiveness of a limited number of businesses and institutions largely in the Pentagon is the engine behind this growth. There will be catching up of the N10 in later years, but initially they will have difficulty competing with the subsidized and already well-developed areas in the EU15. The same is true for some of the former cohesion countries, with the exception of Ireland. More than direct subsidies, the relief given as a result of reduced payments via Pillar 1 will be noticed by consumers in the form of reduced prices, providing an extra boost for the retail sector and consumer services. The loss of vitality in rural areas will create additional migration to urban areas, a source of inexpensive labour.
With regard to **rural development**, the share of CAP in the community budget will be substantially reduced. Rural areas will undergo a fundamental transformation. Agricultural production activity will be concentrated to those farms and those areas, where competitive production can be realised. These are mostly larger farms where the geographic, soil, climatic and hydrological endowments are favourable for agriculture and where markets are easily accessible. In other areas, full-time agricultural production activity will be radically reduced, even abandoned. Land will also be reused for environmental, recreational, and other non-agricultural purposes. The two types of land use will be separated not only at the local level but sometimes at regional level as well. It means that in some regions rural employment opportunities will be radically reduced. This will occur, first of all, in the new member states of Central and Southeast Europe (the present share of agricultural employment is 20-30% in Romania and Poland) but also in some Mediterranean countries.

These people will look for new employment first of all in the urban centres of their own country, but also in the European core area. Many more will remain, however, and become even more disadvantaged. The overall decrease in rural population will be however compensated by urban residents moving to rural areas adjoining urban centres.

In terms of **transport** flows, the probable impact of 'best foot forward' is a rise in traffic volumes between the most important urban areas in the European core. Congestion of the roadway network may lead to the continued growth in air travel via regional (suburban) airports and better utilisation of the high-speed train network, which is geared towards linking important urban centres. Whether the improvements in infrastructure are sufficient to offset the expected growth in transport in the Pentagon is uncertain. More certain, however, is the continued lack of accessibility of peripheral areas.

With regard to the **environment**, it is to be expected that this scenario is hardly sustainable. Waivers of environmental rules entail the acceptance of more intense levels of pollution, and the low priority given to this area and Natura2000 in general will most likely translate itself into reduced environmental quality in the Pentagon. More peripheral areas may notice little change, as work continues to be created elsewhere.

The spatial-economic changes will also be reflected in demographic development. Institutional obstacles to **migration** within the EU will be removed and efforts will be made to overcome other obstacles to labour movement (in terms of the standardisation and acceptance of diplomas, overcoming the language barrier, etc). Consequently, a relatively large flow of migrants will be drawn to the core areas of Europe. Active recruitment of skilled outside the EU is encouraged. These migration flows, however, will be substantially different from those of the 1960s and 1970s (unskilled or low skilled guest workers from the Mediterranean, Maghreb, and Turkey) and also from those of the 1980s and 1990s (asylum seekers from the poorest and war-ridden countries of the world). A large part of the new immigrants will consist of highly skilled, professional people.

4.2.2.8 Territorial image in 2030

As its name implies, the 'best foot forward' will benefit those regions that are currently capable of sustaining top universities, major financial institutions, research facilities and the like. At present, this points to the Pentagon, although obviously not all regions in the Pentagon qualify (e.g. the pockets of poverty in areas like Northern France), while some particularly strong nodes outside (e.g. Scandinavia) do. The net effect of this scenario will be a net increase in territorial disparities at the macro level (the central MegaEuroRegion versus the periphery) and the meso level (major cities versus smaller ones), and in that sense can be seen as anti-polycentric. However, since overall economic growth is expected to increase in 'best foot forward', increasing disparities do not mean necessarily the stagnation or decline of lagging regions. It could still mean growth, albeit less than the average growth rate, but growth nevertheless. But undoubtedly there will be regions in which absolute decline will occur.
In this scenario regional disparities are therefore expected to increase both between and within countries. Economic disparities are expected to increase among countries because knowledge based and research-intensive activities would generate the highest income and these activities are expected to increase faster in the core area where resources for research and innovation are most available. Paradoxically, intensive outsourcing of activities to less developed areas would not reduce but rather increase disparities, because it frees up the labour force in the core area for more productive, profitable and income-generating activities.
The concentration of economic activities is expected to increase within certain countries as well, because knowledge based and innovative economy will emerge first where geographic proximity and 'tacit knowledge' (transferable only by direct, personal contact and

experience) enhance and reinforce innovative behaviour and competitiveness. In the new member states, where FDI is — and will remain for a while — the principal vehicle of growth, the increase of disparities, as a result of the very selective location of FDI, will be marked.
In general, economic growth leads to pressures in and around urban areas for development. As this scenario is expected to produce additional economic growth, we can expect a corresponding intensification of human influence in Europe: draining of lakes, damming of rivers, building of infrastructure and construction of buildings. Urbanisation will however not occur evenly over the territory, but be concentrated in the Pentagon, and specifically in the largest settlements therein. Major urban agglomerations like Paris, London, Randstad and Ruhr will extend their influence into the surrounding regions at the expense of smaller centres, because these do not have the critical mass needed to support top economic facilities.

As noted, **urban development** in this scenario will be concentrated in the European core area, not necessarily within the administrative borders of the big cities, but rather in the Potential Urban Strategic Horizon (PUSH) areas defined in ESPON project 1.1.1. These are the surrounding areas of urban centres within reach of 45 minutes by car from the centre. The fate of the core of cities will depend much less on industry and much more on other factors, like their role as a service centre, tourism, etc. In the new member states and other peripheral areas the future development trend of the urban system is less certain in this scenario. The reason for this is that they will be highly dependent on the outsourcing activity of transnational enterprises and less on endogenous factors. If their main location strategy continues to be cheap labour, transnational enterprises will look for ever more peripheral places where this type of labour force is still available. This will result in a highly decentralised, but unstructured pattern. If those enterprises increasingly utilise the higher educated and skilled labour force of these countries, this will result in the same type of urban structure as in the more developed countries, yet at a more modest level.

4.2.2.9 Summary and conclusions

Although the growth in Europe as a whole will be more dynamic in Best Foot Forward, this will be accompanied by growing regional (but not necessarily national) disparities. Larger metropolitan areas with sufficient facilities like universities will profit from the shifts in EU policy. At the same time, sparsely populated regions will decline further. This is also likely to contribute to additional pressure on the existing transport infrastructure in the Pentagon, and will probably result in intensified environmental pollution.

4.2.3 Economy Scenario 2: EuroTigers

This scenario describes a situation where the EU pursues a two-pronged strategy of economic competitiveness and territorial cohesion. This is currently articulated in the Lisbon/Göteborg strategy, which aims at competitiveness, cohesion and sustainable development, and thus echoes the principles stated in the ESDP. The concept of polycentricity is used as a vehicle to achieve implementation.

4.2.3.1 Scenario hypothesis

In this scenario, the EU embarks on a mission to implement the Lisbon/Göteborg strategy. The approach differs markedly from the previous scenario. While large enterprises and advanced regions will adapt to the new requirements based on (own and external) private resources, knowledge-based and innovative development of small and medium-sized firms and of more peripheral regions will need to be supported by EU and national policies. It assumes also that a more differentiated approach will need to be applied to countries and regions that are in quite different situations. According to the EuroTigers strategy, support is given to areas with the potential to become competitive on a global scale, not to those which already are. Consequently, new competitive knowledge and innovation centres will emerge both inside and outside of the Pentagon. The most lagging regions are largely 'written off' as having little promise for improving the EU's competitiveness. Like the other scenarios, it is assumed that current globalisation trends will continue as well as the rise of the knowledge economy.

4.2.3.2 Driving forces

The main driving forces of this scenario are the ambitions of the Lisbon/Gothenburg strategy, European enlargement, globalisation and increasing pressure from international competitors in the knowledge economy. These will be considered in turn.

Political climate: the Lisbon/Göteborg remain the best statement of European ambitions behind which most member states and citizens can rally. The midterm reviews only emphasise the fact that more efforts — not less — are needed at the European scale. This is consistent with the ESDP and many ESPON findings. In addition, insights into the knowledge economy show that 'softer' criteria are also vital in securing a region's competitiveness, an argument for retaining the aspects of cohesion and sustainability in the Lisbon agenda.

Enlargement: there is a formidable task of reforming sectoral policy in a fair way to accommodate the new member states and bring them up to speed with the rest of Europe. It is acknowledged that the low starting point in terms of GDP per capita can translate itself into high annual growth, thus making these areas interesting to investors.

Globalisation: the mediocre economic performance of Europe in terms of annual growth could be augmented with the incorporation of developing regions (Euro-Tigers) gained by the enlargement into the EU.

Governance: economic organisations (enterprises) will apply business strategies suitable to enhance competitiveness and innovation. Governments and politicians of member states, inspired by their responsibility for the future of Europe, will implement those changes in the institutions, laws and regulations at national and supranational level which are necessary to set the European economy on a new development path, without losing the specific European achievements and social traditions.

4.2.3.3 Contextual elements of the EuroTiger strategy

With the successive enlargements, the European Union became more heterogeneous. Heterogeneity poses, without doubt, a threat to community governance, but simultaneously it is an opportunity as well. The European Union found itself compelled to apply a more differentiated approach to countries and regions being in very different situations and at rather different developmental levels. A differentiated approach is not necessarily contradictory to integration and can, in specific situations, even facilitate and promote it. Although the new member states are lagging economically, for precisely this reason they have a great growth potential, which far exceeds that of the elite areas in Europe in proportional terms. Indeed, economies in the new member states — and those of the 'old' cohesion countries as well — are now growing faster than the EU average. Obviously, their economic weight is not sufficient to give a momentum to the overall growth of the EU, nevertheless, theirs can be a valuable contribution to the spatial-economic structure of the EU, if managed properly. This is the essence of the EuroTigers philosophy.

The midterm review of the Lisbon/Göteborg strategy provides a new impetus for change within Europe. The sobering conclusions serve as a call for action to implement the strategy in its full form: competitiveness, cohesion and sustainability. This becomes a rallying cry for all member states; rather than accepting a two-speed Europe, all member states must band together to ensure that Lisbon becomes a reality. In order to raise the political support necessary in an enlarged Europe, the strategy devised to unite old and new member states stresses the complementarity of competitiveness and cohesion. Ireland is held up as a 'EuroTiger', a shining example of successful use of structural funds, and a model for the N10. Its progressive stance on intra-EU migration is also praised.

4.2.3.4 The 'EuroTiger' strategy

The essence of the Tiger strategy is to identify specific areas and sectors that hold the most promise for rapid and sustainable economic development. Unlike 'best foot forward' these are not necessarily the elite. Proponents of the EuroTiger strategy see devoting resources solely to the elite areas as flawed for two reasons. First, they already have such formidable resources that any extra support provided by the EU would be very small in proportional terms. Second, since these top-performers are already successful (by definition), they are likely to have the resources to remain competitive without EU assistance. The EuroTiger strategy, in contrast, seeks out instances where it can make a decisive contribution. The philosophy is similar to that of regional policy where funds are only given as a critical extra push for a project, rather than comprising a significant share of the total costs.

Like in spatial development, the EuroTigers motto for economic development is that polycentricity constitutes the golden mean between equity/welfare and efficiency/redistribution. This has the clear advantage of broadening the base of political support for the strategy, seen as a prerequisite for the implementation of the Lisbon strategy (COM(2005)24, p. 12). The experience of the last years seems to confirm the viability of this strategy. The table below displays the share of capital regions in the increment of GDP in the Central and Southeast European candidate countries in the period between 1995 and 2001. In Romania and Bulgaria this share is more than 100%, because in all other regions GDP had declined. In the Czech Republic and Hungary capital regions have produced about two thirds of the increment in GDP. Even in Poland and Slovakia, where development was more balanced, capital regions produced more than one third of the increment which is much higher than the respective regions' share in population.

Country	Capital region	Share of capital region in GDP production
Bulgaria	Yugozapaden	151%
Czech Republic	Praha	65%
Hungary	Közép-Magyarország	58%
Poland	Mazowieckie	35%
Romania	Bucuresti	278%
Slovakia	Bratislavsky	38%

Source: CEC: *Third Report on Economic and Social Cohesion*. Statistical Annex. Brussels 2003

Table 10 The share of capital regions in the increment of GDP in the candidate countries 1995-2001

Country	Region	Annual growth rate	Per capita GDP as a percentage of the EU15 average	
			1995	2001
PL	Mazowieckie	10.4	42.7	63.7
IRL	Southern and Eastern	9.8	70.5	85.4
IRL	Border, Midland and Western	8.1	101.5	129.2
PL	Wielkopolskie (Poznan)	7.8	33.8	43.4
RO	Bucuresti	7.4	38.1	52.3
PL	Pomorskie (Gdansk)	6.5	34.4	41.6
PL	Podlaskie	6.3	26.0	37.0
PL	Malopolskie (Kraków)	6.2	30.4	35.3
FIN	Uusimaa (Helsinki)	5.9	128.8	140.3
NL	Flevoland	5.8	83.3	82.4
PL	Lódzkie	5.8	31.3	36.9
PL	Zachodniopomorskie	5.8	35.3	40.5
LV	Latvia (Riga)	5.7	24.7	33.4
SK	Bratislavsky	5.7	91.5	101.8
PL	Świętokrzyskie	5.5	27.3	31.2
FIN	Åland	5.4	119.2	141.6
PT	Algarve	5.4	66.0	72.4
EE	Eesti (Tallin)	5.2	33.6	38.5
HU	Közép-Magyarország (Budapest)	5.2	65.7	81.3
UK	Inner London	5.2	229.8	263.4
UK	Berkshire, Buck, Oxfordshire	5.2	119.9	149.0

Source: CEC: *Third Report on Economic and Social Cohesion*. Statistical Annex. Brussels 2003

Table 11 The most dynamic NUTS2 regions of the European Union and the change of their relative development level 1995-2001

This phenomenon is not exclusive to new member states. Practically all capital regions have increased their relative level of development (compared to EU average) in the Northern, Southern and Eastern periphery. In addition to capital regions, there are a few other regions outside the Pentagon that can fulfil the growth pole function. These regions and cities are actually the 'carriers of growth' in the relevant areas. It is assumed in this scenario that EU policy will build upon this process as a very important factor of European cohesion policy and, simultaneously, a factor of European growth and competitiveness. Additionally, this development process will largely contribute to a more polycentric structure of European space and urban network. Because rapidly growing regions are stimulated further with EU policy (regional, competition and R&D) this is likely to result in environmental problems. To

mitigate this, extra attention is also given to implementing effective growth management controls, using for example the policy suggestions included in the ESDP.

4.2.3.5 Implementation of the strategy

This section will provide a short summary of the various interventions into strategic decisions and sectoral policies that are required to realise the strategy outlined above.

Agriculture: CAP in its present form is not viewed as supporting the EuroTiger strategy because it tends to work against cohesion and supports an antiquated economic sector. There is little economic reason for maintaining the current level of European exports of agricultural products, made inexpensive by lavish Pillar 1 subsidies. However, Pillar 2 does seem to hold some promise for maintaining the environmental quality of rural areas, and can be used to ease the transition of peripheral regions to the EU.

Competition: internal market rules (including public procurement) must be rigorously applied as the development of new markets necessitates unobstructed flow of capital and labour. Markets must not be distorted with national state aid (usually to failing industry), but instead aid must be given at a EU level with the goal of acting as a catalyst to allow exciting new businesses to gain their footing that could compete at the global level.

Enlargement: this is a dynamic process in this scenario. Nevertheless, this process is not exclusively guided by market expansion considerations, as in the first scenario. The deepening of integration is also an important aspect of the process. Therefore, the enlargement process is subject to limits pertaining to political, social and economic absorption capacity. The present candidate countries (Bulgaria, Romania, Croatia and perhaps Turkey) will join the community but further enlargement is not to be expected within the time horizon of the scenario. The policy approach toward individual member states or groups of member states will be differentiated to reflect the different potentials of member states.

Environment and nature: value for a clean environment and natural heritage is seen as an asset of Europe, rather than a liability, which sets it apart from its major competitors. Natura2000 is implemented throughout Europe and environmental standards applied firmly because all of Europe's citizens have a right to clean air and water. Economic development should not have to come at the cost of the natural environment. For this reason, EU support is earmarked for rapidly growing regions in order to mitigate possible environmental damage.

R&D: investment in R&D is likely to boost GDP in Europe as it has been noted that 'government-financed R&D expenditures complement domestic industry-financed expenditures on R&D … both direct funding of business R&D and tax incentives for R&D have a significant and positive impact on business R&D spending in OECD and EU countries' (EC, *2004 European Competitiveness Report*, p. 11). With regard to the Framework Programme, an evaluation of FP6 showed that it was 'almost impossible' for SMEs to participate in the 'Networks of Excellence' programme and that it was particularly difficult for newcomers to become partners (High Level Group chaired by Ramon Marimon, *Evaluation of FP6*, 21 June 2004). In EuroTigers, this problem is remedied with specific measures to ensure that new and smaller organisations also reap the benefits of EU R&D policy. Instead of taking for granted a ruthless competition for scarce financial means, European policies (in coordination with national policies) follow a strategy to encourage researchers and small businesses in less favoured regions to participate in innovation processes funded either by public means or by private resources. As recommended by ESPON project 2.1.2 (2004: 23), the European policy supports a better coordination between the Framework Programmes (FP) and the Structural Funds (SF), which enhances

the innovation capability of disadvantaged regions. The pursued strong regional policy component does in no way means a funding procedure following the 'watering can principle'. Instead, it follows the idea of strengthening those disadvantaged areas that possess the relatively best chances for catching up and becoming competitive regions with a high innovation capability.

Regional policy: the tenets of the policy proposed in the *Third Cohesion Report* (2004) are largely consistent with the EuroTiger strategy, insofar as both competitiveness and cohesion are objectives. However, EuroTiger goes further in linking the two, taking full heed of the recommendation of ESPON 2.1.2 (2004) to facilitate coordinated implementation of regional and R&D policy. The same report has shown that R&D investments in less developed regions may deliver more value-for-money as the impact on accelerating the 'catching up process' is greater.

Transport: as the EuroTiger strategy rests on the idea of polycentricity, this will become the Leitmotiv of the EU's transport policy as well. For the most part, this corresponds with initiatives already underway: the linkage of major 'peripheral' centres with the core of Europe with high-speed connections, preferably environmentally friendly modes of transport. However, a budgetary increase is necessary to translate EU-scale priorities into concrete results.

4.2.3.6 Developments and events (storyline)

In 2004-2005, the European Commission submitted its proposals for the regulation of Structural and Cohesion Funds in the fourth programming period (2007-2013). These regulations took notice of the previous debates on this subject. Net payer countries demanded more say in how their money was spent. There was widespread dissatisfaction regarding the tradition of providing support to eligible regions in otherwise relatively affluent member states. The argument is that development in these cases should be a matter decided at the national level rather than at the European level. On the other hand, eligible regions in poor member states do not have this luxury, and are more dependent on the EU for aid. A second issue during these debates regarded the apparent contradiction between Lisbon goals of achieving prominence in the knowledge economy and the cohesion aim of providing support to the most lagging regions.

These issues were politically resolved in the final decisions on the Fourth Structural Funds period, which enjoyed a large majority when ratified. Here, competitiveness emerged alongside cohesion as a major objective. A harmonization of the next Framework Programme and cohesion was also implemented. A marriage of the two — cohesion and competitiveness — pointed to supporting the fast-growing regions of the poorer member states: EuroTigers. The third major objective, territorial cooperation, was seen as a way to mitigate some of the externalities of growth. Some funds in this objective were earmarked for growth management initiatives in the EuroTiger regions, but these remained rather limited. One reason is that poorer regions in wealthier member states attempted to use this objective to regain some of the funding they had lost as a result of the new orientation.

Between 2010 and 2015 the EuroTigers grew rapidly, resulting in a more polycentric Europe at a macro level. The new opportunities and influx of money into the cities and the simultaneous reduction of CAP caused a major migration from rural to urban areas. Some of the problems of the Pentagon were also starting to make themselves more apparent in the EuroTiger urban regions, such as environmental pollution, sprawl and congestion. The next (Fifth) Structural Funds Period (2014-2020) saw a sharpening of the third objective to support more growth management in these EuroTiger regions, renaming it 'territorial management' rather than cooperation. The necessity for inter-regional cooperation was abandoned. Instead, aid was rewarded for implementing best practices in the area of

metropolitan planning and infrastructure development. The first two objectives were also merged into the 'Targeted Growth' objective. The eighth Framework Programme had as its theme: New Centres of Excellence, intending to create synergy between the rapid economic growth in the EuroTigers with the long-standing scientific quality in the Pentagon area.

By the time of the Sixth Structural Funds Period (2020-2026), the EuroTigers no longer qualified for the Targeted Growth objective, but still some funding from the Territorial Management objective. According to most economic indicators, there was little difference between major urban areas such as London, Paris and the Randstad and the Prague, Budapest, Bratislava network of cities. The major Polish cities also comprise a network of well-performing regions, but are less internationally oriented as the former. As a result of this catching up process, the countries hosting the original EuroTiger regions were able to support their own less-developed regions. At this time, the spill-over effects into neighbouring regions became apparent. This prompted a debate whether these fast-growing regions should be entitled to Targeted Growth funding since they were less the carriers of new growth, but profited by proximity to newly developed areas. It was decided to only apply Territorial Management funding here, and look to new centres for the main objective funding. These were to be found in the new Balkan member states and Turkey, which had recently joined the EU.

4.2.3.7 Impacts

With regard to the impact EuroTigers will have on overall **economic growth**, it is assumed that growth will increase. Specifically, a report to the European Commission *Delivering Lisbon*, stated that 'studies and simulations, conducted by the Commission, have concluded that the simultaneous and integrated pursuit of reforms [akin to the EuroTigers strategy] will produce an increase in the GDP growth potential of the Union in the order of 0.5-0.75 percentage points over the next 5 to 10 years' (COM (2004) 29 final/2, p.2).

In terms of **rural development,** EAGGF allocations to countries and regions will not dramatically decrease (their sum will remain unchanged) but within that sum the share of Guidance section will increase substantially, first and most acutely in the new member states and then in all countries in the EU. That means that radical structural changes will take place in the rural areas. Their accessibility will improve substantially. Structural Funds will support the generation of non-agricultural jobs and income opportunities in these areas. In the new member states, small villages will establish micro-regional cooperation for employment generation. Before 1989, a large part of income and employment in rural areas was generated through non-agricultural activities of agricultural cooperatives (mostly supplying services for large enterprises). After the political and economic change this source of employment and income disappeared. The acquired skills and infrastructure are still there and can be re-utilised, certainly in other organisational and ownership forms than in the past. These measures are indispensable in countries where the share of agricultural employment is still very high.

The **transportation network** will show a smaller rise in volume in the Pentagon than the previous scenario, but higher pressure outside. Connections between EuroTiger centres and the Pentagon will experience the greatest relative increase in traffic.

Migration will be a rather large-scale and dynamic process in this scenario, but not so unidirectional as in the first scenario at the macro level. For many of the new migrants, the destination of the migration will be the new growth centres outside the Pentagon area. This migration will be even more intensive than that to the traditional destinations, because, in these areas, more people will be affected by rural structural change. As a result, the Pentagon area will be partly relieved from a part of the migration pressure. Regarding the origin of migrants, in the new member states domestic migration prevailed (from less

developed and slowly growing regions toward dynamic ones), whereas in the old member states external sources of migration dominated. This was accompanied by additional social and cultural tensions.

4.2.3.8 Territorial image in 2030

As a result of EuroTigers, territorial cohesion will increase at the macro (European) level as secondary regions acting as carriers of growth — like Prague, Budapest and Warsaw — catch up to and in some respects even overtake comparable regions in the Pentagon. Territorial cohesion in Europe will however decrease at the national level as more competitive regions seize new opportunities, and are actually stimulated in doing this by the EuroTiger adapted structural funds. These increasing disparities can be regarded as transitional and provisional however. Filtering down and 'spread' and 'pull' effects will sooner or later have an impact upon the growth of the other regions of the respective countries, though this internal catching up process might prove to be very gradual indeed. Nevertheless, within countries there is always a budgetary redistribution process, so that poorer regions are beneficiaries of higher income generation in the growth poles, even in the short run.
As EuroTigers predicts a higher level of economic growth as a result of the targeted policy, we can expect changes in land-use in the most affected areas. Unlike 'best foot forward' this does not concern the largest metropolitan areas in the Pentagon, but smaller cities therein and larger centres in the periphery. Consequently, the urban development patterns discernable in this scenario are increasing pressure around the EuroTiger urban concentrations for space, reflected in rising land prices and rents. Suburbanisation around these centres and gentrification of the most attractive parts of the cities are to be expected. The influx of external investments will allow local decision-makers to make improvements in the condition of the quality of life of the inhabitants, but most probably this will be targeted towards amenities to attract knowledge-workers.

4.2.3.9 Summary and conclusions

This scenario envisions the implementation of the Lisbon strategy as it was formulated in 2004, with reference to cohesion and sustainability. There is an obvious link to be made between these economic ambitions and the three-pronged strategy of the ESDP. For this reason, the concept of polycentricity is also well adapted to the EuroTigers strategy. The outcome of the scenario is a slightly higher total GDP growth than the 'best foot forward' scenario and considerably higher growth than the next two scenarios. This is due to improved effectiveness of stimuli. The effect on territorial cohesion will also differ from the previous scenario. Here, it is expected to increase at the macro level (rather than decrease) but decrease at the meso level.

4.2.4 Economy Scenario 3: Blühende Landschaften

This scenario describes a situation where the EU pursues a strong policy in favour of cohesion. Lagging regions and sectors are bolstered in order to allow them to achieve a status fitting for a civilised Europe. Matters of sustainability and cultural heritage are major contributing factors to this strategy: especially clean industry and knowledge-oriented businesses are stimulated in lagging regions, making it unnecessary to relocate to find work.

4.2.4.1 Scenario hypothesis

In Blühende Landschaften, support is given to the most lagging regions to bring them to a certain EU minimum standard. EU and national structural support will continue to flow to less developed member states and regions. This includes support for infrastructure and environmental investments, but also for human resource developments. The goal is to make all European regions self-sustaining and have a reasonable quality of life; nobody should be forced to abandon his or her homeland to find a job and no European citizen should live in abject poverty.

4.2.4.2 Driving forces

The main driving force behind this scenario is the growing dissatisfaction in Europe of the unsustainable development path it has been following, and coping with the wide rift in economic position between old and new member states. Ideologically there should be one united and egalitarian Europe to provide a humanitarian alternative to North American hegemony. Gradual but steady economic growth is seen as preferable to the booms and busts that typify more laissez faire economies. Another motivation of this strategy is the more opportunistic desire by a number of vested interests to see cohesion support continue flowing to their regions. Finally, although not necessarily a 'driving force' *per se*, there is the general institutional friction to reform in this scenario, which plays itself out at the EU level as legitimating its existence by offering subsidies.

Political climate: the costs of sprawl and mobility are made apparent by a number of reports critical of the current neo-liberal discourse, raising public sympathy. Europe must compete in the world in terms of *joie de vivre* and not purely using sterile GDP indicators. The 2004 Eurobarometer demonstrated that the European public are of a similar opinion: they do not necessarily equate 'quality of life and economic performance' either (EC, 2005).
Enlargement: having such disparities within Europe is seen as unacceptable, as reflected in a statement by Commissioner of regional policy Hübner that, 'it is hardly surprising, in view of enlargement, that the Commission has set real economic convergence as the main objective for the future. In financial terms, this would absorb some 78% of total resources over the period of the next financial perspective' (EC, Speech/05/70: 3 Feb. 2005). The intent, of course, to be able to reduce this amount gradually as lagging regions catch up.
Governance: European institutions will continue to be dominated by intergovernmental decision-making in which business interests are only one factor of influence. Trade unions, farmers' unions, national, regional and local administrations, and — what is most important — voters' opinion are also factors to be considered.

4.2.4.3 Contextual elements of the strategy

With the subsequent waves of enlargement, the number and share of small and less developed countries have increased significantly in the European Union and so did their influence on European decision-making. Being net beneficiaries of Community budgetary allocations, their interest is to maintain a high share of cohesion and structural funds and —

perhaps to a somewhat lesser extent — that of agricultural supports. It is probable therefore, that contributions to the common budget cannot be reduced to the extent that net contributors would like to see. What can be perhaps achieved, it is the concentration of cohesion and structural supports to the least developed — mostly new — member states and their regions. In this respect, there is a kind of agreement between the largest net contributors and the poorest members. Cohesion and structural support will be spent in the least developed and peripheral areas, where it is really needed, but its effectiveness and the capacity to absorb it efficiently are ambiguous.

4.2.4.4 The Blühende Landschaften strategy

The goal of the Blühende Landschaften strategy is to produce a Europe in the Twenty-first Century based on the idea of sustainable and even economic development and ecological responsibility. The intent is to project these European values as an alternative to the uneven, unstable and hard capitalism of the United States and Asia. The most pressing task at the dawn of the new millennium is to bring up the most lagging regions up to a level worthy of the European Union. Some areas will be able to benefit from the implementation of contemporary and environmentally friendly technological solutions, without having to pass through the phase of dirty industry. Once a certain level of economic development has been achieved throughout Europe, the emphasis will shift on maintaining the high quality of life, peace and stability.

4.2.4.5 Implementation of the strategy

This section will provide a short summary of the various sectoral interventions that are required to realise the strategy outlined above.

Agriculture: as the least privileged regions in Europe are rural in character, and even more so with the 2004 enlargement, CAP will continue to command a large portion of the total EU budget. However, unlike the current regime, CAP will be changed to benefit the poorest areas with little emphasis on production, and much more on the conservation of natural and historical heritage of rural areas. Consequently, a major shift from Pillar 1 to Pillar 2 support will occur. In addition, regions in the wealthiest member states will be excluded from CAP support, but these member states will be given the option to provide like support from the national budget if they wish to do so.

Competition: state aid policies will be relaxed in so far as national funds are injected to sustain ailing industries in poorer regions, subject to environmental controls.

Environment and nature: much more emphasis will be put on a clean environment. The open space in peripheral regions is harnessed to generate renewable energy, and subsidies are available for this purpose via regional policy.

Enlargement: in this scenario, the main objective of the European Union is deepening integration. More functions and tasks are delegated to the supranational institutions, but without the fundamental reform of these institutions and of decision-making. Bulgaria and Romania will be admitted to the EU, but further enlargement will be postponed for an indefinite period.

R&D: under the burden of increased cohesion spending, the framework programmes will lose support, except insofar as R&D policy can be administered as a kind of aid in poorer regions (e.g. subsidising exchanges of personnel and information to lagging regions). The objective regarding Europe's development towards the globally leading knowledge economy is placed on the back burner. The gap between EU and US recorded in the early 2000s (see Council of the European Union 2004: p. 10) widens in the following decades.

Regional policy: undergoes a 'back to the basics' reform where the majority of structural funds are targeted towards cohesion support. Other objectives (e.g. cooperation) are secondary, and must serve the primary regional policy goal of cohesion.

Transportation: more emphasis is put on sustainable modes of transport, especially to connect peripheral regions. Additional congestion in the Pentagon is not viewed as a Community priority, but something to be tackled at the member state level.

4.2.4.6 Developments and events (story line)

The largest enlargement in European history was hailed as a great triumph. Never before have so many people come together under a single political entity in a completely peaceful way. The structure of the European Union as a voluntary network united by a body of common values and laws seems more adapted to the challenges of the next century than the seemingly antiquated sovereign nation-state (Rifkin, 2003). By working together, the European member states can achieve a level of refinement and social equity unthinkable only decades ago. One of the first things that must be done in this regard is a shift in mentality from blindly following the practices of the United States and Japan in supporting elitist R&D to embracing the welfare principle. As a first step in this regard, the European Commission develops an alternative economic indicator to rectify some of the distorting elements of GDP: the Welfare Indicator. From this point onward, rather than being an end in itself, GDP will only be part of the discussions around economic well being in European politics.

In 2005, the financial perspective for the Structural Funds period 2007-2013 was approved with minor amendments. These pertained to the newly established 'Competitiveness for growth and employment' objective and to a lesser extent 'territorial cooperation'. Since nobody knew for certain who would be the beneficiary of the new funds, there was no serious resistance against the proposals. The first objective (cohesion) remained the highest in terms of budget and profile. In addition, like in every programming period which had preceded it, the Structural Funds saw an increase in its budget. A year later, another agreement was reached over the future of CAP which postponed the reforms to a later date, the issue being regarded as far too politically risky to take at the present time. After the failed referenda over the Constitution and unsuccessful attempts by the British presidency to engender far-reaching reforms in agricultural policy there was little enthusiasm to continue in this vein. In addition, the political impact of the 2004 enlargement began to make itself felt.

The increase of the agricultural and cohesion budget was approved partly as a consequence of the large number and significant voting weight of – old and new – beneficiary countries in the Council of Ministers. Some countries, first of all those neighbouring the new member states (Italy, Austria, Greece and Germany), insisted that the increased allocations should be exclusively used for environmental improvements, transport infrastructure, risk prevention, water management and for the conservation of natural and cultural heritage. They were afraid of a situation in which cheap labour costs and EU and national support to SMEs in the new member states would result in a 'rent shifting' situation that would seriously jeopardize the competitiveness of their own enterprises. They argued furthermore, that new member states could afford low corporate taxes only because they can compensate the budgetary losses by generous Structural and Cohesion Funds allocations. They required therefore that beneficiaries of Structural Funds should raise their corporate tax rates to the EU average.

Some of these demands were accepted by the Council of Ministers. Taxation was harmonized and more attention was paid to sustainability in securing structural funding.

However, these funds were still used to promote economic development in the new member states. What finally convinced the bordering EU15 countries was the argument that, without such economic development, they would receive a large influx of immigrants from these countries when the labour market unified, and consistently thereafter due to the sustained disparities. A consensus began to emerge that Europe must achieve a certain balance in its levels of economic development, if for no other reason to preserve its rich cultural diversity. Poles should not be forced by market forces to leave Poland, but should have ample opportunities in their own country. In the implementation, this discourse was, in the context of the Structural Funds (i.e. regional policy), brought down a level of scale: all European regions should be able to offer a reasonable quality of life and employment opportunities. In 2012 the term 'Blühende Landschaften' was coined by the then EU Commissioner for Regional Policy.

The next structural funds period saw the definitive introduction of the Blühende Landschaften into EU policy. CAP became subordinate to the structural funds, which, in turn, adopted a 'back to basics' strategy: fostering (territorial) cohesion. Less developed regions especially in new member states enjoyed generous Structural and Cohesion funds support. The environmental situation improved substantially, and by 2020 the damage incurred by decades of Communist neglect were all but reversed. The Commission preferred to invest in railway network improvements for passenger transport and waterways for freight, rather than motorways. New national parks were established, the surface of protected areas increased substantially, and new cultural facilities built. Tens of thousands of government and local government officers participated in training courses aimed at increasing their skills in the management of the Structural Funds. This was badly needed since small and medium sized enterprises did not exist in the new member countries before the political and economic change. All such businesses were established in the last fifteen years, and did not have the time to accumulate resources. In order to allow them to compete on equal footing with EU15 businesses, or globally, investments and know-how would need to be shared from the rest of the EU.

The heavy burden of enlargement, in terms of Structural and Cohesion Funds supports, discouraged net payer countries from further enlargement. Bulgaria and Romania joined the European Union, but further enlargement was postponed to the indefinite future. Switzerland and Norway, unwilling to pay the high price of membership, refrained from accession. Consequently, in 2030, the EU faces more or less the same problems as in 2005. The problems and tensions could not be solved because the different and confronting interests blocked change and essential reform.

4.2.4.7 Impacts

The framework of the Blühende Landschaften strategy proved flexible and robust enough for enabling the development of the European economy without major crises and shocks, but not adequate for switching it over to a substantially higher rate of growth. One of the main reasons for the lack of dynamic **economic growth**, such as in the previous two scenarios, is the failure to harness the potentials of the knowledge economy. Inefficiencies continue to exist in this area regarding the linkage between industry and science, the underdeveloped competition between universities and a lack of peer-review procedures for funding universities (Commission of the European Communities 2004, p. 179 with reference to Gordon 2004). Deficits also continue to exist regarding sufficient solutions for securing intellectual property rights and non-bureaucratic immigration procedures for top research personnel from outside Europe. The brain-drain of young graduates towards the US, already recorded in the early 2000s, is ongoing in this scenario. As a part of the equity-oriented policies pursued by the European and national authorities, support programmes to improve the skills of the (long term) unemployed will be implemented. However, the disadvantaged regions show an overall weak economic performance, and due to the absence of strong

development cores within these areas, job opportunities remain scant. Younger, well-educated residents continue to migrate towards the agglomerated spaces outward their region, seeking employment opportunities. Elderly people often become dependent on social benefits, which in turn, limits public spending for investment purposes.

In this scenario, the Pentagon loses its competitive edge in the world economy as funds are redirected to other regions in Europe, and a net loss of efficiency is produced as subsidies are disbursed according to need rather than promise. On the other hand, the environmental quality, the protection and maintenance of cultural qualities and the standard of living improve in previously lagging areas.

With regard to **rural development**, support for agriculture will be the largest in this scenario, because contrasting interests will not enable to reform the CAP radically. Consequently, 'stabilisation and peace' in rural areas will be purchased at the expense of other regions, cities and social groups of the population.

This scenario will also have different patterns of **migration**. One of the main objectives of this scenario is to create employment and income for people in their native country and region. The large transfer of resources — through EU cohesion, structural and agricultural policies — should serve this objective. But if the structure and regulation of these funds will be inadequate for creating more jobs and income, then the huge transfer of resources will not bring the expected results. Consequently, despite the massive resource transfer, disparities in employment will not decrease substantially and the intention to migrate may still be strong in many parts of the European Union.

4.2.4.8 Territorial image 2030

Looking back from the present – 2030 – Europe has changed a lot, but its basic situation and its institutions are not very dissimilar to those existing 25 years ago. On balance, disparities among countries and within countries are expected to decrease. The decrease of disparities among countries is due to two factors: first, that in the absence of massive R&D and innovation incentives and pressures even the leading European regions will not be in a position to carry out the breakthrough in productivity and high-tech, second, that EU and national cohesion and structural policies, focusing on most peripheral and underdeveloped regions, contribute largely to this convergence process.

To assess the probable impacts on urban development, we need to look to the mechanisms of the structural funds. One of the basic objectives of cohesion policy in the next programming period (2007-2013) is to improve the accessibility of services of general economic interest for every European citizen. This is the basic idea of urban development in this scenario. Cohesion and structural funds will be used to improve the provision with basic community services in all towns and cities, independently of their size and profile. Consequently, the development of urban areas will be the most balanced in this scenario. Small towns will have the same chance to receive support for improving their infrastructure, as large ones. EU level urban policies will have the most influence on actual developments in this scenario. The reconstruction and revitalisation of the central part of cities and towns will enjoy priority. EU cohesion and structural policies will not support extensive urban sprawl. The accessibility of basic services in every area will certainly slow down the excessive population concentration in large cities. Using ESPON terminology, the favoured urban formations in this scenario are FUAs and PUSH areas, and less MEGAs and PIA areas. However, the major driving force of the urban system is, undoubtedly, the economy, business and economic growth. It is the economy which creates the basic hierarchies and networks in the urban system. In absence of dynamic growth, no high level infrastructure and service provision can serve as substitute for the lack of growth poles, 'spread' and 'pull' effects. This will translate into reduced urbanisation pressure.

4.2.4.9 Summary and conclusions

Of all the scenarios, this seems the least likely to occur, given the current disposition of member states and globalisation tendencies. It has also been stated that 'it would be a political mistake to create a new division in Europe between a West that gives and an East that receives' (Speech/05/70: 3 Feb. 2005). In the end, it could not only result in the failure of countries like Norway and Switzerland from joining the EU, but erode the support of net-payer countries. In the end, the EU could lose legitimacy, bringing with it a revival of the nation state.

4.2.5 Economy Scenario 4: National Revival

This scenario describes a situation where support for European cooperation wanes, and nation states reassert their authority. Both competitiveness and cohesion policies are reduced, as well as other sectoral policies implemented at the EU level. Competition between member states increases, and territorial disparities increase as well.

4.2.5.1 Scenario hypothesis

In the National Revival scenario the European Union takes a more modest approach to developing its territory. As such, it occupies the lower left segment of the system of axes, characterised by low equity and low efficiency ambitions at the EU level. The basic hypothesis is that member states reassert their position in matters of economic and spatial development. The official argumentation for this position is the subsidiarity principle, but there exists also an undercurrent of popular dissatisfaction with the EU which is exploited in several key member states. In National Revival, national governments do not comply with their commitments to European policy objectives and regulations. Obstacles to free movement of labour are maintained, and the period of derogations extended, whilst the regulations of EU competition policy are more frequently evaded. Over time the advantages of integration become less and less exploited and, simultaneously, the effectiveness of cohesion policy reduced.

4.2.5.2 Driving forces

The main driving forces in this scenario are a growing dissatisfaction with Europe and a populist anti-EU movement in many key countries. The common currency, the Euro, and the enlargement are blamed as contributing to sluggish growth and high prices. Some of this sentiment originated with a key decision to limit EU cohesion support (and other support as well) to the most needy; in the more affluent countries there was less enthusiasm for redistributive policies to relatively distant regions. In these nations, the presence of the EU was felt primarily in negative terms (i.e. regulations and standards), further increasing anti-EU sentiment.

Critical reports: as in the first two scenarios, new information about the failure to successfully implement the Lisbon strategy provokes a powerful political response. Unlike the other scenarios, however, this is not interpreted as signalling a need for a new direction in policy, or intensifying policy in order to meet the Lisbon objectives, but results instead in a fatalistic view that Europe is incapable of delivering results. Throwing money at problems at the EU scale is deemed counterproductive: firms are better served by more local level approaches, and particularly by lower taxes. Curtailing EU policies in favour of overall tax reductions is therefore advocated.

Governance: trade unions, farmers and other professional organisations rally against specific imports, migrant labourer, and outlets and shops of trans-national enterprises. National elites make political concessions to offer more market protection. Sometimes these decisions are intertwined with self-interest of supporting state-owned businesses. Subsequently the integrity of the single market is compromised, and economic integration is slowed and in some cases, even reversed.

4.2.5.3 Contextual elements

The political backlash against Europe was already evident in 2004-2005 during the Dutch, Luxembourg and British presidencies. Although the historic enlargement of the European Union to include former communist countries dealt the decisive final blow to the cold war, this fact was greatly overshadowed by fear of job loss and exacerbations of 'net payer'

status among many Western European nations. Guarded beginnings of a dialogue with Turkey regarding possible membership were equally greeted with consternation and disbelief amongst an increasingly Euro-sceptic public. Finally, the defeat of the Draft Constitution in referenda in France and the Netherlands made it painfully clear that Europe is not in touch with the public. As the EU seems to be losing legitimacy, member states rush in to fill the political vacuum, citing the subsidiarity principle as justification for this.

4.2.5.4 The National Revival strategy

In terms of policy direction, there is no real change from the current situation at the EU level. Consequently, EU is expected to perform the same functions and tasks as before, but only with more limited instruments, possibilities and competencies. The EU will not be in the position to exert a significant influence on developments in the member states, while — before the public — it will continue to share the responsibility for these developments.
Economic policy is faced with a dual challenge. First, the reforms suggested in the framework of the Lisbon agenda, are to a large degree decentralized to the member states. Some countries are in a position to build or maintain world-class R&D facilities, but without EU subsidies the amount of pan-European scientific exchange wanes. Most countries forge links with the United States in an ad hoc fashion. Second, EU cohesion policy is weakened as a by-product of reduced funding and a re-nationalisation of regional policies. The structural funds increasingly resemble the cohesion fund: they given only to lagging countries, rather than regions, and administered at the member state level. As a consequence of the more modest responsibility and funding at the EU level for regional policy, two different policy strategies at the national level are imaginable: a) national policy does not pursue an explicit regional policy; b) national policy to a certain extent conducts an own regional policy.

4.2.5.5 Implementation of the strategy

This section will provide a short summary of the various interventions into strategic decisions and sectoral policies that are required to realise the strategy outlined above.

Agriculture: the National Revival strategy feels that the EU has had too much influence in the agricultural sector. In this scenario CAP is reduced significantly, being retained only insofar as it is necessary to prevent gross trade imbalances from emerging. At the member state level, agricultural funding is sometimes retained under pressure of farming interests. This is most pronounced in the more affluent member states with a significant rural constituency.

Competition: the National Revival strategy advocates the abolition of state aid, liberalization of public companies and enforcement anti-monopoly regulations. The intended result is that competition would increase *between* European regions as well as globally, thus providing spin-off benefits in terms of increased GDP production. Member states are expected to follow this strategy, since it is in their long-term self-interest to do so, so few EU-level rules are implemented to enforce this behaviour.

Enlargement: there is little interest in enlarging the EU in the short term, given the reservations of member states only (Bulgaria, Romania and perhaps Croatia — even if with some delay, will join the EU). However, as the reforms of the National Revival strategy are implemented, it becomes increasingly clear that enlargement can proceed with fewer consequences for existing member states. As a consequence, after a long period of relative stability, many new members are invited to join the Union — stretching from North Africa to former Soviet Republics — since the EU nations have already abolished a great deal of the structural funds, agricultural policy and R&D funding that would go to these new members,

and enacted measures (tariff walls, limits on labour migration) to lessen any financial or economic effects.

Environment and nature: the National Revival strategy views the environment as one of the few areas where the EU remains indispensable, since the effects are felt over national borders. However, a more critical view is taken at the specific measures taken: they must all pass the test of subsidiarity, or be decentralised. Nature policy does not fare as well as environmental policy, and the implementation of this policy comes to the discretion of the member states. In some countries, Natura2000 is blamed for blocking projects vital for economic development and competitiveness, and support for these policies wanes.

R&D: widespread criticisms of Framework Programmes that require large-scale European cooperation result in initiatives to renationalise R&D, allowing researchers to intensify their work in their own language. As a result there is a reorientation of research activities along linguistic lines (Spain with Latin America, the German block in Europe, etc.) and ad hoc scientific research network development with Asia and the United States. Obviously, some member states are in a much better position to participate in these networks than others. A nationally based R&D strategy is all but unaffordable for less developed member states, while richer countries that have benefited from cuts in the EU budget can afford extra spending on universities, R&D facilities and interregional transport infrastructure.

Regional policy: the National Revival strategy regards the most effective means to promote growth and prosperity in Europe as allowing member states to compete effectively in a global economy. In order to do this, the burden of EU taxes must be reduced and the least competitive member states given a quick boost to allow them to operate at a (reasonably) equal footing. Specifically, EU regional policy is reduced and targeted to only the poorest member states. The philosophy is that after a few years, they should be able to run their own affairs. This is not to say that strong regional policy will vanish from Europe. Member states may still — at their own discretion — conduct transfers to aid lagging regions, such has been the case in countries like Italy and Germany. Generally, these policies vacillate in intensity as the national political climate shifts between liberals and socialists.

Transportation: the ambition of the EU to adopt a more strategic approach to designating new priority projects for TENs is widely criticized and abandoned. As in the 1990s, new projects are essentially those previously identified by member states and nominated for EU support. Enthusiasm for cross-border and other politically difficult projects wanes as the level of funding at the EU level is reduced.

4.2.5.6 Developments and events (storyline)

An important driving force regards the failure of the EU to institutionally deal with the 2004 enlargement. The addition of ten new member states increased the heterogeneity of the European Union substantially, making cooperation between EU member states more difficult and eroding feelings of shared commitment to objectives such as territorial cohesion. At the same time, decisions continue to be made on the basis of consensus or require a large majority, resulting in gridlock in EU decision-making on many key issues. This is seized upon by national politicians sceptical of EU involvement in what they consider their country's internal affairs.

This political shift is crucial in producing the National Revival. Already in the first half of the 2000s, the rise of national pride and populist politics was apparent in Europe, replacing virtually a decade of 'Third-Way' dominance. This shift in mentality has significant implications for the way in which the role of the EU in various member states is conceived. Increasingly, the EU is used as a scapegoat for national ills. The populist New Right is

successfully able to blame part of social-cultural tensions, resulting in part from immigration from outside of the EU, on lax border controls and ineffective asylum policies. In some countries, as minorities from one EU country move to others, these politicians increasingly advocate reinstating restrictions to movement within the EU. This is not necessarily confined to old member states; some new member states encounter for the first time an influx of immigrants from developing countries. This fuels an anti-EU sentiment, especially given the reduction in the expected structural funds and CAP aid.

Governments were willing to cooperate only if the countries concerned were sufficiently homogeneous. Soon, a club of rich and powerful countries was born within the European Union. This club intensified cooperation in various policy fields, including taxation and social policy, through 'reinforced cooperation'. This was a legitimate method of the Community, originally intended to create a 'two-speed' Europe, in which countries that lag behind would catch up with the frontrunners after some time. But new member states remained outside the core group because they were either unwilling or unable to join. Consequently, as early as 2010, 'two-speed' Europe ended up clearly in a 'two-tier' Europe where the division acquired a more permanent character.

The main feature of this scenario is that the capacity and willingness of nations to contribute to the Community budget is reduced. The centralised resources of the Union are reduced in second half of the 2010s to less than 1% of the overall GDP of the Community. Opposing interests do not enable a structural reform of EU expenditures and the reform of the decision-making system in the EU will also be delayed. Because of the criticism and refusal of certain vested interest groups and political forces, a diminishing importance and role will be assigned to EU cohesion policy and to public policies in general: little government intervention in terms of direct subsidies, but more in terms of protecting the functioning of the market. Under severely strained budgets, cohesion policies are largely ineffective. With regard to R&D, for example, those research institutes and universities which already belonged in the early 2000s to the top ranked will be able to maintain their favourable position, but – due to the lack of institutional changes – the rest show signs of mediocrity. The absence of EU-policies designated to support inter-regional cooperation in the field of R&D enforces this negative trend. This is also interpreted as the futility of conducting R&D policy at the EU level, rather than eliciting a cry to reinstate EU R&D expenditures.

Many mature European industries became protected from outside competition through trade barriers. Additionally, national elites, disregarding EU competition policies, began to apply semi-legal or illegal support instruments in respect to public procurements, exceptions and preferred treatments. This was true in particular for agriculture, but also for network industries. Trade unions and other vested interest groups in the core countries exercised serious pressure on national and European level as well, in order to minimise wage dispersion. They formed a powerful lobby group in core Europe to hold up reforms in welfare state managements. In the new member countries, first of all, entrepreneurial organisations and Farmer's Unions exercised pressure on governments.

In the 2010-2020 period EU budgets continue to be slashed, and the resulting drop in policy effectiveness is interpreted as proof that these policies are inherently flawed. The bureaucracy in Brussels was seen as unnecessarily interfering, undemocratic and non-transparent. Countries began to play down the power and importance of supranational decision-making, intensifying the National Revival strategy after 2020. As policies are repealed at the Community level, new bilateral treaties are made between European nations to fill the void. These often bind certain areas together: the Benelux intensifies cooperation, for example, more than in the past. At the same time, new members are allowed to join the Union, as membership has lost much of its former meaning. Norway joins the union, now that most of the objectionable EU legislation has been decentralized, but Switzerland remains outside more as a matter of principle. Turkey, Ukraine, Morocco and the Balkan

countries join in the course of the 2020s. This is received with apathy than antipathy by old member states, as migration within the European Union is increasingly restricted. By 2030 the European Union is primarily regarded as an internal market, having disposed of much of its agricultural subsidies and structural investment support. These are now dealt with at the national level. Increasing mobility of capital intensifies policy competition within various cooperating national blocks, even as they attempt to restrict the mobility of labour.

4.2.5.7 Impacts

The National Revival strategy is expected to have significant ramifications for not only the spatial distribution of wealth, but also **net economic development** in the EU. According to current president Barroso, the 'costs of non-Europe' have been substantiated through a large volume of academic evidence. One can argue with the figures, of course, such as the contention by the European Commission, that GDP is almost 2% higher and foreign direct investment twice as high as it would have been without the creation of the internal market.[24] Nevertheless, it is reasonable to assume that if the workings of the internal market were to be undermined, as in the latter part of this scenario, that this would have perceptible repercussions for economic growth. In addition, given the premise in all scenarios of ongoing globalisation and importance of the knowledge economy, not achieving the Lisbon goals will also have a macroeconomic price tag. Therefore, it is safe to assume that by 2030 economic growth at the macro level will have slowed as a result of the National Revival strategy.

With respect to territorial cohesion, a few remarks can be made about the spatial distribution of economic growth resulting from the National Revival strategy. First, given that regional policy is decentralised to a large degree, poor regions in poor member states will probably not get the help they need, unlike less poor regions in wealthier member states. The weakest regions in Europe will most likely be 'written off' in this scenario. There will be a widening of disparities between nations, or at the meso level. Within nations, disparities could decrease, depending on the degree to which national-level cohesion policies are implemented (less in the UK, and more in France, for example).

Changes in **rural development** will also be highly dependent on national politics. As a whole, CAP is reduced, but so too are competition policy controls on how much state aid can be disbursed to various industries, including agriculture. Vested interests of farmers and national politicians depending on rural voters will undercut efforts to reform and restructure agricultural policy in many countries. If national governments should want to maintain the level of support to agriculture, then they will be forced to contribute from their own resources. The first steps in this direction have been already taken during the last phase of enlargement, when new member countries were allowed to complement the direct EU support given to their farmers, and amounting to 25% of that of farmers in the old member states, with 30% from their own resources. The development of rural areas will be, therefore, differentiated. Rural areas under favourable natural and economic circumstances or with generous national subsidies will fare rather well, while rural areas and farms in unfavourable circumstances will remain among the lagging and problematic areas of the EU, ridden by unemployment and poverty. In absence of this support, land will be simply abandoned and exposed to different environmental hazards and to deterioration.

This scenario differs markedly from the others in terms of **migration** and demography. One of the fundamental achievements of the European integration was the free movement of labour within the Union. It became subject of some restrictions and withdrawals during the last enlargement. Old member states have applied different derogations for different periods of time in this respect, signalling the first step towards renationalisation of decisions on

[24] European Commission (2003) *The Internal Market: ten years without frontiers*, cited in Leonard (2005) p. 81.

movement of people, capital and goods. As the scenario progresses, and political tension mounts with falling economic growth, nations respond by imposing tariffs on goods and restricting movement. Meanwhile, a radical ageing will take place in most EU member countries, and labour — especially highly skilled labour — will become bottleneck of economic growth and development. If politicians will realise this situation late, and — especially — if they will act to facilitate labour movement and migration only with substantial delay, then the only possibility will be to attract migrants from outside the EU. Namely, ageing and natural decrease of population will take place in most new members even more dramatically than in the old member countries.

4.2.5.8 The territorial image 2030

After the application of the National Rival strategy, there are some points to be made about how it has affected **economic development**. It is clear that re-nationalisation and national isolationism are most harmful for small, less developed countries. Their market is small; their most important driving force is the assimilation of existing technology and organisational practices of larger countries. Consequently, economic development disparities will increase between countries in this scenario, to the disadvantage of smaller and less developed countries. Simultaneously, disparities within countries might decrease for two reasons. First, leading regions cannot fulfil the breakthrough in the absence of intensive inflow of capital, knowledge and innovation. Secondly, lagging regions and agricultural regions will be more 'protected' from European and worldwide competition through national subsidization and bailout of languid enterprises owned by the state and/or managed by the national elites. But it can also occur that even disparities within countries will increase. It might be the case, if in the course of 're-nationalisation' of structural policies the national governments spend a considerable amount of money for universities, motorways and the like which de facto strengthens the agglomerated spaces whereas the peripheral areas might further fall behind. In sum, overall economic growth is the smallest in this scenario.

In this scenario, **urban development** will not transcend national boundaries, especially in less-developed member states. Cities in border regions continue to be in peripheral and disadvantageous position, since, at present, the trade between regions within the same country is about 80 times more intense than is trade between two regions which are in two different countries, and, in this scenario, this situation will not change substantially in the future (Centraal Planbureau 2003). It would follow that capital cities of the countries would be in an exemplary position: remaining the centres of national power, wealth and control. This applies less to capital cities of smaller and less developed countries, whose functions reach only as far as national borders. They will not be in the position to assume and fulfil European, or even trans-national central functions, let alone becoming fully integrated in the network of European or World metropolises. From a European point of view, they still remain 'provincial' cities.

4.2.5.9 Summary and conclusions

By and large, the combination of weak efficiency oriented policies with a weak cohesion policy at the European level coupled with re-nationalization tendencies in terms of structural policies, have ambiguous impacts. A smaller budget for cohesion purposes at the European level will deteriorate the chances of the less developed countries (and their regions) to catch up economically. Against this background, regional disparities between the states in Europe are likely to become greater. Furthermore, the absence of a strong European structural policy which had a broad focus on R&D and training activities until 2013, will weaken not only the innovative capabilities of the disadvantaged regions but the overall innovation performance in Europe.

5. Thematic scenario 'Governance'

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5.1 Scenario baseline

5.1.1 Present situation and trends

The issues of territorial governance have become a real concern at different levels of government, the EU and the Nation-State not being the least, and have been driven by some key-notions that have found a strong echo in the world of policy-making: subsidiarity, territorial cohesion, effectiveness, transparency… The latest 25 years have therefore witnessed some important changes that are related to the modernisation of the mechanics of governance inside the EU and its member-states.

The European Union in itself is a governance project between countries. In order to have a better insight on the issues of governance inside the EU, it is worth, as a first step, analysing the theoretical framework of EU type of governance. During the 60s and 70s, two main theories were intending to explain the style of policy-making at the EU level. First of all, *neofunctionalism* was based on the belief that even if states were the prime instigators of the EU integration process, other levels, whether sub- or supra-national, will take the process further by ways of 'political spillovers' (Bache, 1998). The competing theory, *Intergovernmentalism*, is focusing on the central role of the state as a point of entry for supra and sub-national authorities, and can be seen as the 'ultimate arbiters of key decisions' (Bache, 1998). The national governments would then serve as guarantors of important domestic policies (Bache, 1998). Those traditional theories have paved the way for more renewed views on the EU style of policy-making, more adapted to the contemporary shape of the EU. *Multi-level governance* and *Liberal Intergovermentalism* can therefore be described as follow-up of the more traditional theories, respectively Neofunctionalism and Intergovernmentalism.

Before attempting to describe the current situation as regards the theme of territorial governance, it is worth highlighting the important notions that will lead us in our reflection throughout this paper. The first one is the concept of multi-level governance which aims at involving the stakeholders inside each level of authorities (Marks cited in *Böhme et al.*, 2004) on a more equal basis, contrarily to a more hierarchical system. The second notion that will be widely used in this paper is the multi-sectoral approach to policy-making, coordinating sectoral policies in order to optimise their spatial impacts. Finally, a territorial approach to policy-making, where the territory is at the heart of the policies, by integrating both notions of multi-level governance and multi-sectoral approach in order to achieve a strategic vision and integrated policy-making for this territory, has been lately discussed at the highest level of the EU (Informal ministerial meeting, 2004).

As regards the multi-level approach to governance, it is seen as a way to redistribute the responsibilities between the different levels of government, from the EU to the municipalities, following the concept of subsidiarity, by trying to define the most appropriate level of action for a particular issue. But this later concept can be also understood as a way to improve the horizontal type of coordination, that is to say between organizations at the same level, one of the most obvious example being the European Union, fostering

cooperation and policy coordination between its member-states. In most of the EU countries, the national level has been the most important level of authority, which is due to the tight link between the building of democracy and the concept of Nation-State (Loughlin, 2001). Inside each country, the repartition of the responsibilities for policy-making depends on the structure of the state itself (federal, regionalized, decentralised, centralised). In this pattern, the region is often perceived as the 'weak' point (Jönsson *et al.*, 2000) and it is then not surprising that most of the radical changes that occurred in the latest 25 years concerned this particular level. Indeed, the process of political regionalisation that is underway in many European countries has enabled to put the region in a more central position in the political and institutional system. This process can be described as heterogeneous and asymmetric even inside the different member-states, as sometimes regions have different degrees of autonomy and related competences, like in Italy or Spain. This process is also in accordance with the vision of a 'Europe of the Regions', putting the emphasis on the Europeanization of the sub-national levels. Moreover, the way regions operate is different from the one of Nation-State, and can therefore be perceived as a 'principle of organisation in civil society' (Keating in Le Gales, 1998), differing in the sense that they often offer other approaches to management, such as partnerships. At the local administrative level, the delegation of powers from the state, associated with a stronger involvement of market forces (especially via taxes), has enabled the authorities, in some countries, to be more involved in the conception and implementation of its policies (Nicholls, 2005).

But the process of regionalisation goes beyond the bare political process of decentralisation or regionalisation. Indeed, it also refers to the increasing cooperation between the regions, often on a trans-national basis. This horizontal type of coordination is targeting a better economic integration of the territories, which could be linked to the 'functional synergies' addressed in the ESDP (Jönsson *et al.*, 2000). This first type of cross-border cooperation was the creation of the Euregio, a Dutch-German initiative, and now the number of trans-border cooperation has increased dramatically in the latest 25 years, counting with more than 70 Euro-Regions (Perkmann, 2003). This type of initiatives has enabled a better functional integration of the regions and helped the sub-national authorities to foster a more pro-active approach for the development of the territory. Such incentives for cooperation beyond the bare administrative limits exist also at the local level. Indeed, some countries have enabled such inter-municipal co-operations. Such partnerships enable the municipalities to express a common vision for their territory. Those territories are often culturally, economically and functionally connected, and thus forming a coherent territory for efficient policy-making. However, the extent of cooperation is often limited to a restricted number of policy sectors, such as environment or transport.

In the 29 countries under scrutiny in this paper, there are large differences as regards the use of sectoral or territorial approach to policy-making. The sectoral approach is commonly used at the EU and national levels. This approach was historically implemented in order to 'tackle a specific sectoral issue' (Discussion paper, 2004). The recognition of territorial specificities throughout Europe has put the emphasis on the need for a more tailor-made approach. As regards this theme, the ESPON 2.3.2 project gives us an interesting analysis of the main component of the couple sectoral/territorial aspects of governance: degree and forms of coordination of sectoral policies, use of policy packages, use of territorial plans…

The ESPON 2.3.2 concludes that several EU countries have sectoral policies or currently elaborate such policies. However, there are relatively few examples of mechanisms or processes to integrate sectoral policies and examine the spatial implications, whether at the conception or implementation phases. The problem of non-coordination of sectoral policies has been emphasised in some recent studies (Robert, 2001), as different sectoral policies can have contrary spatial impacts. The use of policy packages as a mechanism of integration of sectoral policies is one of the solutions found in some EU countries in order to

minimize those contrary effects (ESPON 2.3.2). Cooperation between agencies, departments and authorities also plays a considerable role in the setting up of an environment favouring sectoral coordination. It seems that most of the former EU15 countries have developed mechanisms for inter-sectoral coordination (ESPON 2.3.2).

Finally, the need for more tailor-made solutions, especially as regards spatial planning policies, can be perceived via the use of territorial plans in the different countries studied. Those plans, whether they are legally binding or not, enable to create a strategic vision for the development of the territory. The ESPON 2.3.2 project has given an overview of the range of such plans at different scale of territories, from national to municipal. Those plans can be perceived as the framework enabling to coordinate actors and policies for the purpose of territorial development.

5.1.2 Existing relevant EU policies

The way EU policies are conceived and implemented has been thoroughly debated in the latest years, one of the most interesting outcomes being the 'White paper on European Governance'. As regards EU policies and the issues of territorial governance, the discussion can be divided in two main parts: first of all, an overview of the nature of the EU policies themselves is needed; then a closer look at the EU Regional Policy will give us a better hint on the role of the policy in the context of regional and local development.

EU policies can have various impacts in the different member states. This feature is mainly due to the various national patterns of policy-making, which have different traditions in involving State/Public actors and Societal actors in the process (Schmidt, 2005). Four such categories can be identified: *corporatist* (Germany), *clientelist* (Italy), *statist* (UK, France) and *pluralist* (Schmidt, 2005). The EU style of policy-making, often described as pluralist, can thus lead to either disruption or continuity with the national style of policy-making (Schmidt, 2005). Moreover, the willingness (or reluctance) of the countries to adapt to EU policy-making is also a important variable. However, the impacts that EU policies can have on the national systems is also very dependent on the policy sector itself, as some of them have traditionally different ways of including the public and societal actors in the policy process.

In the EU policy-making context, there is no policy that is directly dealing with the issues of territorial governance. In fact, it is the whole nature of the EU policies that can give us a better idea on the manner the different issues are dealt with, at which level of authority, between which actors, at which scale… EU policies have been designed from the beginning as sectoral policies, reflecting much the national way of policy-making. The array of policy sectors is broad, the Common Agriculture Policy and the Transport Policy belonging to the most emblematic ones. The purpose was to draw a strategic plan over the European territory in order to improve the situation on the selected issue. This sectoral policy-making has had some good results, but the debate is currently growing on the need of better integration and coordination of sectoral policies between them, using a multi-sectoral approach. This issue is particularly highlighted when dealing with the environment, which needs to be closely coordinated with transport and energy policies in order to be more efficient and prevent opposite impacts to occur. Studies on the cost of non-coordination raised the attention on this need for a renewed approach (Robert, 2001). During the informal meeting in November 2004, it was agreed by the Member-States to put the emphasis on a multi-sectoral approach to policy-making, taking into account the diversity of resources and the particular needs of each territory (Discussion paper, 2004).

Although most of the EU sectoral policies have territorial impacts, only the Regional Policy can be considered as a territorial policy (Robert, 2001). The policy was first designed in order to reduce the disparities between the different regions in the EU. The main purpose is

to develop the tangible (physical infrastructure, urban regeneration…) and intangible (business development, human resources…) structures of the territories by taking into account their geographical and socio-economic pre-conditions and specificities. This policy has fostered projects aiming at a better cohesion of the European territory by targeting the territories and their specific needs, one of the main levers being the Structural and Cohesion Funds. The ESPON 2.2.1 project has shown that those funds have had contrasted results, as their effects are often difficult to distinguish from other policies'. One of the main concerns is the lack of coordination between the EU and the national regional policies, which can have different priorities and thus mixed effects. However, it has been shown that the EU Regional Policy has had a strong impact in improving the governance system in the targeted regions, by fostering innovative and tailor-made types of governance (Bache, 1998). Indeed, the introduction of partnership as a main principle is often considered as one of the main improvements realised by the EU regional policy (Bache, 1998). Partnership is intending to improve the participation of the stakeholders in the policy-making process. Public-Private Partnerships are for instance increasingly used at the regional or local level in order to build the widest coalition of interests possible (public authorities, private actors, NGOs), the aim being that the broader the coalition the better the 'common interest' is defined. In fact, the intention is to have a more decentralised and collective approach to regional policy (Bachtler and Turok, 1997), by shifting from the more directive and hierarchical approach by the national governments. The EU Regional Policy has had strong impact on the modernisation of the institutional structures in some countries (Ireland for example), by creating a regional layer of authority that did not existed before. Although its direct impacts are difficult to assess (Bachtler and Turok, 1997; ESPON 232), it has had some effects on the governance systems at the sub-national levels by developing horizontal (between regions or municipalities, and involving other actors and stakeholders) and vertical (with higher and lower layers of authority) coordination when dealing with policy-making and implementation.

The Open Method of Coordination (OMC) has been developed as a new tool improving the policy-making process in some selected sectoral policies, such as, for instance, European Employment Strategy, social inclusion or education (Zeitlin, 2002). However, the OMC is not an already-made package, but it should be seen as a framework for co-operation, and is thus taking different forms in the different policy sectors (Radaelli, 2003). The OMC is based around the exchange of 'best practice' as well as mutual feedbacks, trans-national comparison and policy adjustment of the policies of the different member states (Zeitlin, 2002). Participation of the widest possible actors is a fundamental feature in the process of the OMC (Radaelli, 2003). However, the evaluation of the OMC as a policy-making process has raised some important bias. First of all, if actors from different levels were often involved, they were seldom reaching out to others than the traditional types of actors (Unions…) (Zeitlin, 2002). Then, the involvement of regional or local actors was somehow limited (Radaelli, 2003) and came at a later stage in the process, mostly the implementation one, and they were therefore seldom involved in the conception or monitoring phases (Zeitlin, 2002), mainly centralised at the national level.

To conclude, the challenges for the EU policies can be considered as twofold. First of all, the cohesion of sectoral policies should be emphasised in order to optimize the EU financial resources and to minimize the possible opposite impacts. On the other hand, the EU Regional Policy enables to give a more territorial dimension to the EU policies, that is to say targeted to the specific local needs, and to deal with the regional governance issues.

5.1.3 Most important driving forces

The review of the past and current trends concerning territorial governance has led us to identify its most important driving forces.

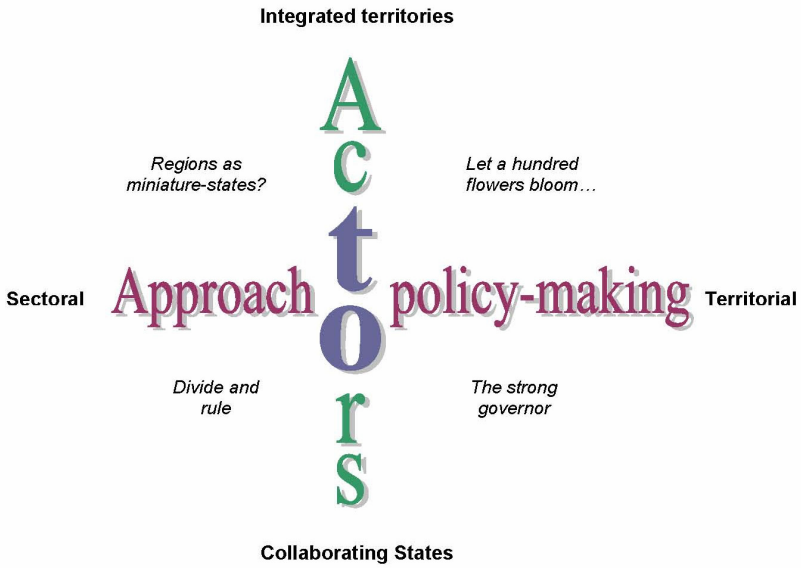
- ✓ New roles for supra- and sub-national levels in the policy-making process
- ✓ Partnership as a 'new deal' in governance, involving public, private and NGOs stakeholders
- ✓ New tools for governance (OMC) intending to make the coordination of sectoral policies between the member states more efficient
- ✓ Need for policy-making based on territories instead of sectors in order to optimize the territorial impacts of the policies
- ✓ Importance of the EU Regional Policy in developing new tools for governance for the regional and local levels
- ✓ Political and functional spillover effects, especially to regional level

It is therefore possible to regroup those different driving forces in two main categories.

First of all, territorial governance is dependent on the **actors** that are involved, and especially the way they collaborate. With actors, it is intended the array and degree of involvement of the actors, as well as their possibilities to influence (to a more or lesser degree) the policy-making process.

Second, the issues of territorial governance are also largely influenced by the **policy approach** itself. As identified in the previous part, this focus is mainly twofold: sectoral or territorial.

5.1.4 Identification of the scenarios hypotheses



The synthesis of the analysis on the main driving forces in the field of governance inside the EU has lead to their grouping into two categories: the actors involved in the policy-making process, including their ability to influence the process, and the approach to policy-making chosen. Those two categories are therefore defining the two main axes upon which our scenarios will be built. As shown in the diagram here above, the two possible directions for the development of each axis define a quadrant with four possible scenarios.

Actors axis:

- ✓ *Integrated territories*: the actors involved in the decision-making process are spread over different levels (supra-national, national, Subnational). Even if not evenly shared, each actor has a real ability to influence the decision-making process, whether at the conception or the implementation phase.
- ✓ *Collaborating States*: the main actors of the decision-making process are situated at the national level (national governments, agencies). The State is mobilizing the other actors in the decision-making process, but with little degree of influence on it. Subnational levels are mainly involved at the implementation stage.

Approach to policy-making axis:

- ✓ *Sectoral*: the use of sectoral policies is still widely used in the policy-making process in order to 'tackle' some specific issues of high European interests.
- ✓ *Territorial*: the territories are the focus of the policy-making process. The main goal is to optimize the effects of the policy sectors on each territory by using a tailor-made approach.

In order to propose two distinct pictures of territorial governance in Europe, two scenarios will be further developed: *Let a hundred flowers bloom…* (*Integrated territories* + *Territorial approach*) and *Divide and Rule* (*Collaborating States* + *Sectoral approach*).

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5.2 Thematic prospective scenarios

5.2.1 Scenario 1: Let a hundred flowers bloom…

5.2.1.1 Scenario hypothesis

The first hypothesis in this scenario relates to the Actors' category. The notion of multi-level governance, which was backed by the member states, emphasises the EU as integrated and collaborating territories. Actors at different levels (supranational, national, subnational) as well as from different 'niches' (public, private, NGOs) are participating actively to the policy-making process. Moreover, the shift in focus from sectoral to territorial policy-making is acknowledging that the great diversity of territorial preconditions and potentials inside the union implies specific and more tailor-made approaches.

5.2.1.2 Scenario process

After 2005, the need for new ways of dealing with policies was getting stronger in the EU. On the actors' side, and in line with the recommendations made in the *White paper on governance*, there has been a widening of the array of authority levels represented in the policy-making process, reaching out to supranational and subnational (regions, municipalities) actors. This move towards multi-level governance gave a new impulse to the legitimacy of the decision-making process, which was felt as too technocratic. The responsibility and accountability within the process was shared across the different levels involved, even if not always equally. In fact, the stronger involvement of the supra and subnational levels was the result of both a conscious and unconscious choice of the member states. On the one hand, the states clearly realised that, in order to implement the huge challenge that the Gothenburg and Lisbon strategies represent, they would need the strongest coalition of actors possible, and also by this way, limiting their direct responsibility in case of failure. But on the other hand, it was also the result from a 'snowball effect', the integration of supra- and subnational actors at some specific moment of the policy-making process, mainly the implementation phase, led to an even greater integration, and by this way benefiting from their deep knowledge of local issues. The involvement of other actors was thus enlarged to the conception and monitoring phases, and not anymore restricted to the implementation one. The role of the state was shifting to the one of a guarantor of the institutional framework within which collaboration takes place.

The multi-level governance approach, first initiated in some parts of the EU around 2000, thus became a guiding principle for policy-making though the 'sectoralisation' of policy remained. The different territorial entities (local, regional, national and EU) agreed initially to coordinate their actions and policies on a selected panel of sectoral policies, subsequently extending it across all sectoral policies. The clearer definition of each level's responsibilities engendered by these new arrangements provided a major fillip to the process more generally having results far beyond original expectations.

The implementation of multi-level governance was especially successful in the Central and Eastern European Countries (CEEC). There, the young institutional framework was more flexible to the use of new innovative tools for governance than in the former EU15 countries. Moreover, the remembrance of the former authoritarian communist regimes

pushed towards a weaker central government and a greater involvement of the other subnational authorities. Finally, CEEC were keener to cooperate with EU institutions in order to quickly catch up with the older member states.

The involvement of subnational actors, as described here above, has enhanced the trend towards a greater delegation of powers to the constitutional regions, and local authorities, as started in some countries in the 1980s. The two main characteristics of this decentralisation occurred in two successive phases. First of all, there was a widening of the institutional leverages delegated to the regions, shaping a renewed institutional framework. Second, the decentralisation of the financial management systems by 2015 gave the regions the means to be fully operational partners. Moreover, this two-step process fostered the development of an innovative regional style of governance. The partnership method, introduced within the framework of the EU Regional Policy during the 1990s, was commonly used as a governance tool by the regions by 2015. As stated before, the lack of financial means in the beginning of the decentralisation process pushed the constitutional regions to involve other regional actors, and thus pooling their resources. The most widespread type of partnership was the Public-Private Partnership (PPP). By involving private actors as well as other relevant stakeholders (NGOs, associations…), the public authorities had the ability to better define their actions and to inject innovative solutions for better policy-making. Moreover, they could rely on the financial and human resources of the private sector as complementary to theirs. Horizontal co-operation (Region-Region, Municipality-Municipality) inside the member states improved the coherence and efficiency of the policies with strong territorial impacts.

Thanks to the use of Public-Private Partnership, the provision of public services was substantially improved and was both more efficient and more financially sustainable. However, this renewed flexibility in public services was realised at the expense of equality. Indeed, the most remote and sparsely populated areas were barely reached out. Overall, the greater involvement of private actors in the policy-making process provided with greater flexibility and diversity in the offer of basic services to persons.

The greater integration of the European territories was also largely due to the intensification of cross-border relations between subnational levels. The stronger political role played by the Regions, as well as the territorial approach to policy-making, fostered trans-national regional co-operation throughout Europe. Having both the ability to draw up comprehensive regional plans and the means to implement them gave the subnational levels (Regions, local authorities) the opportunity to collaborate with other subnational levels, both within and across national borders. Indeed, in some areas, it quickly became obvious that the territorial approach would not be optimal unless it was drawn up on a cross-border basis. The success of co-operation programmes such as Interreg was praised and paved the way for deeper policy co-operation between territories, mainly through increased EU Fundings after 2010, and became a strong driving force towards integrated territories in Europe. Significant results were thus made in terms of cross-border co-operation, especially by the shaping of functional cross-border regions, with common labour markets and provision of public services). The area lying at the border of the former EU15 and CEEC became highly dynamic in the field of cross-border co-operation. The intensification of exchanges fostered the development of large functionally integrated cross-border areas, backed by adjusted labour market policies in those territories.

In the continuation of the work that came after the publication of the White Paper on European Governance, the debate on the territorial approach to policy-making increased in both volume and importance, involving the different layers of government in Europe: i.e. not only the EU and the member-states, but also the regions and municipalities were becoming increasingly interested in the policy-making process, essentially based on the specificity of each territory. The process of actually implementing a territorial system of governance was of course to take a considerable amount of time however, as the different actors did not always agree on how to actually implement this strategy on the ground, but it

became widely spread over the EU territory after 2015.

The use of the Open Method of Coordination (OMC) to territorial development issues, instead of the bare sectoral ones, was one of the responses suggested and enabled a renewed sharing of 'best practice'. This led to some adjustments in policies on a cross-border basis, in order to foster the functional integration of the territories, instead of adjusting the whole national systems, which would have taken much more time due to higher degree of bureaucratic inertia. This strategy was particularly successful as regards labour markets policies, combining mainly employment and education policies. The 'tailor-made' adjustments were designed to improve the cross-border spillovers. The use of OMC was therefore an important pillar in the design of tailor-made territorial policies. It was one of the first steps from a sectoral to a territorial approach to policy-making.

In the field of policies, this transition from sectoral to territorial approach led, by 2015, to the development of intermediary policy packages. It was evident to all that an integrated strategy was needed. Thus, the first step here was confirmed and implemented in the framework not of sectoral policies but of thematic strategies. For instance, the transport, energy, agriculture and environment sectors were grouped into a wider 'ecology' theme; Public health, education and training, civil protection and social affairs were grouped under a 'society' theme; Information society, industry, commerce and competition were grouped under an 'economy' theme. The sectoral regrouping process was difficult, and often subject to controversy, but ultimately it was seen as a further important step towards achieving a workable form of territorial governance.

By 2030, the strategy of multi-level governance associated with a territorial approach to policy-making was felt to be successful in enabling a more sustainable path for the development of the various 'territorial capital' that existed throughout Europe. Moreover, cross-border co-operation, which was essentially a top-down process just after 2005, became a natural way for territories to approach the complexity of policy-making and became a widespread tool for territorial management at the subnational levels, achieved on a federative basis.

5.2.1.3 Territorial impacts of the scenario

At the *macro* level, functional integration of cross-border regions has enabled polycentric development, as displayed by the rising number of Mega-Regions and Global Economic Integration Zones increased, moderately in the Pentagon, but significantly in the more peripheral areas of the European territory. The Mega-Regions are composed of a network of regional capitals. Europe has thus become more polycentric in its structure and more balanced as regards economic development. The networks of infrastructure between the Mega-Regions have been considerably improved, boosting the accessibility of regional capitals from a wider European perspective. The overall competitiveness of the EU has increased, as the regions are more able to exploit their comparative advantage and to adapt to new economic challenges. Competition between Mega-Regions and Global Economic Integration Zones is greater. However, the differences in terms of GDP per capita between the leading regions and the lagging ones is greater, which threatens the territorial cohesion of the European territory.

At the *meso* level, trans-national co-operation between regions has also been fostered. In those co-operation areas, the Regions have developed a joint territorial approach to the development of the area. This was made possible by the emphasis on new tools for territorial governance in most of the member-states. New infrastructure networks have been built inside these areas, making the regional capital cities less reliant on their national capitals for access to other markets. This phenomenon can be particularly witnessed when

looking at the extent of the development of Polycentric Integrated Areas (PIA). The development of strong physical networks does however raise questions over their impact on the environment, as well as over their potential side effects on the preservation of the natural and cultural landscape.

At the *micro* level, the settlement pattern initially concentrated around the most important of medium-sized towns. The main effect was thus urban sprawl around these cities and the extension the commuting distances. The regions can thus be seen to be developing in a monocentric fashion, with a strong regional capital, while rural areas are thus becoming increasingly seen as basically recreational, given the increasing need for leisure activities in the main regional cities. In the territorial governance approach developed by most Regions, the rural areas develop their comparative advantage by specialising in agriculture, tourism and leisure activities.

In this scenario the most favoured regions are:

- ✓ Near-border and nationally peripheral regions as they are thoroughly exploiting the advantages of Cross-border co-operation
- ✓ Regions that have been devolved key competences, such as spatial planning and regional development, enabling them to create complete and integrated regional plans
- ✓ Regional capitals as the newly devolved political responsibilities have increased their importance on the national scale, as well as their legitimacy on their regional hinterland.

5.2.1.4 Final image of the territory

In this scenario, the final image of the European territory could be seen as reflecting the idea of 'the bunch of grapes.' The emphasis on territorial governance, coupled with a stronger political role for the regions, fostered a Europe made up of 'islands' of co-operation, i.e. the Mega-Regions, shaping a more balanced overall European territory. Another interesting feature in this final image of the European territory is the growing disparities because strong and weak regions. Indeed, strong regions have a greater capability for co-operation, especially between themselves, but also with their directly neighbouring regions, and thus create more synergies by being part of wider transnational cooperation networks, while weaker regions are partly left out of those networks.

5.2.2 Scenario 2: Divide and Rule

5.2.2.1 Scenario hypothesis

In this scenario, the actors' side is mainly dominated by the national level of authority, both governments and agencies. Instead of delegating powers to the subnational actors, as in scenario 1, the states are mobilizing them in the later stages of the policy-making process, restricting their ability to influence the formation of policies, and binding them to a barely advisory role. The focus on sectoral policies as a main leverage for implementing policies is also reinforced. The context of strong international competition forces the member states to take drastic measures in order to tackle some specific issues (improvement of transport networks, energy crisis…).

5.2.2.2 Scenario process

After 2005, the member states decided that if the Lisbon (competitiveness) and Gothenburg (sustainable development) strategies were to me met, they would have to act as strong and efficient leaders for their respective countries. The style of governance for the EU was then moving towards a forum of collaborating countries than a deeply policy integrated territories. The member states as thus reinforcing their position as the central actor in the policy-making process, dedicated to the development of the domestic agenda. The mobilisation of subnational actors in the policy-making process has improved, but their ability to influence it is limited, and their role restricted to the one of advisors.

The fear of a spreading of powers between a multitude of actors, which would have resulted in a worsening of the public policies' efficiency, was one of the defining driving force for the re-centralisation to the national level, whether governments or sectoral agencies. Moreover, too many actors would have confused the citizens on who is responsible for what, reducing the democratic accountability of the policy-making process. The retention of financial means at the national level emphasized this limited role. However, the member states advocates the need for stronger co-operation with the other domestic public authorities (Constitutional regions, municipalities), but in a contractual form, following the pattern of the French '*Contrat Etat-Region*', less flexible than other forms of management, like partnership for instance.

In order to deflect the lack of the financial means, the local authorities focussed on attracting businesses on their territory to increase their fiscal revenues. The fierce competition led to enhanced larger economic disparities at the local level between 'winners' and losers', due to the high pace of business relocation. The most attractive municipalities were those situated along the major road networks, by this way having a better accessibility to regional and national markets. The main consequences are, on the 'winners' side, a higher pressure on the real estate and land-use regulations (often softened in order to attract firms more easily), and, on the 'losers' side, a higher number of disused industrial areas to be decommissioned as well as a rise in local unemployment rate. The rigidity of the national Employment and Education policies, and despite the use of the OMC for these policies, prevented from having a tailor-made response to those local problems. Disparities at the local level were therefore higher after 2015 than they were in 2005.

For some of the societal actors, such as banking interests or major sectoral trade unions, the refocus on the national level was seen as a positive development and an opportunity to

regain importance on the domestic agenda. Indeed, they felt that the state was the only actor that had the real potential to influence the policy-making process on an international scale and to lobby for the domestic interests. Consequently, by 2015, many of those societal actors had closed their offices in Brussels.

After the overall shrinking of the EU budget in 2005, the impacts of EU policies were substantially reduced throughout the European territory. The most affected policy was the Regional Policy, the only policy that was fostering approach to policy-making. The increase in the number of recipient regions after the 2004 enlargement, widely spreading out the funds in far too many regions, was also perceived as a limiting factor for the efficiency of the policy. The further enlargements after 2015 emphasized this trend. Trans-national programmes, such as Interreg, despite some positive outcomes, have not been reconducted after 2013, which limited the exchange of 'best practice' on a cross-border basis.

The emphasis on sectoral policies was sustained. The use of the Open Method of Coordination was only developed on selected sectors with no strategic domestic specificity for the member states. Moreover, the OMC is barely reaching out to public actors at the subnational levels, serving more as a way for the national authorities of controlling the extent and pace of the policy adjustments. The growing emphasis on sectoral policies increased the negative spatial side effects, as the lack of coordination prevented from synergizing the spatial impacts of the various sectoral policies. For instance, if the strong focus on the development of new road infrastructure has enabled to make peripheral areas more accessible, it has been at the expense of some local communities, and with, often non-reversible, environmental impacts.

5.2.2.3 Territorial impacts of the scenario

At the *macro* level, the emphasis on the role of the national governments as lead actors in the policy-making process has fostered the expansion of the national capital cities, which continued to act as the main gateways for the rest of the country. The economic position of the capital cities of the peripheral countries of Europe however has also been strengthened, but overall these areas continue to be faced with serious accessibility problems. The most remote areas are still poorly connected to the wider European networks while their economic development remains effectively decoupled from that of the capital cities. The strong focus on the transport policy as the most important sectoral policy has also improved the position of the capital cities in the CEE Countries, as the road network was mainly expanded eastward..

At the *meso* level, the capital regions remain at the core of the economic system as well as of the infrastructure networks. The transport network is star-shaped and centred on the capital region. The other larger national cities have good connections to the capital, but poor connections with each other. The urban system within countries is typically hierarchical. The regions along the national corridors are favoured. Regional divides are also getting wider at the *meso* level. The rigidity of national polices prevents the development of economically strong Mega-Regions in cross-border regions outside the Pentagon.

At the *micro* level, the strong competition between small and medium-sized cities to attract businesses prevented the creation of fully operative city-networks. Moreover, it seems that the development of the main cities has to some extent been decoupled from the development of their hinterlands, which results in a strong urban-rural divide at the micro scale.

In this scenario, the most favoured regions are:

- ✓ Capital cities as the State is still the cornerstone of the policy-making system
- ✓ Cities and regions along the main European and national axes of transport, as the focus on sectoral approach has given new emphasis to the development of transport corridors.
- ✓ Municipalities in countries with a strong municipal level, enabling them to compete

As such, this scenario is reinforcing the predominant position of the national capitals of the Pentagone, because it is strengthening their central position.

5.2.2.4 Final image of the territory

The European territory is poorly integrated. Strong connections and exchanges exist between the capital cities, particularly in the European Pentagon, while at the local level co-operation between small and medium sized municipalities has had some success in tackling difficult sectoral issues. Nevertheless, in terms of these networks, an obvious lack of integration to the closest regional FUAs remains an issue to be tackled. Moreover, disparities between the development of the capital cities and the more peripheral areas are increasing, while the emphasis remains on significant infrastructural investment, threatening the environmental equilibrium of the regions crossed by the transport corridors. Finally, a major concern in this final image is the inconsistencies and discrepancies that are resulting from the lack of coordination of the different sectoral policies, as for instance, the lack of synergies, the sub-optimal allocation of resources as well as the negative impacts caused by the counteracting public sectoral policies. This general lack of coordination greatly contributes to a weakened territorial cohesion of Europe.

6. Thematic scenario 'Enlargement'

Christopher J. Smith and Minas Angelidis

Key words: 'deepening vs. widening' debate, enlargement, integration, globalisation, economic impacts, peace and stability.

'Whatever its structural and policy consequences, enlargement constitutes the single greatest contribution the EU can make to European, even global stability. As I have said, I see the projection of stability as the EU's central objective of Common Foreign and Security Policy (CFSP). The enlargement of the EU itself is the greatest example of that policy' (EU Commissioner Chris Patten, *Financial Times,* 2003).

6.1 Scenario Baseline

6.1.1 Current situation and trends

Enlargement is a central part of the integration process. The basic arguments for further enlargement each implicitly have at their core an integrative mechanism. The core economic argument relates to the expansion of the single market to include new states, and through both the abolition of tariffs (trade induced impact) and what Pelkmans (2002) terms 'regime change' including politico-administrative change and market liberalisation, the economy of the whole enlarged EU benefits. Similarly, the core political argument for enlargement relates to the need to spread peace and political (and thus by implication economic) stability across the continent of Europe in the hope of avoiding the spread of political instability and conflict. The problem is that the benefits of enlargement are not evenly spread in spatial terms, nor do they necessarily outweigh the immediate (perceived at least) costs to any single individual. As such then, enlargement is a fundamentally *political* issue, where perception often trumps rationality.

Though these ideas have been implicit from the outset they have been impacted over time by the prevailing nature of the global system. During the Cold War, European Integration was necessarily constrained to the 'small Europe' model, but with the end of communism in Eastern Europe and the advent of globalisation, the possibilities for, and problems constraining further integration changed dramatically.

Two basic views on European Integration and in particular the drive for *political union* have existed side by side since its inception (for simplicity's sake they are usually reduced to the labels, *federalist* and *intergovernmentalist,* and represent the original six member 'core' of Europe on the one hand and the British and the Scandinavians on the other*),* though this is of course to massively oversimplify the issue. In the initial ideological struggle in the 1950s the 'federalist' core group triumphed, though by the 1980s, with British entry confirmed and after a decade of European economic stagnation, the alternative 'intergovernmental' view began to gain in importance.

The global changes of the 1990s however fundamentally challenged each approach (see ESPON 3.4.1). Although the Cold War's end made the prospect of a Europe 'whole and free' more plausible (i.e. the extension of the single market and the zone of stability across the whole of continental Europe), it also (by removing the 'existential' threat of nuclear war, which had necessitated US political and military dominance in the US-European strategic

partnership) removed the geo-political barriers to 'ever closer union.' At the same time however the impact of increasing globalisation further impacted on the possible roots to implementation for each scheme.

Between 1973 and 1995, enlargement was basically an uncontested issue. As such, bouts of integration and enlargement went 'hand in hand' as for instance Mediterranean accession was coupled with the Single European Act and the Internal Market, while 'EFTA' entry was coupled with the Maastricht process and the 2004 enlargement with the Amsterdam and Nice Treaties leading up to the European Constitution 'process'. On each occasion, the Commission in particular sought to ensure that a balance was maintained between 'deepening and widening', this issue however became increasingly acute as the Union expanded in size over time but essentially retained a politico-administrative structure designed for *six* not *twenty five plus* members.

The current difficulties of the Union, highlighted in particular by the French and Dutch 'no' votes over the EU constitution (where a negative reaction to globalisation and opposition to further enlargement were paramount), thus draws together a number of long term themes that have now coalesced into the basis for a new 'grand debate' on the future of Europe. These themes can be identified as follows:

- The need to deal with the problem of creating an institutional solution that works in an environment of 25+ members
- The need to agree on a shared goal for what kind of Europe the Member States now want
- The need to implement the 'Lisbon Agenda' goals within the context of ongoing globalisation and a wider strategy encouraging European economic growth
- The need to ensure greater cohesion across the European territory and to ensure also that Europe's new 'neighbours' are not left behind thus increasing political tensions through failing to deal with the widening of economic disparity levels between 'insiders' and 'outsiders'
- The need to deal with the Union's chronic financing issue within the context of a new budgetary deal for the next financial perspective

As noted above, while after UK entry in 1973, enlargement was traditionally 'uncontested' it is now again at the centre of this emerging debate over the future content and direction of the Union as a whole, as the issue has been enveloped by broader questions and 'politicised' as a socio-cultural 'issue' in some Member States (in particular over the issue of Turkish accession).

Concentrating specifically on enlargement, the middle course in this 'deepening versus widening' debate – usually represented by the Commission, but also by most Member States – was perhaps best represented by former Commission President Romano Prodi (2004), who stressed the need '*not* to choose but to convince', while the extremes have been represented (for the purposes of this paper) by drawing out this 'deepening and widening' dichotomy, and thus posing possible futures based on a concentration on one at the expense of the other. This is not to say that either of the extremes is particularly likely to occur, but if this approach were not used, any alternative scenario would simply be a minor adjustment from the trend, and thus would lack pedagogic value as the 'drivers' of integration are not 'mechanical' and are thus heavily mediated by ongoing political events at the global, EU and national levels.

6.1.2 Existing relevant EU policies

As a process, enlargement has changed quite substantially in recent years both in terms of the size of the *acquis* to be adopted and in respect of the way in which the whole process develops. As such, the 2004 enlargement marked a significant departure from previous experience in this regard, with accession – within the wider context of 'conditionality' (i.e. the so called 'Copenhagen Criteria') – now representing a new Member States' basic *achievement* of the entry conditions rather than its mere acceptance of such conditions *to be met in the future.* This change in approach to deal with the influx of new members, predominantly from Eastern Europe was however buttressed by new mechanisms such as pre-accession aid, based on previous PHARE and EUROPE agreements (Maresceau, 2003).

The *raison d'être* for enlargement is the need to engender political and economic stability across the whole European space while also boosting European economies. This occurs in two separate but interconnected 'impulses'. The first takes place in the pre-accession period as potential members go through a process of market liberalisation and politico-administrative reform, with the pre-accession strategy and pre-accession aids smoothing the course (see ESPON 2.2.2). The second phase occurs after accession within the context of what we shall call the 'catch-up' strategy, where an attempt is made to deal with the economic disparity between new and established Member States.

'Catch up' strategies generally entail new Member State access to the Union's Structural and Cohesion funds, though policy areas such as transport, agriculture, cross-border co-operation (i.e. within the context of INTERREG) and border control obviously also have a specific territorial impact on the new Member States. Enlargement thus necessarily has a budgetary impact, though the basic outlines to this were covered within the context of the Commission's Agenda 2000 document (1997), as well as, given the list of policy issues above, a sectoral policy impact also. The issue of the net 'costs' of enlargement should not however be overplayed, while issues such as FDI displacement and migration are difficult to quantify *ceteris paribus*.

For instance, the protectionist principle of *host country control,* which dictates that immigrant workers from Member State *X* must be paid and otherwise treated as indigenous workers from the host Member State *A* at a stroke pre-empts any possibility of genuine cross-border labour mobility where citizens from the new Member States could exercise their market advantage (i.e. the ability to accept lower wages). This does not necessarily however impact on illegal immigration flows. Similarly, the question of potential FDI 'displacement' assumes a 'zero sum' game in this sector, though FDI inputs are likely to rise for a time after accession in the new Member States and then stabilise as new markets are found elsewhere.

Note should also be made here of the Union's emerging 'Neighbourhood Policy' designed to deal with those states who currently do not have an 'entry perspective' in respect of future EU membership. Although there is a desire on the part of some to maintain a strict division between pre-accession policy and the NP, reflecting a wider desire perhaps to limit enlargement, in reality the policy mechanisms (if not the specific goals) are the same, and in the long run if countries such as Moldova and the Ukraine fulfil the Copenhagen criteria in full it will be very difficult to exclude them from membership.

With the emerging new 'grand debate' over the future content and direction of the Union now encompassing the reform of the CAP and potentially also the re-nationalisation of Cohesion Policy (though the Commission has now come up with its own proposals to forestall this), as well as an eventual refocusing of the entire EU budget, it is currently rather difficult to predict the political ramifications that will occur in these areas, though the Union's current inability to agree on the new financial perspective for the 2006-17 period is

causing some new Member States some distress. Moreover, this must also be put in the context of the re-launching of the overarching goals of the Lisbon/Gothenburg programme for increased competitiveness and sustainable development.

In the context of globalisation and the current economic recession in Europe (the Euro-zone currently has 20 million people registered as 'unemployed'), 'catch up' is not just a social necessity to decrease disparities between new and old Member States, but actually vital as a 'growth mechanism' for the whole of the enlarged EU. The problem here is however that the decline of west European welfare states and the removal of the 'safety net' during the period of market liberalisation and political restructuring in Eastern Europe has seen *regional* disparities (i.e. disparities *within* states) across the European space markedly increase, and it will thus be difficult to encourage growth at the European level while also promoting cohesion at the regional level. Moreover, historical analysis suggests (i.e. The Iberian countries in the 1980s-90s and Scandinavia at the turn of the twentieth century, that increasing regional disparities is an inevitable side-effect of economic 'catch-up' at the national level). Further discussion of this issue is fruitfully undertaken within the context of notions of polycentricity (see ESPON 1.1.1), and more specifically in a policy context in ESPON 2.2.1.

6.1.3 Most important driving forces

The review of past and current trends identified four basic driving forces for enlargement these can be outlined as follows.

6.1.3.1 Economic Success

It is undeniable that the EC/EU has been a resounding economic success. Whether or not this success can be attributed directly to the Customs Union and the Cohesion policies, or more generally to the simple fact of the 'stability' it has brought to Europe after WW2 is however not really the issue, as undoubtedly both played their part. Nevertheless, the economic success factor continues to act as a powerful magnet, ensuring that those on the periphery of the Union are eventually 'pulled into its orbit'. Below the rarefied level of 'high politics' however it is undoubtedly the case that it was the reduction and elimination of tariff and non-tariff barriers to trade (i.e. the envisaged creation of a 'single market') that originally, in practice, drove the integration process. This of course had a significant number of 'knock-on' spatial effects within the context of enlargement, though the basic motor of 'trade diffusion' has now been replaced by broader 'regime change' factors in the new Member States.

The pace of this process is of course quickened when the attractiveness of the integration project – or the expected benefits of membership – precipitate indigenous 'push' dynamics from within the group of countries currently outside the Union. This was perhaps most evident with the Mediterranean enlargements of the 1980s, though the realities of the 'classical method' of enlargement generally ensured that current members' interests were protected at the expense of those of prospective entrants. As such, entry on the basis of short-term economic gain has rarely been an important driver of enlargement as the costs of 'adjustment' usually outweigh initial trade based gains. This is particularly evident in terms of the expected 'cost' in GDP terms to the new CEE Member States of implementing the EUs high environmental standards. Note should however also be made of the fact that the power of this particular driving force – in relation to some of the other driving forces – has to some extent been seen to have declined in recent years for a number of reasons, with the nature of globalisation in particular playing an important role here. As such, where previously the focus of economic integration was 'regional' it is now increasingly global. This

significantly impacts on European integration to the extent that the EU itself is no longer viewed as the primary *economic* generator of integration, but rather as its regionally based *political* guarantor. Thus the EUs role in this sense is subtly changing. Moreover, as the major economic 'players' in Europe are almost all now already members, the power of the economic driving force to continue (in a political sense at least) to 'push the borders of the EU outwards' has waned with the decline in the number of economically attractive prospective applicants, while additionally, *full* EU membership itself is no longer seen as a necessary prerequisite to participation in either regional or global economic integration, though it continues to afford prospective members with the most effective route to politico-institutional 'lock-in'.

6.1.3.2 The fear of being 'left behind'

While the economic success driver historically acted as a powerful force 'pulling' the States of Europe into the Union, 'the fear of being left behind' predominantly acts as a 'push' factor on prospective members. Basically, as the EU became increasingly successful, encompassing ever larger swathes of Europe, the costs of non-membership increased exponentially for most countries, but particularly for those rather more fragile non-members who sought not only economic, but also political and *civic* benefits from entry (i.e. politico-institutional 'lock-in'). Moreover, this is, in itself, a rather dynamic process as the actions of ones immediate neighbours can potentially fundamentally affect ones own decision-making processes. We can therefore postulate that this factor perhaps played a role in respect of the various EFTA countries applications to the EU in the early 1990s, where each country undoubtedly sought to avoid being 'left behind' and where it was perceived to be important to get ones feet 'under the table' before the onrush of new applicants. Similarly, the Central and East European countries that were eventually to accede *en masse* in 2004 were each very keen to ensure that they were not 'slow tracked' – a fate that was eventually to befall Rumania and Bulgaria – with all the consequences that such a decision would have for their economies when they finally got down to the 'nitty-gritty' of the accession negotiations, with their neighbours and often direct competitors (in terms of industrial and agricultural production, the need to 'export' labour to gain remittances from the stronger economies of the Union, and in respect of attracting either FDI or 'cohesion' financing) now on 'the inside' and thus able, in part, to 'dictate' the conditions of entry for prospective new members. Thus the practical implementation of the 2004 enlargement framework saw the grouping together of a number of hitherto rather distinct groupings of applicants, namely, the Mediterranean island mini-states, the Baltic States, and the so-called Visegrad States, with Slovenia providing a fourth grouping as it managed to politically detach itself from the rest of the Western Balkan grouping – who were deemed unready for membership given the various continuing 'ethnic' conflicts across the region. Similarly, for this very reason, Croatia has been assiduous in attempting to de-couple itself from Serbia in particular, and the rest of the Western Balkans in general as regards future EU accession.

6.1.3.3 Institutional/Bureaucratic 'Dynamics'

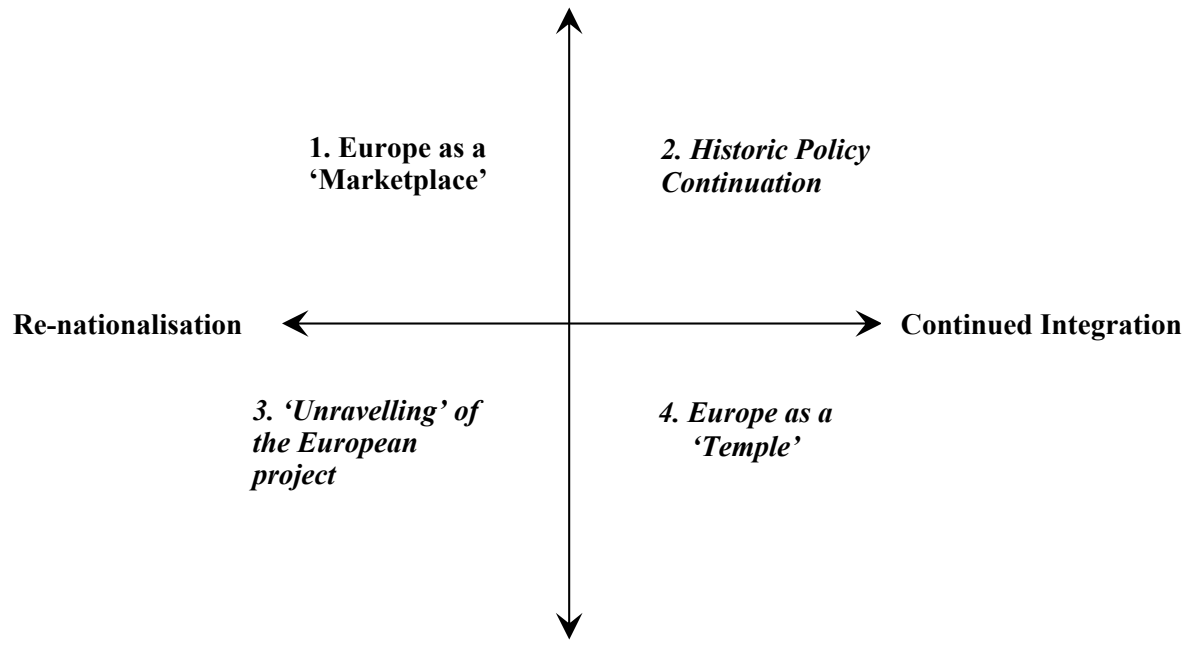
Although the EC/EU has never had to advertise for members, one could postulate that in the past a certain amount of institutional or bureaucratic 'drift' existed at various times in respect of the issue of enlargement, particularly in terms of the wider implications of the intimate relationship between *deepening* and *widening.* As such, one could postulate that, on the one hand, perhaps in order simply to avoid 'bureaucratic sclerosis', and on the other, driven by the desire to maintain the holy shibboleths of integration theory, that the EU institutions themselves, and the Commission in particular, have at certain times sought to cajole the Member States towards opening up the Union to continual expansion. The institutions themselves then have thus acted as a subtle factor prompting evolution in this regard. We should of course stress that this has never been a major driving force in EU enlargement, but it is useful to consider this point nonetheless because it functions to

remind us of the important role played initially by the Commission, and now also by the European Parliament, in the enlargement process, and in particular in respect of the accession procedures. In essence however this is a potential driver only in particular circumstances – such as when profound disagreement exists between the current members over the long-term goals of the Union as was the case between 1981-84 – and thus where the need for enlargement can be used to defray or redistribute the costs of such disagreements to prospective new members, or to reaffirm the status of the 'integration project' more generally. Similarly such an issue surfaced again as Prodi sought to ensure that the Western Balkans were, as a group, promoted from the *antechamber* of the Neighbourhood Policy to be given a full 'entry perspective' into the EU.

6.1.3.4 Political stability/wider 'civic' duty?

Finally, we can see that political factors have also been of fundamental importance in this ongoing enlargement process. Independent of the economic benefits of accession or enlargement (depending on whether one is a candidate or an existing member) there is certainly a strong case to be made for promoting the notion of the political stability that membership invariably brings – although in some cases this may be merely the displacement of a previous area of instability to a position beyond the 'new border' – as an increasingly significant driving force in the enlargement process. Not only does this however relate to the desire for what can now be termed 'soft security insurance' on the part of prospective members, but also to what we may term, the EU's 'wider civic duty' to admit all those that pass the 'entrance exam' essentially laid down by the 'Copenhagen Criteria'. This point is again often couched within the context of the desire for politico-administrative 'lock-in' on the part of the potential new Member States. Moreover, it is also perceived as a dynamic issue, as the failure to 'project' stability is seen as merely an invitation to 'import' instability. As such, this point relates in particular to the broad acknowledgement of the significant changes that have occurred at the global political level since the end of the Cold War, and in particular to the realisation that the process of European integration has a fundamental impact - with the potential to be either good or bad – upon the EUs neighbouring states.

6.1.4 Identification of the Scenario Hypotheses



From the driving forces outlined above it was possible to draw out two axes in respect of the development of the scenarios. The vertical axis corresponds to the 'widening' parameter outlining the binary possibilities of 'continuing enlargement' and 'no further enlargement', while the horizontal axis corresponds to the 'deepening' parameter outlining the potentials of 'continuing integration' and some policy 're-nationalisation'. These choices are designed to circumscribe the limits of policy choice, and as such the field of realistic outcomes is much more likely to be found as a variation of the trend scenario 'historic policy continuation', which for example would include the possibility of some policy re-nationalisation, perhaps in respect of Cohesion Policy, combined with a more nuanced reading of the subsidiarity issue which saw the term defined as action taking place 'at the most appropriate level' as opposed to 'at the lowest level'. This could potentially see further integration in terms of cross-border transport issues (i.e. missing links) (see, Pelkmans 2004, and Sapir 2003).

The two axes define four possible outcomes, with all but scenario three, which postulates an increasing breakdown of the European project (and which is therefore not considered at any length) being a mixture of positive and negative outcomes. As its name suggests, scenario two is in effect the 'baseline' scenario, which is basically expounded in the baseline document. The scenario document thus concentrates on scenarios one and four.

In scenario one - 'Europe as a Marketplace' - the implications of a rapidly widening but increasingly 'shallow' Union are played out, with the impact on growth and convergence, 'catch-up' and regional disparities all addressed. Here significant enlargement activity continues though we can surmise that *political* problems may emerged *at the national level* in respect of issues such as cohesion, where, given the impact of ongoing globalisation on the nature of regional disparities, it may be increasingly less likely that alliances can be maintained providing for fiscal transfers from poor regions in rich countries to rich regions in poor countries.

Similarly, in scenario four, 'Europe as a Temple' the implications of the decision to abruptly end the enlargement process in an attempt to concentrate more fully on deepening, particularly in respect of institutional issues initially, but ultimately also in respect of environmental standards and even tax policy, is drawn out. Here a particular approach to globalisation is adopted that stresses the need for Europe to avoid trying to compete 'at the lowest level', postulating instead the need to generate growth through making the internal market function more effectively.

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6.2 Scenarios

6.2.1 Scenario 1: Europe as a 'marketplace'

6.2.1.1 Scenario Hypothesis

This scenario sees a continuation of national level control of the enlargement agenda with in addition, some measure of policy re-nationalisation in respect of cohesion policy. Questions over Turkish entry would be answered positively though the budgetary issue would remain a thorny one and thus enlargement would be expected to essentially finance itself in the medium term (e.g. the 'win-win' game). In principle, different forms of capitalism could continue to exist under the EU umbrella, though this would necessarily act as a brake on further integration – particularly in areas such as tax policy. It is perhaps more likely in this scenario however that structural economic change – particularly in respect of labour market policy – would spread from East to West, calling into question the European 'social model'. The ultimate role of the Neighbourhood Policy is unlikely to be decided within the timeframe up to 2030. This scenario also postulates that the *marketplace* increasingly becomes more important than the *temple*. The forces of marketisation, individualism, liberalism, and de-centralisation (from the EU-level at least) win out as *intergovernmentalism* prevails over *federalism* in the EU, and the choice is thus made for *widening* over *deepening.* The EU contracts in terms of functions to conform to the liberal ethos of the 'night-watchman' state, providing only for 'soft security' and the overseeing of the proper and unfettered functioning of the market, introducing also, where necessary, a measure of *variable geometry*. The *raison d`être* of the new EU is enshrined as the Lisbon goal of 'competitiveness.' The EU Constitution is eventually ratified to consolidate this vision, while the EFTA/EEA states (Norway, Switzerland, Iceland) as well as Turkey and the Western Balkan states all accede to membership of the Union before 2030. The EU however becomes far less cohesive given the difficulties of integrating so many new and, for the most part, relatively poor members in such a short space of time. The main objective of the European Neighbourhood Policy (ENP) is to promote the establishment of Free Trade Areas in the large neighbourhood zones on the EU external border in the Mediterranean region and in the states of the former Soviet Union. EU Cohesion Policy is gradually effectively nationalised, as it is assumed that the member states themselves can better deal with the question of regional disparities. As a result, the EUs Structural and Cohesion Funds are essentially starved of resources, and thus the pressure of enlargement on the EU budget is lightened considerably.

6.2.1.2 Scenario Process

After much debate, the EU - driven by the more sceptical anti-federal members - decided on the need to focus on widening at the expense of deepening. The major reason being that for the EU to effectively compete with the other global trade zones in North America and East Asia, the primary objective remained the need to *quickly* become the most innovative and competitive economy in the world (i.e. the Lisbon strategy). As such, the fundamental improvement of its economic performance required the further, and indeed substantial, widening of the internal market and its socio-economic disciplines to those territories still outside the EU.

As the power of market forces remained a major driver of enlargement, the internal market and the EMU constituted the institutional context in which such forces were given free reign to operate, with the process of policy and market competition determining to what extent differences between Member States could be maintained with respect to welfare state and other arrangements.

The driving force here was the desire by many of the larger contributors to the EU budget (i.e. Germany, the UK, the Netherlands and Sweden) to ensure that the projected shifts in aid flows in the EU25+ would not entail the need for a 'blank cheque' to be written to the new members, as the size of the Regional Aid budget was predicted to rise by some 50% merely to cope with the new 2004 entrants (2nd Cohesion Report). In addition, the main recipients of such aid in the former EU15 'fell into line' with the tough stance adopted by the major contributors as they themselves were set to lose most of their aid in any case. Indeed, Ireland and Spain were set, in the medium term, to become 'net contributors', with Portugal and Greece retaining only a small amount of aid for their poorest regions. Yet provision was made in the 2007-13 financial perspective for the 'statistical effect' of the 75% barrier to be addressed.

With the entry of Croatia, Bulgaria and Romania in 2007, the Member States continued to give priority to widening at the expense of deepening. Though the EU constitution, in its new vastly amended form, was finally ratified in 2008, the aspects of the Constitution relating to subsidiarity and States' rights were given prominence over grand schemes for further integrationary projects. Moreover, the increasingly decentralisation stance adopted by the EU smoothed the way for the remaining EEA/EFTA countries to quickly accede also after a rapid pre-accession period, in 2013.

The basic choice facing the EU thus concerned the tension between the centralisation and the de-centralisation of powers, which was perhaps exemplified most clearly in the final decision of 2013 taken on the basis of the report by the 2nd High Level Expert Group (i.e. The Tarschys Report II), and designed to coincide with the end of the 2007-13 financial period, to renationalise both the CAP and Regional Policy. Significantly however although the need for 'growth' was again stressed as paramount this was however no longer, as was the case in the Report of the 1st High Level Expert Group, couched within the context of the risks of 'non-growth' to *further integration*. Growth was now seen as *the* end in itself, not merely as the means to support further integration.

The impending entry of Turkey and the remaining countries of the Western Balkans, envisaged sometime after 2015, which would bring the EU up to 35+ in size, however further exacerbated problems over the issue of co-ordination. A point that was duly made in the conclusions to the 5th Cohesion Report published in 2016**.**

From here onwards the integration process then began to evolve in a much more 'intergovernmental' direction. Increasingly then the EU's responsibilities were confined to those policies that were deemed relevant to the maintenance of the internal market, e.g. commercial, fiscal and transport policies, with the supranational level's role in welfare, environmental, and other policies being reduced to a minimum, and often – in the context of the pervasive mood in respect of subsidiarity – simply re-delegated to the national level. Moreover, where the EU was able to maintain its position in the policy hierarchy this was generally done within the context of *variable geometry*.

A significant amount of time and political capital was however devoted to neighbourhood relations, and to what Romano Prodi had termed 'the completion of Europe,' namely, the accession of the countries of the Western Balkans. This, together with Turkish accession, was a long and arduous process, which was not finally completed until 2022, thus bringing the membership roster up to 37 with, Turkey, Albania, Serbia, Montenegro, Bosnia-Herzegovina, and the FYR of Macedonia all acceding at this point.

Within the context of the European Neighbourhood Policy (ENP) a number of European Neighbourhood Agreements were also unveiled between 2008 and 2013 with the Maghreb and Mashreq countries. Moreover, with the emergence of the Mediterranean Free Trade

Area on a solid politico-economic footing by 2020, the Southern and Eastern Mediterranean countries were now better placed than ever to contribute to the development of the region as a whole.

Moreover, with 'political conditionality' now widely regarded as a necessary motor in this process, the 'Copenhagen criteria' were widely credited with helping to define the pathway from traditional 'Associate Status' to new so-called 'EEA-style' neighbourhood arrangements. These agreements were subsequently of course to be subsumed into the MFTA (Mediterranean Free Trade Area).

The main policy objectives in respect of the states of the former Soviet Union remain assuring political stability and reinforcing democratic institutions and the free market. Ukraine, Moldova, Armenia, Georgia and Azerbaijan all move forwards in the Neighbourhood 'process'; while countries such as Turkey, Romania, Slovakia and Poland support future entry for their neighbours, though by 2030 these countries still had not been granted an entry 'perspective'.

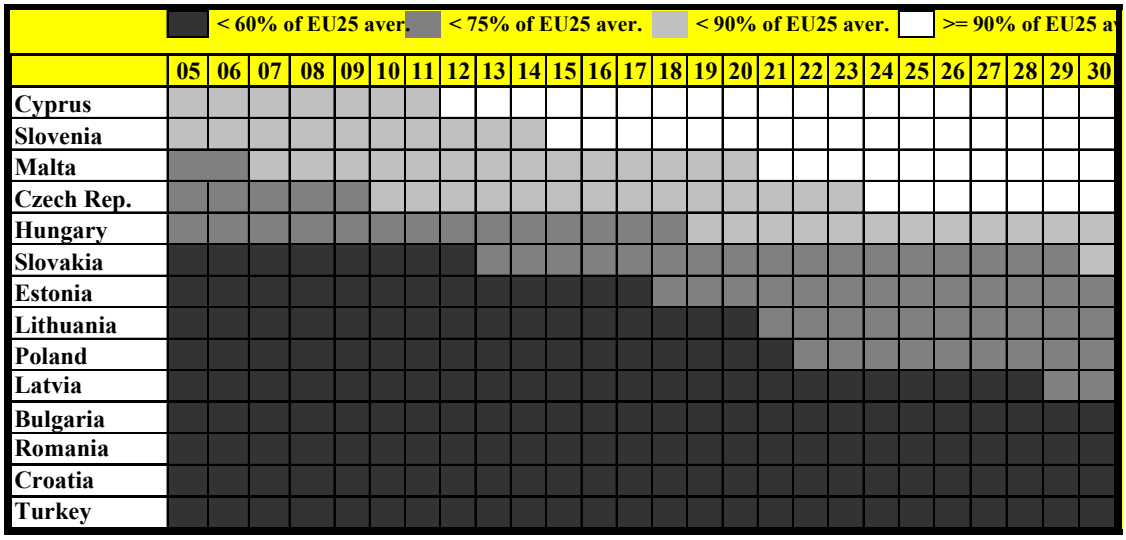
As regards the promotion of a Strategic Partnership Agreement with Russia, and notwithstanding the fact that access to Russia's energy resources remained important for the EU throughout this period, the 'special status' (i.e. outside the general set of Neighbourhood Policy arrangements used for all other neighbouring states) of the EU-Russia relationship actually detracted somewhat from its overall utility. This was particularly so in respect of cross-border relations in the context of the uptake of available funds through the post–2006 New Neighbourhood Instrument, as it was often the case that opportunities for co-operation were missed as it proved rather more difficult than expected to find suitable partners on the Russian side of the border.

In conclusion, after 2005 the EU developed into a 'leaner and meaner' more economically competitive and dynamic grouping, where the free market rationalises resource allocation improving competitiveness (the main Lisbon goal), though it simply could not afford to attempt to do too many things at the one time. Essentially then the EU economy grows by encouraging technological advances and new forms of production, while also continuing to enlarge the size of the internal market. In this way it sought to remain *the* central regional player in this part of the global economy. The global economy underwent a number of significant changes in the first quarter of the 21st century, as did its institutions and rules. The enlarged EU played a significant role in this process though this process significantly affected the individual Member States with social tension increasing in less well performing areas. Cohesion policy was effectively re-nationalised, while the goal of polycentricity was easier to achieve at the national rather than the regional level. The 2004 enlargement intensified the need to re-assess the whole *raison d'être* of the European integration process, and in particular the traditional balance between deepening and widening. With this came also a need to reassess how the EU interacts with its neighbours, particularly in respect of the delicate balance between giving them incentives to reform whilst limiting their appetites for immediate EU entry.

6.2.1.3 Territorial Impacts of the Scenario

According to the *Market scenario* ('1½% a year above': implying growth of 4% a year, if growth is 2½% a year in the EU15), average GDP *per capita* in the 12 countries would remain below 60% of the enlarged EU27 average until 2017 (Graphs 1 and 2). In this year, it would exceed 75% of the average only in four countries (for more detail see the ESPON 3.2 TIR 2004). If growth were to continue at this rate, Slovakia would reach 75% of the average by 2019, while Bulgaria and Romania would still have a level of GDP *per capita* below 75% of the average in 2050.

Taking into account the fact that GDP *per capita* in Turkey as well as that in the Western Balkans states is much lower than that of the EU-15, EU-25 and EU-27, the duration of the corresponding catching-up process (to 75% or 100% of the EU-15 GDP average), in terms either of the first or the second scenario, will exceed considerably that of the 10+2 new countries. Moreover, the accession of Turkey and / or the Western Balkans' states (or other neighbouring states, with the exception of the EEA/EFTA states) will prolong considerably the duration of the catching-up process (to 75% or 100% of the EU-15 GDP average) for the 10+2 new Member States.



[Produced by ESPON 3.2]

Figure 5 'Market' Scenario : Simulation of GDP per capita (PPS) in the 10+2 states, plus Turkey and Croatia 2005-2030

- Assumptions: EU15 GDP +2,5% per year,
- New Members (2004) +4% per year
- Bulgaria, Romania, Croatia, Turkey + 4% per year

Discussing the implications in regional disparities and EU structural policies

In the context of the *Market scenario*, Turkey, the Western Balkans' states and the EEA/EFTA states all enter the EU during the period 2005-2030. For the purpose of this analysis, we term them the 'Potential Accession Countries' / PAC.

As noted previously in the baseline scenarios, the potential enlargement of the EU to states of low economic potential such as Turkey and those the Western Balkans will have a significant effect on EU regional disparities, which are very closely related to the future of the EU structural policies. Though these effects will *not* have the determining influence on future political decisions in respect of EU enlargement[25] they remain important none the less. It would however be illuminating to examine these effects, together with the future effects of the '10+2' enlargement.

[25] This is undeniable given that enlargement to include the 10+2 states was taken and indeed implemented *before* either the political structure to cope with so many new entrants, or the economic resources to pay for enlargement had been realised. This is indeed how the enlargement has usually worked, with new entrants predominantly bearing the costs of enlargement in the expectation of future gain. Moreover, although the 2004 enlargement deviated significantly from what Preston termed 'the Classical Method', with a generous level of pre-accession assistance being given to the prospective new Members, the basic deal remains in place, as new Members will continue to have to substantially adjust their economies to the EU model, and thus ultimately bear the costs of adjustment.

This discussion will focus on three crucial issues: (a) the effects of the population size and GDP level of the recent and future accession countries (b) the impact of the potential accession countries on the eligibility for assistance criteria (c) the time needed for the GDP of the PACs to catch up with the EU-25 average.

The population size and the GDP level of the recent and future accession countries

As we have already seen, the accession of both the 10+2 states and Turkey will add considerable surface area and population, while offering only a small additional amount of GDP. The changes in these dimensions are presented in Table 1 of the baseline scenarios. We repeat below this table in which we have added data on the % difference of the EU-36 (EU27 +PAC) from the EU27 concerning the surface, the population, the *per capita* GDP in PPS and the *per capita* GDP in PPS as a % of the EU25 average (as well as that of the EU27 average).

The resulting data suggests that the accession of the PAC to the EU27 would raise the surface of the EU27 by 35%, its population by 22% and its GDP by only 8%. Inversely, the average *per capita* GDP would lower by 8% and 11% compared to the EU27 on the basis of EU25=100 and EU15=100 respectively (data for 2004).

	SURFACE AREA	POPULATION - Millions - 2004*	TOTAL GDP - Billions EUR 2004*	TOTAL GDP - Billions PPS 2004***	PER CAPITA GDP PPS 2004***	AVERAGE PER CAPITA GDP PPS (EU25 = 100) 2004***	AVERAGE PER CAPITA GDP PPS (EU15 = 100) 2004***
EU15	3.244.479	383,7	9731	9311	24267	108,8	100,0
New 10 member c.	734.059	74,0	477	897	12117	54,3	49,9
EU25	3.978.538	457,7	10208	10208	22303	100,0	91,9
Bulgaria, Romania	348.873	29,7	76	204	6860	30,8	28,3
EU27	4.327.411	487,4	9783	10411	21361	95,8	88,0
Turkey	769.604	71,4	245	464	6500	29,1	26,8
W. Balkans	264.482	24,4	5788	109	4487	20,1	18,5
Norw., Switz, Icel.	468.510	12,1	506	372	30657	137,5	126,3
Potential Acc. Countries (PAC) / Scenario 1	1.502.596	107,9		945	8760	39,3	36,1
EU27 + PAC	5.830.007	595,3		11357	19077	85,5	78,6
EU27 / EU25	8,8	6,5		2,0	-4,2	-4,2	-4,2
EU27 / EU15	33,4	27,0		11,8	-12,0	-12,0	-12,0
CHANGE EU27+ PAC / EU27 %	35	22		9,1	-10,7	-10,7	-10,7

* Eurostat latest forecasts for 2004 population - For the W. Balkans' states estimates taking into account Popul. 2002 (EC / DG Economic and Financial Affairs 2004) and recent population change rates.

** For 2002

*** Eurostat latest forecasts for 2004 GDP - For the W. Balkans' states estimates taking into account GDP in Euros 2002 (EC / DG Economic and Financial Affairs 2004), recent GDP change rates and ratio GDP Euros / GDP PPS for Turkey for 2004

Table 12 Impacts of previous enlargements of the EU as well as the PAC accession

Impact of the accession of the PAC on the 'catching up process' and on the eligibility for assistance

On the basis of the current data and eligibility criteria, the entire territory of Turkey as well as that of the W. Balkans[26] would be eligible for assistance under Objective 1 of the Structural Funds in addition to assistance under the Cohesion Fund.

In the baseline scenario we attempted to evaluate the impact of the accession of the 10+2 states on the eligibility for assistance with the aid of two 'catch up' scenarios. The first sees growth being maintained in these countries at 1,5 % a year above the EU15 average, while the second sees it sustained at 2,5 % above the EU15 average. We have now extended this analysis concerning the 10+2 countries to include coverage of the PAC.

As we noted previously, the continuation of the current approach to structural / cohesion policy in the 'trend' scenario, which stands as a middle course between widening and deepening, could lead to 'catch-up' rates in the 10+2 countries fluctuating between those of the first catch up scenario and those of the second.

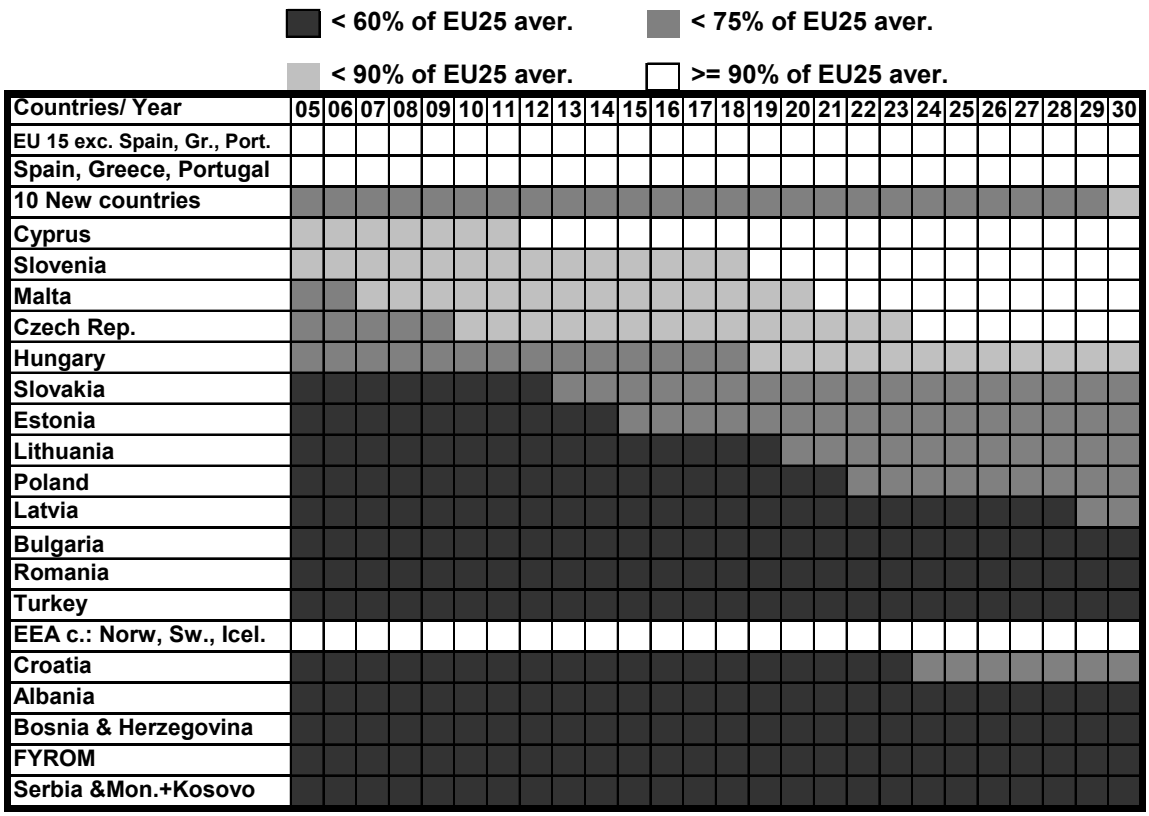
In the framework of the *Market Scenario* emphasis is given to widening and to market liberalization in the enlarged EU, while structural policies are eventually, in effect, re-nationalised. In order to evaluate the effects on the eligibility for assistance in the framework of the Scenario 1, we have thus created a proper 'catch up' scenario. We assume that the 'above the EU15 average' growth rate is sustained at 1,5 % for the 10+2 countries, as well as for the 'poor' future accession countries: Turkey and those of the Western Balkans (i.e. 4% a year if growth is 2½% a year in the EU15). This difference of 1,5% might be even lower. Provided that the estimates we give are indicative, even if the 'above 1,5%' is lowered a little (indicatively, by 0,2-0,3%), the substance of the results will not change. In any case, in the framework of this 'catch up' simulation, less than 1% (of the total 2,5 %) is owed to the Cohesion policy. We have also taken into account the fact that SF / Cohesion Fund aid will be allocated to the three EU15 Cohesion countries (Spain, Greece, Portugal) for some period of time after 2005, with an agreement for the programme period 2007-2013 already existing.

The aid that will be allocated to the "new neighbouring countries' (remaining outside the EU during this period, such as for Moldova and the Ukraine etc) will be limited, consequently we estimate that the % in growth rates in such cases will equal that of the 10+2 new Member States We also take into account here the fact that high growth rates are justified for new neighbouring countries provided that their initial economic base is very low. Finally, the EEA/EFTA countries growth rates are expected to equal those of countries of EU15.

In the Graph 2 we present the time moments in which the GDP of the EU15, the three EU15 Cohesion countries, Turkey and each of the Western Balkans states[27] will reach 60%, 75% and 90% of the EU25 *per capita* GDP.

[26] Including Croatia

[27] This analysis assumes that Serbia and Montenegro do not in fact separate and that Kosovo remains part of Serbia.



For the data sources see Table 12 notes.

Figure 6 Market Scenario : Simulation of GDP per head (PPS) in the EU27 + PAC countries 2005-2030

(See text for the inherent assumptions)

Impacts on territorial cohesion

From the data produced we conclude the following. The average *per capita* GDP of the 10 new Member States (of 2004) will reach 75% of the EE25 average by about 2030. More specifically, the average GDP of half of these countries will not reach 75% of the EE25 average before 2030, while in the middle of the 2005-2030 period the GDP of three of them will not have reached even 60% of EU25s GDP average, while the *per capita* GDP of Bulgaria, Romania and the Western Balkans states (excepting Slovenia and Croatia) will still not have reached 60% of the EU25 GDP average by 2030. Therefore, on the basis of the *Market Scenario*, disparities across national GDPs in the EU36 would be much larger than that either for the EU25 or the EU27.

The same applies in respect of regional disparities. Turkey's eastern regions together with some regions of the Western Balkans will have the lowest *per capita* GDP in the EU36. We will specify the effects on disparities among regions using the above simulation in the next phase of the project. We forecast then that the difference between the neighbouring

(outside EU36) states' *per capita* GDP and the EU27 average will not dramatically decrease in the period 2005-2030.
The final image of the disparities in *per capita* GDP for the EU36 and the neighbouring countries is shown in Fig. 7. The corresponding values have been calculated on the basis of the above simulation. We have tried to illustrate in this Map the two main aspects of the Market Scenario, namely, the lowering of the 'barrier' between EU and the neighbouring countries and the lack of cohesion between national territories in the EU.

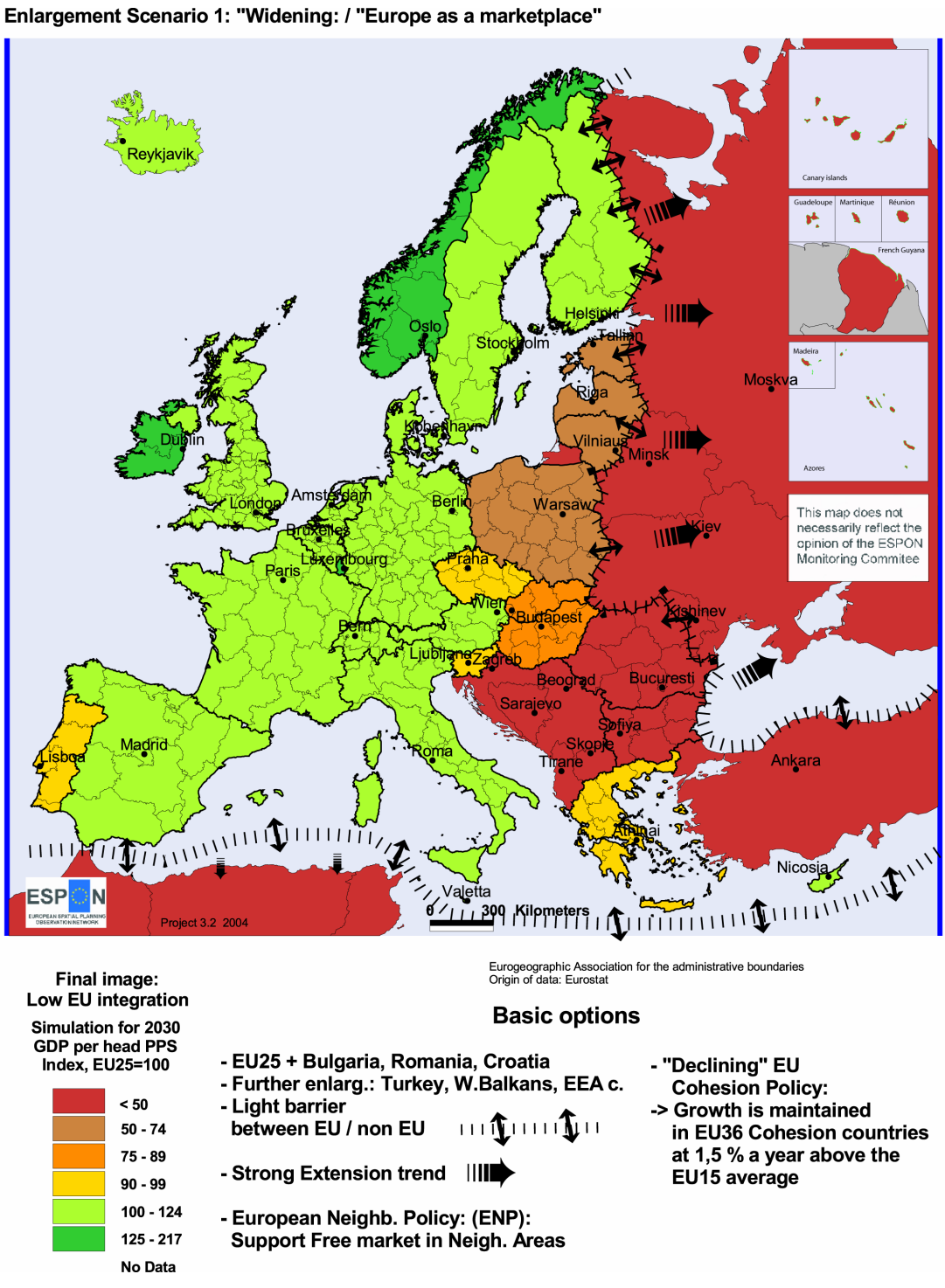


Figure 7 Europe as a 'Marketplace' – The Impact of Widening

6.2.1.4 Final Image of Territory

The Union's territory is rather more loosely integrated than before given the policy re-nationalisation that has taken place in certain areas, while adherence to a view of regional policy that stresses 'endogenous potentials' sees regional disparaties continue to widen still further, both *within* states and *between* them as polycentricity is pursued at the global level given the stress on maintaining *global* competitiveness through the cultivation of traditional MEGAs. Notwithstanding the continuing threat of terrorism and other 'soft security' questions, Europe's border regime remains relatively open.

6.2.2 Scenario 2: Europe as a 'Temple'

6.2.2.1 Scenario Hypothesis

This scenario also sees national control maintained in respect of the enlargement policy process, though Union competences are maintained in respect of cohesion policy, while *territorial cohesion* takes its place alongside economic and social cohesion as a Union objective. Turkish entry is however proscribed as Europe's *Christian heritage* is eventually re-affirmed as a French referendum mandates its government to deny Turkey entry. Lip-service is paid to the Lisbon process, and, as such, progress on issues such as labour market liberalisation is slow. Adherence to the European 'social model' is reaffirmed at the national level in the EU 'core' with more liberalised models of capitalism existing on its Eastern and Western fringes. At the regional level growth is slower but more evenly spread and thus disparities reduce, albeit slowly, as the rate of 'catch-up' growth in Eastern Europe is less than expected, given the costs to the CEE countries of implementing the EUs stringent environmental standards regime. Budgetary issues remain a problem however and cause some of the 'net payers' significant political problems. Finally, the decision not to continue with enlargement *for the foreseeable future* causes significant political problems in both the Balkans and in Turkey, while the Neighbourhood Policy remains at best an inferior alternative to accession for most of those seeking entry. This scenario postulates then that the *temple* remains as a fundamental constraint on the 'invisible hand' of the *marketplace.* The Lisbon goal of 'competitiveness' is still highlighted; though its implementation is now handled rather differently as the Gothenburg principles in respect of 'sustainability' are given a more prominent role. Here the broad forces of communitarianism, welfarism, sustainability, and integration continue to temper the 'market-centred' *intergovernmentalist* approach, while a choice is made for *deepening* over *widening.* As such, only Romania and Bulgaria – to whom promises were already made – gain entry (the EFTA/EEA members declined to apply), while Turkey is finally denied entry once and for all, and the countries of the Western Balkans are left, uncomfortably, in the *anteroom* of enlargement for the duration of this period. Europe then concentrates on implementing its sustainability agenda, which attempts to integrate environmental, welfare and territorial cohesion concerns in an attempt to develop a 'Euro-centric' approach to the demands of globalisation, this can however only be done through further integration, which in itself is only practical if it is undertaken on the basis of the 'variable geometry' approach[28]. Increasing tension however arises between the 'inner' and 'outer' cores over the *ad hoc* nature of the variable geometry approach, and in particular over the costs involved, causing some in the 'outer' core to

[28] The notion of 'variable geometry' was coined originally in relation to the emerging European security debate of the 1980s, where different bodies carried out different tasks in the security field. It has since come to encapsulate a much wider vision of the EU experience where rather than one uniform approach being taken, issues are addressed in different ways by varying groups of states, and/or at different speeds. EMU is a good example of this process in action.

contemplate leaving the Union altogether. Meanwhile, the potential for the Union's 'neighbours' – now certain of their 'marginalised' status to become increasingly troublesome increases.

6.2.2.2 Scenario Process

The 'historic mission' of Europe has always been about more than simply economics and the provision of welfare, in a material sense. The essence of the 'experiment' has always been about undertaking an innovative approach to international affairs, and to the problems of the modern world. It is in this light then that this scenario's developments take place.

Sustainable development and 'renewability' (the Gothenburg 'goals') become the driving forces of the post-industrial economies of Europe. Competition could not realistically take place with the newly industrialising and emerging market countries on the basis of reduction to the cost base. Rather, the need to add 'value' was seen as the correct approach. Europe's competitive advantage lay in doing things cleaner, more quietly and at less cost to the environment. As such, though the Lisbon 'goals' of greater competitiveness remained important, this was so only to the extent that they were buttressed by the wider 'Gothenburg agenda'.

The impetus to move in this direction was given by the ratification of the EU constitution in 2008. Although, initial misgivings existed among some sections of the populace, it was finally acknowledged that the measures contained within the Constitution, particularly in respect of its approach to institutional and voting arrangements, were vital if the EU was to maintain any semblance of coherence, politically. Moreover, the internal market reforms needed necessarily entailed that further economic integration be undertaken.

Although the Constitution – within the context of subsidiarity - set out the limits of rights and responsibilities between the Union's constituent parts, its effect was actually rather more profound. In effect, rather than simply drawing a legal border between what was, and was not, a power reserved to the Union, in typical 'neo-functionalist' style it generated the potential for many new forms of political spillover to occur, as effective functional cooperation in one field suggested the need for further beneficial cooperation in another contiguous area.

Perhaps the first concrete indication of this emerged in the context of the debate over the remodelling of the Union's Cohesion and Regional policies that took place in the aftermath of the 2004 enlargement in 2006. At this point, a significant body of opinion existed arguing that we should, in effect 're-nationalise' these policies. The impact that the Structural Policies in particular had on cohesion, it was argued, was minimal, and the costs of enlargement were set to grow exponentially some claimed, particularly in the period after 2013 when the next financial perspective would need to be put in place, at the same time as the 'GDP subsidies,' in the form of fiscal transfers from the core members to the 2004 entrants, reached their peak.

Such concerns generally reflected the view that enlargement had been taken as far as was feasibly possible. Indeed, the accession of Bulgaria and Romania scheduled for 2007 was drawn out for over two difficult years of final negotiations, and it was not until the beginning of 2009 that they were allowed to accede. The entry of Bulgaria and Romania rekindled old arguments over 'who pays' for enlargement, effectively poisoning the debate over the Structural and Cohesion funds for some time to come. Moreover, the bureaucratic *driver* which saw the process of enlargement being tied to that of integration more generally, with the Commission as the main 'cheerleader' for this approach was decisively checked when, in 2009, a number of Commissioners – echoing the earlier stance taken by Frits Bolkestein, a

previous Commissioner for the Internal Market – made it clear that, for the foreseeable future at least, 'enlargement could go no further.'[29]

In this light, the need to straighten out 'once and for all' the issue of how the goal of cohesion was to be paid for, and at what level it was to be implemented at, effectively concentrated minds on the need for deepening at the expense of widening. Debate over this issue was further focussed by the impending entry of Turkey, though its continuing refusal to recognise the legitimate Government of Cyprus provided an effective block on accession as the need to deal with this issue had been explicitly raised at the outset of the Turkish negotiation process in 2004.

The years after 2010 were however to prove some of the most difficult and indeed darkest in the history of European Integration, as concerns over budgetary issues and re-distribution/cohesion became interlaced with what can only be described as an anti-globalisation 'backlash' across large parts of the Union, specifically in respect of both 'economic' and 'identity' issues.

There were essentially three elements to this. In terms of 'identity issues' two separate groupings of disgruntled Member States could be identified. Firstly, the then still 'new' Member States of 'Catholic Central Europe', such as Austria, Poland and Lithuania – with no small measure of support from France – argued vocally against the widening of the Union to include non-Christian countries. Basically they argued that the social consequences of such a significant 'cultural' widening of the EU would be disastrous. A second group of countries also sought to prevent further widening, again citing its potentially disastrous social consequences, in particular with respect to the tensions raised by the fear of further immigration, particularly from Turkey. Paradoxically, included in this group were some of the countries with, historically speaking, the most 'liberal' immigration policies in Europe, i.e. countries such as Denmark and the Netherlands, backed by Germany.

In more purely economic terms, Sweden, Spain and Ireland became increasingly hostile to further enlargement because of what they saw as the unenviable economic and fiscal consequences it had for them. Not only were they expected, in effect, to 'export' medium-level skilled jobs to the new member countries (a process that began after the 2004 enlargement, and continued with the accession of Romania and Bulgaria in 2009), but they were now also expected to increase their contribution to the EUs cohesion goals through continuing fiscal transfers. Such a situation was of course nothing new for long-term integration sceptics such as Sweden, but to those, like Spain and Ireland, that had benefited themselves for so long from such transfers it came as a rather rude awakening to, after 2013 at least, join the ranks of the EUs 'net contributors'.

Problems in respect of Turkish membership basically mirrored the wider issue of the EUs relations with the Islamic world, which were further exacerbated by what can only now be seen as the EUs ill-advised attempt to bind the countries of North Africa in particular too closely to the European Integration project. Increasingly across the region manifest tension arose between some sectors of the governmental elites of these countries who hoped that the economic benefits of Mediterranean free trade would help stabilise their uncertain political legitimacy, and the vast majorities of their populaces enraged by other elite factions who either saw the agreements as economically inadequate, or who took a wholly different view of the acceptable level of interaction across the Mediterranean.

As such, the Mediterranean Free Trade Area never materialised, while the ENP in the Southern and Eastern Mediterranean proved to be either 'too little' or 'too much' depending

[29] See 'Bolkenstein warns EU growth will create chaos' The Financial Times 23/11/04 for the original article, and 'Rebellious Commissioners: Thus far and no further' The Economist, 7/709.

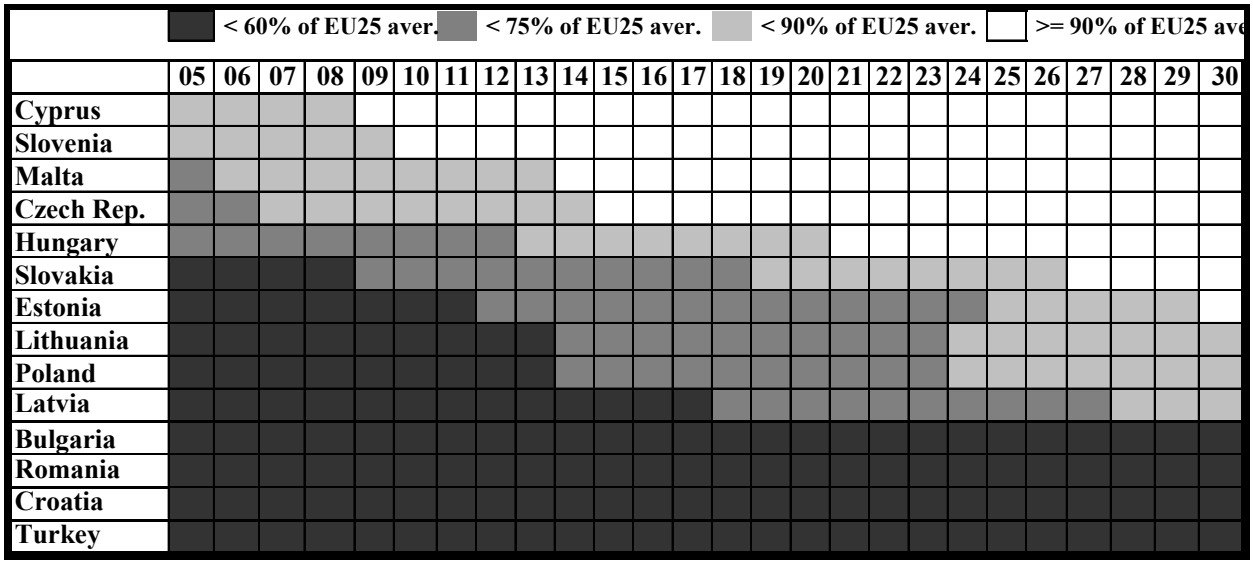
on the view of the recipient. This inevitably however had a significant effect on the whole process of integration as EU 'influence' across it southern border declined dramatically. In addition, the failure to beneficially 'engage' the countries of the EUs southern 'border' had not only the inevitable security implications in a conventional sense, but the significant differences that were subsequently to emerge in terms of environmental standards threatened to dwarf even the most pessimistic security projections in terms of the potential scale of its implications.

By 2015 then the EU was in significant difficulty and in retreat across many fronts. Indeed, the inevitable squabbles that resulted from the ill thought out move towards *variable geometry* combined with the problems over the immigration and enlargement issues, and the wider problems of a fiscal and/or economic nature saw the inherent tensions between the Member States, the Commission and the EUs neighbours stretched almost to breaking point, with a number of Member States (i.e. the UK, Denmark, and Sweden) contemplating, for various reasons, withdrawal from the Union as they individually perceived the general 'bargain of membership' to be becoming increasingly unpalatable.

In conclusion, though the internal 'storm' of the years between 2010 and 2020 was eventually ridden out, as threats of secession did not come to pass, significant problems remained, in particular the need to effectively re-model relations with those beyond the Union's now *permanent* external border. Though the gains made across the EU after 2020 in terms of cohesion, economic vitality and sustainability would be difficult to maintain if the issue of political stability *beyond* the external border continued to be ignored. As such, for many of the EUs neighbours, accession will – EU declaratory policy notwithstanding - remain their ultimate goal, while others want relations to be kept at 'arms length'. Ultimately however the EU cannot exist in isolation of its neighbours.

6.2.2.3 Territorial Impacts of the Scenario

According to the *Temple scenario* ('2½% a year above': implying growth of just over 5% a year if growth in the EU15 is 2½%), then convergence would, of course, happen within a shorter period of time. Nevertheless, the number of years involved remains considerable for many of the countries. For Poland, for example, even at this rate, it would still take 20 years or more for GDP *per capita* to reach 75% of the EU average and many more years to converge to the EU average or close to it. For Bulgaria and Romania, it would take much longer than this. Nevertheless, at this rate of growth, the number of regions in the accession states that require structural support because their GDP *per capita* is below 75% of the EU average is reduced much more quickly than if growth were to be slower.



[Produced by ESPON 3.2]
Assumptions: EU15 GDP +2,5% per year ; New Members (2004) +5,2% per year ; Bulgaria, Romania, Croatia, Turkey +2,5% per year

Figure 8 'Temple Scenario' : Simulation of GDP per capita (PPS) in the 10+2 countries plus Turkey and Croatia 2005-2030

Discussing the implications in regional disparities and EU structural policies

In the framework of this scenario, only Bulgaria, Romania and Croatia accede to the EU25 during the period 2005-2030. Turkey, the rest of the Western Balkans and the EEA/EFTA states are thus considered here as 'neighbouring countries'.

The population size and the GDP level of the recent and future accession countries

The corresponding changes in EU area, population and GDP are also described both in the baseline scenarios and the Market Scenario. (See Table 1of the Market Scenario).

Impact on the 'catch up process' and on the eligibility for assistance

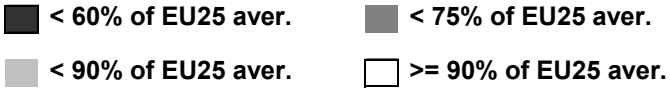
On the basis of the current data and eligibility criteria, the entire territory of Bulgaria, Romania and Croatia will be eligible for assistance under Objective 1 of the Structural Funds, as well as for assistance under the Cohesion Fund. In the framework of the Temple Scenario, emphasis is put on deepening (integration) through the intensification of the EUs structural policies. The EUs borders are seen as a strong barrier separating the EU from its neighbouring countries. We will show however that this barrier also entails increasing differences in incomes between those 'inside' and those 'outside'.

In order to better evaluate the effects on the eligibility of assistance in the framework of the Temple Scenario, we have created a proper 'catch up' scenario (See Graph 4). We have assumed here that the 'above the EU15 average' growth rate is sustained at 2,5 % for the 10+2 countries, as well as for Croatia (i.e. 5% a year if growth is 2,5 % a year in the EU15). This 'above' 2,5% might be even little higher, although this would not change the substance of the results. In any case, in the framework of this 'catch up' simulation, at least 1% (of the total 2,5 %) is due to the Cohesion policy. We have also taken into account the fact that SF / Cohesion Fund aid will be allocated to the three EU15 Cohesion countries (Spain, Greece, Portugal) for some time after 2005.

The aid that will be allocated to the neighbouring states (i.e. those remaining outside the EU during this period, such as Turkey, the remaining Western Balkans' states, the EEA/EFTA

states, Moldova and the Ukraine etc) will be lower than that allocated to the 10+2 new Member States, i.e. 'above 1,5 %' of the EU15 average (compared to the 'above 2,5 %' for the 10+2 Member States). The EEA/EFTA states growth rates are assumed to equal those of the EU15 countries.

In the Figure below we present the time moments in which the GDP of the EU15, the three EU15 Cohesion countries, Turkey and each of the Western Balkans' states[30] will reach 60%, 75% and 90% of the EU25 per capita GDP.



Countries/ Year	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
EU 15 exc. Spain, Gr., Port.																										
Spain, Greece, Portugal																										
10 New countries	55																									
Cyprus																										
Slovenia																										
Malta																										
Czech Rep.																										
Hungary																										
Slovakia																										
Estonia																										
Lithuania																										
Poland																										
Latvia																										
Bulgaria																										
Romania																										
Turkey																										
EEA c.: Norw, Sw., Icel.																										
Croatia																										
Albania																										
Bosnia & Herzegovina																										
FYROM																										
Serbia &Mon.+Kosovo																										

For the sources of data see in Table 1 notes.

Figure 9 'Temple' Scenario : Simulation of GDP per head (PPS) in the EU27 + PAC countries 2005-2030

(See for the assumptions in the text)

[30] Again assuming here that Serbia and Montenegro stay together, and that Kosovo remains part of Serbia.

6.2.2.4 Impacts on territorial cohesion

On the basis of the data we conclude the following. That the average *per capita* GDP of the 10 new (2004) Member States will reach 60 % of the EU25 average in 2008, 75 % of the same average in 2019 and 90 % in 2028. Although, in the middle of the period 2005-2030 the GDP of half of the 10 new countries will have exceeded 60% but not 75 % of the EU25 average. The *per capita* GDP of Bulgaria and Romania will not have reached the EU25 average by 2030, while the GDP of Croatia will reach this level by 2014. Moreover, in spite of the fact that the 'catch up' rates are quicker in comparison with the Market Scenario, the GDP of an important part of the EU population will remain under 75 % of the EU25 average in 2030. As such, the pressure for change (i.e. the further strengthening or weakening of EU structural policies) will be considerable.

Finally, the *per capita* GDP of both Turkey and the Western Balkans', as well as that of the other neighbouring countries will be very low. Moreover this difference between all of these states and the EU27 average will further increase over the period 2005-2030.

GDP inequalities *among the regions* of the EU27 (+1) will be rather less than in the case of the Market Scenario, although they will remain significant even during the period 2015-2030. Turkey's eastern regions together with some regions of the Western Balkans will have the lowest *per capita* GDP in the EU36. We will further specify the effects on disparities among the regions using the above simulation in next phase of the project.

The final image of the disparities in terms of *per capita* GDP for the EU and the neighbouring countries in this Scenario is shown in Fig.10. The corresponding values have been calculated on the basis of the above simulation. We have attempted in this Map to illustrate the two main aspects of the Temple Scenario, namely, the strengthening of the 'barrier' between the EU and the neighbouring countries and the increase in the level of cohesion across national territories in the EU.

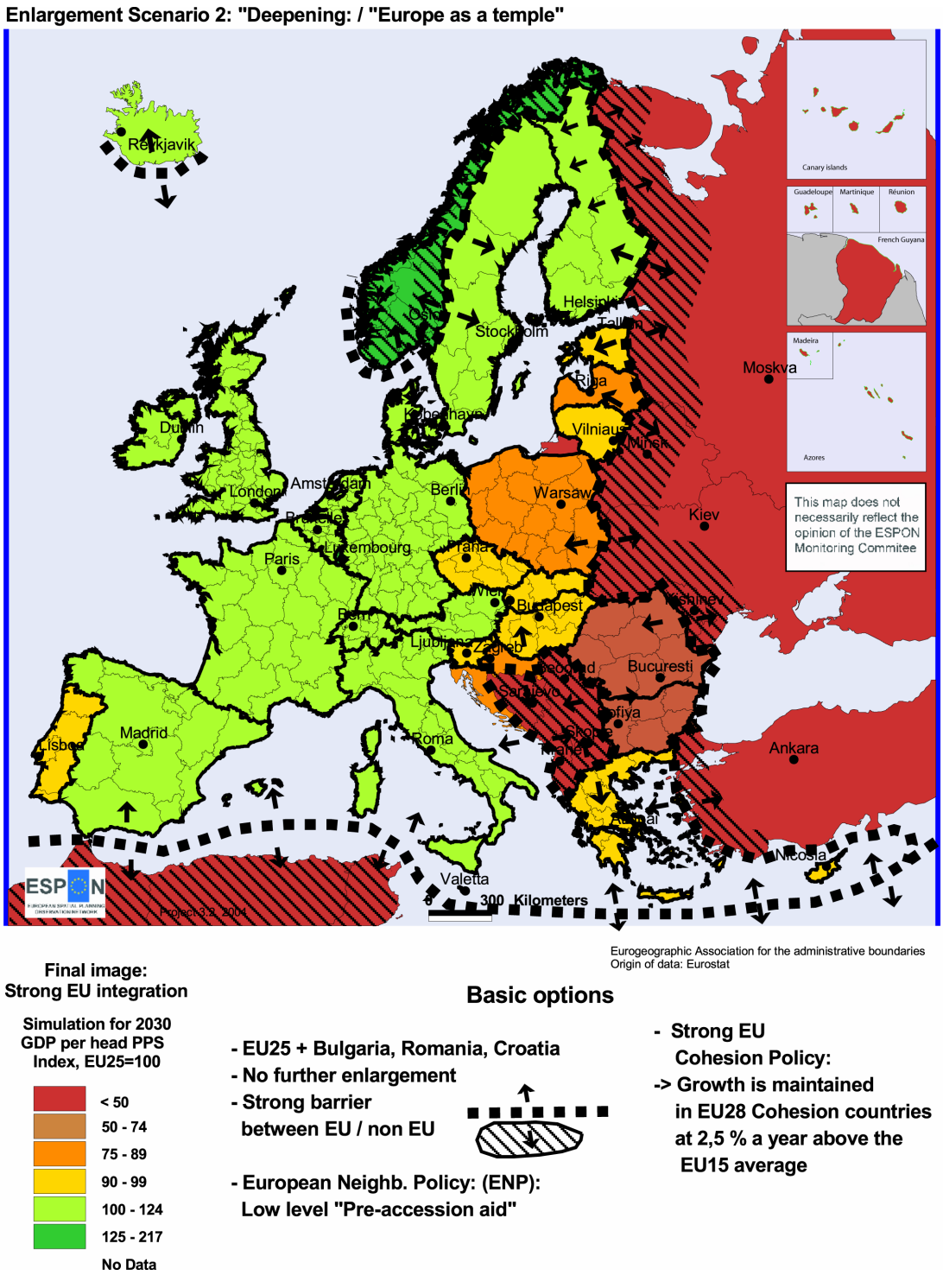


Figure 10 Europe as a 'Temple' – The Impact of Deepening

6.2.2.5 Final Image of Territory

The Union's territory remains integrated and *solidaristic,* with regional policy continuing to be based on these principles in addition to the increasing role given to sustainability and cultural heritage issues. Polycentricity is stressed at the regional level with development outside the *pentagon* preferred over the continuing overdevelopment of the pentagon MEGAs. Given the pressure created by the decision to discontinue the enlargement process the pressure on Europe's border regime increases significantly. This has a significant impact on the economic development of some of the newer Member States who still maintain a wide range of linkages (usually at the local level) with their neighbours, who have now been denied entry.

6.2.2.6 Conclusions: Basic differences between the two 'final images'

As noted at the beginning of this document, scenarios were used here in a sense to present 'artificially' generated potential alternative futures in the context of EU enlargement. This was particularly difficult here because of the necessarily long term and often scripted nature of EU policy commitments in this field. Moreover, as we are dealing with a discrete number of policy variables it is quite easy to project back and forward in time to discern 'patterns of behaviour' etc., which then become the accepted norm. Basically, when the future is already 'made', it is rather difficult to think 'outside the box' while at the same time remaining 'realistic'.

The two alternative scenarios sketched out here must therefore be seen in this overall context, as being artificially constructed to be something like polar opposites in order that a clear differentiation from the baseline scenario and its likely forward projection (in terms of policies and agreements already entered into) can be made. The apparent differences between the two scenarios have thus been stretched to the limit, though in reality what we are seeing is perhaps a continuation of the 'different forms of capitalism' debate. In the *market* scenario, economic growth is privileged over more solidaristic concerns, but this is not to imply that in the *temple* scenario the need for economic growth is eschewed, rather, it reflects the differences between 'bottom up' and 'top down' approaches in terms of economic development.

In practice, and taking all of the above caveats into consideration, the differences between the two final territorial images highlight the practical implications of the scenario choices made. In a policy-sense the market scenario is 'bottom up', while the temple scenario is 'top down', specifically in relation to the question of subsidiarity and the re-nationalisation of certain policy areas. In terms of polycentricity, the market scenario focuses on the global context, while the temple scenario looks to the regional level, particularly in relation to the fostering of 'alternative economic poles' to the traditional European pentagon. Socially, Europe *may* be richer but looks like being much less cohesive – socially and territorially - under the market scenario, while in terms of external relations, the decision to 'end' enlargement, taken under the temple scenario would probably have profound and potentially extremely negative implications not seen in the market scenario. Both scenarios have the same basic goal, but rather different ways of achieving it. The test case here is undoubtedly what 'model' works best in terms of East European 'catch-up', which would (if successful) in itself be the best way to guarantee future European economic health. The question as ever in politics remains one of balance, which model would do the most good, while at the same time doing the least damage?

7. Thematic prospective scenarios 'Rural development'

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7.1 Scenario base 'Rural development'

7.1.1 Present situation and trends in agriculture and rural areas

Agriculture

Agriculture experiences substantial *structural changes*. Cost-intensive technological progress leads to higher agricultural productivity and production. This causes an increasing supply on the markets. The increased supply, together with the competition with producers from abroad causes a spill-over, a decrease in prices and consequently a decline of farmers' revenues. In this way a vicious circle is set in motion. Important indicators for this structural change are the number of farms and farm size.

In the EU-15 the *number of farms* dropped from 7.4 million in 1995 to 6.8 million in 2000. Small farms (0-5 ha) dominate with 3.9 million in 2000. Only 0.6 million farms are larger than 50 ha. In the CEECs farming is characterised by a large number of holdings: 9.2 million (30% more than in the EU-15). Cultivated land, however, amounts to 50 million ha (40% of that in the EU-15).

Concerning *farm-size* a distinction must be made between the physical and the economic size. In 2000, the average area of a farm in the EU-15 was 18.7 ha. The difference between the Member States, however, is remarkable. The smallest average farm sizes existed in Greece (4.4 ha) and the largest in the UK (67.7 ha). In all CEESs the share of small holdings in the total number of farms is high: from 42% in Latvia to 97% in Bulgaria. Most of the small farms are subsistence or part-time farms. Large farms (more than 50 ha) include mainly commercial companies and co-operatives.

The Standard Gross Margins (SGM) of a holding is a measure for its economic strength. From 1989 to 1997 the average SGM in the EU-15 rose in all Member States, most of all in the Netherlands, Belgium and Denmark. In 1997, the average SGM per holding was highest in the Netherlands, followed by Denmark, the United Kingdom, and Belgium. In 2000, in the new member states, Slovenia has, by large, the highest SGM, followed by Cyprus and the Czech Republic.

Regarding *agricultural production* the following trends can be observed:

- The production of *major crops* continued growing. Community support to cereals, oilseeds and protein seeds as well as the fall of the number of cattle induced an increase in the crops for sale. The CAP reform in 1992 only modestly affected these major trends.
- *Permanent crops* decreased. The main reason was the pulling up of vines intended for ordinary wine production. This results partly from Community support. Wine production concentrated on the name areas (quality wines). The orchard surfaces decreased in the northern Member States but remained constant in the southern Member States.
- Between 1975 and 1995, *surfaces still in grass* decreased by 12% in the EU-9. The cattle and sheep rearing areas in plains were most affected. Only some cattle-rearing areas (Ireland, Limousin, Umbria) saw their surfaces still in grass increasing. The period was marked by the milk quotas (1984) and the decline of livestock-farming resulting from it.

With regard to *rural areas* five different categories can be distinguished:

- *Rural areas in urbanized regions* are situated in the periphery of important agglomerations, especially in the Pentagon and near the large cities. Many of these areas profit from the presence of residential areas, industrial estates, and recreational amenities. They are affected by high socioeconomic dynamics in terms of population density and urbanisation. This reinforces the trend towards scattered settlements and increased pressure on land-use.

- Many coastal areas near the Baltic, the North Sea, the Atlantic Ocean, and the Mediterranean have a well developed tourist industry and can be characterized as *rural areas attractive for tourism.* The same is true for mountain areas in the Alps, the Pyrenees and to a lesser extend in the Tatra. The tourist industry contributes to a high economic viability. Moreover, it causes the in-migration of many young people from the surrounding areas. In high seasons, however, tourism puts nature, landscape and environment under pressure.

- *Rural areas with a variety of activities* are for instance situated in Devon in the United Kingdom, in regions in the Middle of France, and in the Po area in Italy. These areas are highly dependent on rural activities but additional activities, like service for out-door recreation, manufacturing or local crafts, generate additional incomes. Socioeconomic viability is moderate. It is uncertain whether agriculture will survive or the economic structure will become more diversified. Landscape elements are developed to some extent in these areas.

- *Rural areas where agriculture dominates* are less diversified than the rural areas with a variety of activities. These areas can be divided into two subcategories. Areas in which agriculture is highly productive and in which the processing industry plays an important role are e.g. found in Bretagne in France and in England. Their socioeconomic viability is moderate or high. Intensified and large-scale agriculture, however, puts the environment under high pressure. Areas in which agriculture is traditional and has a low productivity are found in Galicia in Spain, in Poitou-Charentes in France, and most of the CEECs. Their socioeconomic viability is low. In these areas environment is under low pressure.

- *Rural areas with low accessibility* are located in the middle and high mountains, isolated plateaus, and peripheral areas, e.g. in Northern Scandinavia and South-Eastern Poland. They are characterised by large natural landscapes and small scale cultural landscapes dominated by marginalised agriculture. Out-migration of younger people causes an aging of the population. This is sometimes further enhanced by the in-migration of retirees. Many of these areas loose the critical mass which is necessary for the maintenance of services and infrastructure.

Rural areas are affected by different but related trends. This varies, however, significantly according to their physical, socioeconomic, demographic and other characteristics.

- *Towards the post-productivist country-side.* Changes related to this trend are e.g. growth of alternative farm activities and increasing investments in the quality of the environment. Rural areas are commodified by marketing their characteristics. Especially rural areas with a variety of activities or with low agricultural productivity are subject to this trend.
- *Changing role of agriculture and food-supply chains.* The CAP reforms stimulated a shift from the agri-industrial towards the multi-functional model of food-supply chains. Animal diseases and food scandals put food quality, food security and animal welfare high on the agenda. As a result, more attention is paid now to the origins of food and to the production methods applied, especially in rural areas in urbanized regions.

- *Towards consumption of different ruralities.* Many rural areas have turned to out-door recreation or tourism. This is not only true for rural areas attractive for tourism but also for rural areas where agricultural productivity is low or with a variety of activities. The urbanites visiting rural areas and the regular residents can be regarded as consumers of different ruralities. This may pose a challenge on the prevailing culture.
- *Localities as resources of identity formation.* The self-identification of rural areas is a key to spatial development. The constructed identities must fit local needs and extra-local opportunities. Rural areas with natural, cultural and other assets, e.g. rural areas attractive for tourism, with low agricultural productivity or with a variety of activities, gain importance.

7.1.2 Past and present EU policies

The CAP has its foundations in the *Treaty of Rome* (1957) establishing the EEC. Self-sufficiency was a prime objective of the fledgling Community. The common market, with its protected external borders, was established to counter the fluctuations in the availability and prices of food and to raise the level of production. Principles commonly cited were market unity, community preference, and common funding. The most important measures were – and still are – income support, price support, import tariffs, and export subsidies.

The CAP was so successful that within 20 years Europe produced more than enough food for its own population. Exports were rising sharply and surpluses mounting ('butter mountain', 'milk lake'). The Council Directive on Less Favoured Areas (1975) introduced an explicit territorial dimension into the CAP. It provides payments to farmers in areas characterised by permanent handicaps. In 1988 the LFA scheme was incorporated into the Structural Funds.

It became increasingly clear, however, that the production growth was achieved at the expense of nature and environment in Europe and the distortion of the international markets. Milk quota was introduced in order to limit milk production. Income subsidies were linked to measures like set-aside, and agri-environmental measures were implemented to stipulate environmental conditions to other measures. This led to some new territorial aspects in the CAP.

In the beginning of the 1980s Regional Policy began in earnest. Funding was used to finance schemes for – among other aims – the development of rural areas with few alternatives to agriculture. In 1988 the budget was doubled and there was a shift from individual project support to a programme-based approach. The following objectives were relevant for agriculture and rural areas: *Objective 1* ('Structural adjustments and development of less developed regions'), *Objective 5a* ('Speeding up the adjustment of agricultural and fisheries structures'), *Objective 5b* ('Facilitating development of rural areas'), and *Objective 6* ('Promotion of development in regions with exceptionally low population density'). The Community Initiative LEADER was introduced to encourage integrated local development strategies.

The system of protected European markets was in danger of collapsing under the weight of its own success and was becoming too expensive to maintain. The pressure for reform was intensified by the GATT and WTO negotiations. In response to this, more efforts were made to mitigate the negative side effects. The EC began a shift in expenditure from production support to income support and rural development.

The MacSharry reform (1992) was a milestone in this process. The reform decoupled agricultural payments from production levels and introduced the set-aside system. *Agenda 2000* (1999) was another milestone. It defined two pillars of the CAP. *Pillar 1* contains

among other things:
- commodity market support with intervention buying or private storage aids
- direct payments, often with quotas and area ceilings to limit expenditure
- supply management tools such as quotas on milk supplies and compulsory arable set-aside
- other elements such as environmental or animal welfare requirements

Pillar 2 covers measures aimed both at the agricultural sector and the wider economic development of rural areas throughout the EU. Support offered under these measures can cover:
- improving farm incomes and production conditions of farmers
- less favoured areas and areas subject to environmental constraints
- agri-environmental measures
- investments to improve production, processing and marketing of forestry products
- measures promoting the adaptation and development of rural areas

'Modulation' was introduced to switch funding from Pillar 1 to certain elements of Pillar 2. This implied a further shift in favour of rural development. The mid-term review defined some additional changes in the CAP, which were also needed to accommodate the expansion of the EU with ten new Member States. Despite all reforms the CAP still remained a costly endeavour: in 2002 agricultural expenditure accounted for 45% of the EU budget.

Since 1999 the new Member States received aid from the pre-accession programme SAPARD. SAPARD interventions were oriented towards three bottlenecks: the regional capital supply (e.g. by providing support to agricultural holdings), the regional market potential (e.g. by improving processing and marketing), and the geographical position (e.g. by improving rural transport infrastructure) (IRS, 2004). After their accession Pillar 1 direct payments were phased in gradually. The new Member States receive substantial payments for rural development.

Regarding the Structural Funds, the end of the 1990s marked the emergence of a new approach. Budgets were not only cut but also concentrated in order to increase their effectiveness. The six priority objectives were reduced to three. Objectives relevant for agriculture and rural areas are:
- *Objective 1* ('Development and structural adjustment of areas most lagging behind')
- *Objective 2* ('Economic and social conversion of areas facing structural difficulties')

Although the CAP was primarily designed to improve the productivity of agriculture it has significant territorial impacts. Its impact on agriculture and rural areas varies from region to region depending on specific physical, socio-economic, and other conditions:
- A certain limitation of over-production has occurred. For instance cereal production in the EU-12 declined from 170 million tonnes in 1992 to 165 million in 1995. The fall in intervention prices increased the strength of the market. Because of that, productions with industrial purpose, e.g. colza, strongly increased and intensified. Moreover, new crops competitive on international markets appeared, e.g. flowers in the Bergamo Province.
- Partly due to market forces and partly owing to the CAP, a dualisation of agricultural production has taken place. Concentration and an intensification of production occurred in the most fertile areas and more extensive agriculture and agricultural abandonment took place in the LFAs. In the new Member States, the existing dualisation is also a major problem.
- Intensified arable and diary farming have caused serious damage to landscapes and environment in open fields, polders and deltas. The scaling-up of production has also occurred most profoundly in the open fields. In many British areas bocage landscapes were changed into open fields. There are also many areas in which agriculture is

marginalising, e.g. high and low mountains.
- Pollution by agriculture is reduced but not stopped. The intensification of certain agricultural productions, in particular in the field of cereals, is still topical and the expansion of irrigation also contributes to it. The intensification of livestock-farming in or near the cereal areas is also noticed. A number of positive developments, however, can be observed as well. Between 1992 and 2001, for instance, 500,000 ha have been afforested.

Regarding SAPARD priorities varied between countries. In Poland and Slovakia improvements of the agri-food business was the main priority. In Latvia and Hungary most resources were invested in farms. SAPARD had a stronger impact on territorial cohesion in countries like Poland, with large areas dependent on agriculture, than in countries like the Czech Republic, where significant steps towards the restructuring of agriculture had already been made (IRS, 2004).

The Structural Funds generate different effects on different levels. Rural and other areas outside the Pentagon (especially in Greece, Portugal and Spain) receive substantially more assistance than areas inside. The bulk of the assistance, however, goes to urban areas although sparsely populated rural areas receive most spending per capita. While contributing to territorial cohesion on the macro level it works against it on the meso level. On the micro level, e.g. in rural areas like Calabria and Toscana, the Structural Funds contributed to the stabilisation of settlement patterns and the strengthening of the regional and local levels of government.

7.1.3 Driving forces behind agriculture and rural areas

Key factors behind *structural changes in agriculture* are:
- In the last decades the *markets for agricultural products* were characterised by increasing globalisation. At the same time real food prices and the proportion of income spent on food declined. These dynamics put farmers' revenues under pressure and gave an impulse to the scaling-up of production in order to lower production costs. At the same time, however, the demand for quality products increased, creating niches for regional and organic products.
- The global markets for agricultural products are seriously distorted by export subsidies and import tariffs. Although many developing countries are able to produce against relatively low costs they are hindered in gaining their market shares. *WTO negotiations,* aiming at the removal of these market distortions, may put small farms and farms in less favoured areas further under pressure.
- *EU Enlargement* is another factor with an impact on agricultural production. After the enlargement by 10 new Member States in 2004 the arable area of the EU doubled and over 100 million food consumers and 9.2 million farms were added to the internal market. For farmers in the old and in the new Member States this implies growing markets but also increased competition.
- The factors just mentioned stimulate *technological innovations* in the agricultural sector. Increased competition makes investments in cost-intensive innovations like new machines, fertilizers, herbicides and fungicides necessary in order to maintain and gain market shares. Technological innovations in their turn lead to higher agricultural production.
- Some sorts of agricultural production demand large amounts of *energy*. Rising energy prices may therefore generate increasing production costs. This is especially true for greenhouses demanding much energy for heat and light in order to stimulate the growth of crops. At the same time demand for sustainable energy like biomass and wind energy is growing, providing new opportunities for farmers and rural areas.

Main factors behind the *development of rural areas* are:

- The rise of the *experience economy* is a driving force behind the 'post-productivist country-side' and the 'changing role of agriculture and food-supply chains'. With rising incomes more consumers are willing to pay for safe and high quality food products, alternative farm activities like landscape management, and the quality of the environment.
- *Migration* has a significant impact on the socio-economic viability of rural areas. The loss of younger people and the in-migration of retirees have left many rural areas as 'aging areas'. As a result these areas may loose the critical mass which is necessary for the maintenance of services and infrastructure. This is especially true for peripheral rural areas.
- The increasing amount of *leisure* has an impact on the 'consumption of different ruralities'. The number of urbanites 'consuming' rural areas has increased significantly in the last decades. The same is true for the time they spent in rural areas.
- The significant increase of *mobility* has the same impact. Many rural areas have turned to out-door recreation and tourism now as an alternative development strategy. The commodification of local resources like natural landscapes and cultural heritage has helped to strengthen the base in large parts of rural Europe.

Reforms of the CAP, RDP, and the Structural Funds are stimulated by the following factors:

- *Interest groups*. In the 1945 – 1975 period, agricultural interest groups formed an effective lobby for the introduction and the further development of the CAP. In the 1975-2004 period, NGOs (environmental groups and third world groups) became more and more effective.
- *Animal diseases.* Epidemic diseases like BSE and FMD caused large economic negative impacts and large collective investments in order to combat the diseases. In the subsequent CAP reforms more and more attention was being paid to these issues.
- *WTO negotiations.* The GATT and WTO negotiations aim at realising more open and competitive global markets for agricultural and other products. The pressure for CAP reforms was significantly intensified by these negotiations.
- *EU Enlargement.* Almost every entry of a group of new Member States into the EU generated larger budgets and adaptations of the CAP, RDP, and Structural Funds. The accession of the CEECs, however, implied that the same budget for Pillar 1 payments must be divided by more farmers because it was decided to freeze the budget until 2013.

7.1.4 Scenario hypotheses

Two scenarios have been developed for the theme 'Rural development': 'Open Market' and 'Sustainable Rurality'. Both scenarios are from the prospective policy type, assuming that policy changes will occur and exploring the territorial and other impacts of these changes. The scenarios represent two different 'schools' in thinking about the reforms of the CAP, RDP and other EU Policies: the 'liberalization model' versus the 'European model'.

In 'Open market' the evolution of agriculture and rural areas is mainly driven by market forces. This is the result of the outcomes of the WTO negotiations and a deliberate EU-policy aiming at reducing subsidies, with the exception of payments contributing to the improvement of R&D. Criteria for food safety and the environment are only implemented to the extent that this can be done in a cost-effective way. Ecological sustainability is implemented at a low pace. Rural development is considered to support agriculture and tourism and abolished at last.

In 'Sustainable rurality' competition, environmental conditions and territorial cohesion are stimulated by policies in order to transform the enlarged internal market into a 'sustainable economy'. Criteria for food safety, animal welfare and the environment are respected. In cases of conflict with economic growth, priority is given to these concerns. Rural development is considered to support the economic competitiveness of rural areas but also social cohesion and the quality of the environment. Economic diversification in rural areas is actively promoted.

7.1.5 Sources of information

As sources of information we have first of all used the results of other ESPON projects (mainly 1.1.2 'Urban-rural', 2.1.3 'CAP impact', and 2.2.2 'Enlargement'). But in order to complete missing information we have also used additional sources.

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7.2 Thematic prospective scenarios

Two prospective policy scenarios for the period 2006 - 2030

The description of the trends in part I looked more than 25 years into the past. The same is true for the description of the most relevant policy developments and the driving forces behind these changes. The two scenarios presented in part II look instead 25 years into the future. First 'Open market' will be presented and after that 'Sustainable rurality'. Both scenarios are of the prospective policy type, assuming specific policy changes and exploring the territorial and other impacts of these changes. By doing this they may provide important information for decision-makers.

The rationale behind the presentation of 'Open Market' and 'Sustainable Rurality' is that both scenarios explore two alternative policy options which play an important role in discussions among policy-makers and scientists about the CAP and RDP reforms. Both policy options imply a transition of the agricultural sector from a highly protected and heavily subsidized sector into a liberalized or sustainable sector.[31] The scenarios represent two different 'schools' in thinking about EU Policies: the 'liberalization model' versus the 'European model'.

In order to present the policy changes and their expected impacts in a clear way, both scenarios assume the same trends regarding some contextual factors.[32] Regarding *global competition* and the outcomes of the *WTO negotiations* it is assumed that the American and European trade blocks are both willing to liberalize the world economy (Van Egmond et al., 2005). Most developing countries are positive about liberalization as well, in particular as far as agricultural products are concerned. WTO agreements are made on building more open and competitive global markets and also on *the possibility* to implement criteria for food safety, animal welfare and environmental protection ('non-tradables').

In both scenarios it is assumed that *average temperatures* in Europe will rise by one degree Celsius until 2030. This projection is the average of the IPCC scenarios (IPCC, 2001). It is expected that global warming has noticeable impacts on the conditions for agricultural production in the scenario period: more droughts and water shortages in southern Europe, more flooding in areas along great rivers, and more summer and winter storms. The mid latitudes and northern Europe can, however, profit from the temperature rise and the growing seasons are lengthened.

EU-enlargements are assumed to be primarily driven by economic reasons (market size, competition) and political reasons (safety, stability) (De Mooij & Tang, 2003). In both scenarios Bulgaria and Romania enter the EU in 2007. The EFTA countries Iceland, Norway, and Switzerland join in 2015. And after a more or less successful transition, the Balkans, Turkey and the Ukraine enter the EU in 2025. This latest enlargement implies a large extension of agricultural land and rural areas, most of which, however, don't perform economically well. Significant efforts are assumed to prepare these candidate countries for their entry. Special trade relations are settled with Russia and the African Mediterranean countries.

[31] A transition is a structural change of a sector or society as a whole, involving various mutually related developments on different aggregation levels and taking a time span of at least one generation (Rotmans et al, 2003).

[32] A sensitivity analysis could be carried out in order to explore the impacts of the policy changes under alternative assumptions about these trends.

In both scenarios *welfare* is assumed to increase on the global as well as on the European level. The breakthrough of the 'knowledge economy' causes an increasing consumption, not only of (agricultural and other) products and services but also of (landscape and other) experiences (Klijn, 2005). Consumption patterns are, however, hardly predictable because they depend to a large extent on new trends and fashions. Therefore the first scenario assumes materialistic, diverse, and irregular consumption patterns and the second one in-materialistic, less diverse and more regular patterns.

Concerning *demography* it is assumed that after a decreasing rise of the total population of Europe there is a fall after 2020. This is caused by a downward trajectory of fertility rates and a further rise of life expectancy. The proportion of Europeans above the age of 65 increases significantly. The age at which full retirement starts rises above 70. The ageing of the population influences settlement and consumption patterns. More wealthy people settle in rural areas and spend a large part of their incomes on housing in a green environment and on travelling.

Finally, it is assumed that the EU will take the *Lisbon Strategy* seriously in a context of sustained discrepancies between its own economic performance and that of other world economies such as those of the US, China, and India. The implementation of the strategy differs, however, in both scenarios. The first being focused on economic welfare for Europe in general and the second on the territorial potentials of the various European regions, in line with the conclusions of the Rotterdam Conference of Ministers responsible for territorial cohesion (November 2004).

7.2.1 Scenario 'Open market'

7.2.1.1 Scenario hypotheses

In this scenario, market forces play an important part in the evolution of rural areas, in particular in the agricultural sector. This obviously results from the outcomes of the WTO negotiations (liberalisation of international markets), but is also exacerbated by a deliberate EU-policy aiming at reducing its support to the agricultural sector and to rural development in general, with the exception of fields of activity which contribute to the improvement of competitiveness and growth, such as R&D and technological development. The breakthrough of the 'knowledge economy' on the global scale implies that the European agricultural sector has to cope with the introduction of one product innovation after the other on the international markets, e.g. genetically modified raw materials and food products (Dammers et al., 2003). This is a reason to significantly enhance investments in R&D. Environmental and food safety criteria are only implemented to the extent that they stimulate the competitiveness of the agricultural sector and that this can be done in a cost-effective way. Ecological sustainability is not denied but in cases of conflict with economic growth, it is only implemented at a low pace. Rural development assistance is considered to support agriculture and tourism as economic sectors.

7.2.1.2 Driving forces

Driving forces leading to an open market for *agricultural products* are:

- *WTO negotiations,* aiming at the removal of market distortions caused by import tariffs, export subsidies, market price support, and income support.
- *EU enlargement*, leading to a growing internal market for agricultural products but also to increased competition among farmers in Europe.

- Investments in the *Trans European Network*, improving the mobility and thereby the competition between farmers inside and outside the EU.
- *Technological innovations* in the agricultural sector, strengthening the market position of competing farmers.

Main factors behind increasing commodification of and competition between *rural areas* are:
- With the rise of the '*experience economy'* (going hand in hand with the breakthrough of the 'knowledge economy') consumers are more willing to pay for experiences related to rural areas.
- The increasing amount of *leisure* further stimulates this tendency to 'consume' rural areas (country weekends, vacations).
- The significant increase in *mobility*, caused by the investments in TEN-T and the increasing car-ownership (especially in the CEECs), has the same impact.

Key factors stimulating the liberalisation of the *CAP and related EU policies* are:
- The fact that the CAP is still a very costly endeavour – 45% of the EU budget flows to the CAP.
- The incidental but very expensive and drastic measures to combat *animal diseases,* like BSE and FMD.
- The *WTO negotiations*, putting significant pressure on the EU to reduce import tariffs and export subsidies as well as market price support and income support.

7.2.1.3 Contextual elements of the transition to an open market

By 2006 the EU was for the fifth year confronted with a low economic growth rate. The midterm assessment of the Lisbon Strategy had at the end of 2004 revealed that the targets of European competitiveness could not be reached without a serious reconsideration of the efficiency of EU policies, following in that some conclusions of the Sapir Report published in 2003. The increase of the unemployment rate resulting from the progress of globalisation and in particular from the acceleration of enterprise relocation towards low-wage countries outside Europe was a determining factor for the reconsideration of all EU policies as to their economic efficiency.

A tense debate took place at EU level and within the Member States, in which roughly speaking two policy coalitions were involved. One coalition consisted of those members of the EC and the EP, Member States, and business groups wishing to achieve the Lisbon Strategy by the 'liberalization model'. According to this model agriculture should liberalize and rural areas should valorise their 'territorial capital' in order to enhance their competitiveness and economic welfare in general. Another coalition consisted of those members of the EC and the EP, Member States, environmental and third world groups wishing to achieve the Lisbon Strategy by the 'European model'. According to this model agriculture and rural areas should develop in a sustainable way along the lines of the Göteborg Strategy formulated in 2001.

After several years of debate the coalition promoting the 'liberalization model' proved to be most influential. At the end of 2008, a decision was made on the EU level that, after the reforms of *Agenda 2000* (1999) and the proposal of the EC in 2004, the CAP and RDP would be reformed in a different direction. Import tariffs and export subsidies as well as market price support and income support would be cut down. Agriculture would be treated as any other economic sector. Because of the urgency of the Lisbon Strategy the reforms would be implemented in a short period. The same decision was made regarding the Structural Funds.

The 'liberalization coalition' was supported by the fact that during the WTO negotiations the US, major developing countries like India and China, and the Cairns Group of agricultural exporters put the EU under pressure to liberalize its markets for agricultural products (Rollo, 2003). The coalition used the pressure from these actors as an argument to overcome resistance by opponents in Europe. Besides, more and more members of the EC and EP and Member States became convinced that the CAP was too much a burden for the EU budget. The burden would even become heavier if it wasn't reformed prior to further enlargements of the EU, especially the enlargement with the Ukraine and Turkey. Furthermore, the agrarian lobby became aware that the sector can only survive in a globalizing economy if it becomes more competitive and demand oriented.

7.2.1.4 The open market strategy

The reforms of the CAP, Rural Development Policy, and the Structural Funds in the 1992-2005 period were only limited to some adaptations of existing policy measures, like a reduction of market price support (compensated by an increase in income support), or the introduction of new policy measures, like production quotas and set-aside measures. It was decided, however, that in the 2007-2020 period the policy objectives as well as the policy measures should be rapidly and radically changed (Griffiths, 2002). In little more than 10 years agriculture was transformed from a highly protected and heavily subsidized sector into an open and competitive (economic!) sector. Liberalisation, deregulation, and freedom to innovate played an important role in this transition process.

The main objectives of the reforms were to reduce the 'excessive' transfers from tax payers and consumers to agriculture, to stimulate the application of production factors (land, labour, and capital) where they are most productive, to make the agricultural sector more competitive on the world market and to reduce overproduction and other market distortions (Kol, 2002). Criteria related to food safety, animal welfare, and environmental protection would only be implemented to the extent that they didn't hinder economic competitiveness or that they were forced by consumer concerns. Three reforms can be considered as milestones in the liberalization process.

Reform of 2010
The midterm review of 2010 marked the beginning of the liberalization process. In that year it was decided to gradually reduce tariffs and export subsidies to 75% compared to 2005. Despite the decision of the heads of state in 2002 to freeze the budget for Pillar 1 until 2013, it was now also decided to reduce the budget to € 30 billion (80% of the budget for 2005).[33] Moreover, the budget had to be divided among a greater number of farmers because Bulgaria and Romania had entered the EU in 2007. It was also decided to further shift direct payments from market support to income support. The European Food Authority was established to control food safety (Massink & Meester, 2002). A guideline obliged farmers to insurance themselves against animal diseases. The EU would now longer pay in cases of calamities. Environmental measures were reduced to a minimal level.

The budget for Pillar 2 (rural development) was reduced to € 4 billion in 2013 (90% of the budget for 2005). At the same time priorities changed. Most of the budget was spent on the stimulation of the wider rural economy (axis 3), especially on the diversification of economic activities and the improvement of infrastructure (mainly roads and digital networks) (AIRDR, 2004). The entrepreneurial capacity and local initiative were mobilized. By organising competitions for project ideas and providing training programmes innovative projects were triggered and facilitated. Commodification and marketing of the natural and

[33] All amounts are expressed in constant 1999 prices.

cultural heritage was considered a key issue. Farmers could play an important role in this. A significant part of the budget was spent on stimulating the competitiveness of the agricultural sector (axis 1). These payments worked as accompanying measures to the reduced Pillar 1 payments. Payments on land management / environment (axis 2) were significantly reduced because they were from now on considered the responsibility of national and regional governments. The same priorities were set for LEADER.

The objectives of the Structural Funds related to rural areas became more concentrated on the new Member States. This is true for Objective 1 (promoting the development of and structural adjustment of areas most lagging behind) as well as Objective 2 (supporting the economic and social conversion of areas facing structural difficulties). Like Rural Development Policy triggering innovative projects played an important role. The payments for rural areas (funded by EAGGF) were reduced to € 2.5 billion (90% of the budget for 2005).

Reform of 2014
Another significant step in the liberalization process was made in 2014. This reform marked the beginning of a period in which liberalization was accelerated. From 2014 until 2017 tariffs and export subsidies were further reduced to 30% compared to 2005. The budget for Pillar 1 was further reduced to € 15 billion in 2017 (40% of the budget compared to 2005). Market price support was even abolished; only income support remained. Measures to stimulate food quality and animal welfare were considered to be the responsibility of farmers, retailers and consumers. Regulations in the field of animal welfare were abandoned for the same reason.

The budget for Pillar 2 measures was further reduced to € 2.5 billion in 2017 (50% of the budget for 2005). In order to stimulate the general welfare of Europe priority was given to the economically most successful rural areas. Wider rural economy (axis 3) became further concentrated on tangible factors like the diversification of economic activities and the improvement of the physical and digital infrastructure (roads, ICT). Competitiveness of agriculture (axis 1) was intended to stimulate technological and other innovations in agricultural productions. Land management / environment (axis 2) was further reduced.

From now on the Structural Funds were first of all applied to the economically most successful rural areas *in the new Member States* since the EU was convinced that the institutional capacity of the less successful areas was too weak to absorb EU funds successfully (IRS, 2004). Like Pillar 2 of the CAP the budget for the Structural Funds applied to rural areas was further reduced to € 1.5 billion (50% of the budget for 2005).

Reform of 2017
The liberalization process was completed by the reform of 2017. At the end of the programme period 2014-2020 the import tariffs and export subsidies were almost completely abolished. Tariffs of 3 or 4 % were considered appropriate for a normal economic sector (Kol, 2002). Export subsidies were reduced to 5% compared to those in 2005. The Pillar 1 payments were reduced now to € 4 billion (10% of the budget for 2005). Pillar 2 measures were further reduced to € 1 billion (20% of the budget for 2005). Stimulation of the wider economy of rural areas was considered first of all the responsibility of the national governments.

The Structural Funds were almost completely reduced to pre-accession aid. From now on they were only applied to stimulate the economically most successful rural areas in the *candidate countries.* They should stimulate these countries to prepare themselves for their entry into the EU. Because of long negotiation processes, however, the Balkan countries, Turkey, and the Ukraine didn't enter the EU before 2025. The Structural Funds applied to rural areas were further reduced to € 0.5 billion (20% of the budget for 2005).

7.2.1.5 Impacts of the strategy

The open market strategy generated large *macro-economic impacts*. At the end of the transition period production factors (land, labour, and capital) were to a great extent applied where they were most productive in Europe. Gylfason (1995) calculated that this would generate 3 percent additional economic growth in the EU-12. In scenario 'Open market' this impact could be comparable. The enormous transfers from consumers / taxpayers to agriculture were almost completely stopped. In 1999 these transfers amounted €120 billion (Kol, 2002). In the scenario the reduction of transfers was even larger because the new Member States abolished their protective measures as well.

The abolishment of import tariffs and export subsidies generated large impacts for the developing countries. Swinbank et al. (1999) calculated that developing countries could generate € 20 billion per year extra welfare if the EU abolished its protective measures, three times the amount of the development aid they receive per year. In the scenario the impact was even larger because the New Member States abolished their import tariffs as well. Countries that used to enjoy preferential assess to protected Western markets, however, suffered from the opening up of the borders (Massink & Meester, 2002).

- **Territorial and other impacts**

Macro level
Regarding *agricultural production* the vicious circle set in motion in the last decades of the 20th century was further intensified by the open market strategy. This causes substantial structural changes in the direction of further intensification and scaling-up. New technologies (machines), chemicals (fertilizers, herbicides), and (genetically modified) crops were frequently introduced. Land from farms who didn't survive was bought on a large scale. This caused a fall in the number of farms and a substantial rise in the average farm-size. In the 2005 – 2030 period the UAA was almost quadrupled from 20 to 80 ha. The SGM rose even more than in the 1990s.

The intensification and scaling-up of production were most dominant in *large-scale arable and dairy farming*. Large-scale farming decreased in Northwest and Southern Europe but increased in most of the CEECs and Turkey where land-prices were much lower. *Intensive cattle farming and horticulture*, however, profited from the highly developed infrastructure in urbanized regions of Northwest Europe. Further scaling-up and clustering of farms and greenhouses reduced production costs (energy, waste, and transport). This enabled them to produce more efficiently for the world market. In the metropolitan areas, particularly in the Pentagon, possibilities for agrarian *nature and landscape management* were limited because RDP was almost completely abolished. Besides, increased competition made it difficult for farmers to combine these activities with efficient agricultural production. *Experience farming* didn't break through because only a small number of farmers were able to do this in a profitable way. In the peripheral areas of the CEECS and South and North Europe *subsistence farming* played a significantly more important role.

The trends of agriculture developing in the most fertile areas and giving up less-favoured areas and areas in urbanised regions, which was already dominant in the 1990s, was significantly intensified during the scenario period. The surface of agricultural land decreased in the EU-15 due to higher efficiency of productive areas and to significant rises in land-prices in urbanized regions. Subsequently, former agricultural surfaces were naturally replaced by woodland. In the countries like Poland, Romania, Turkey and the Ukraine the surface, however, increased because land-prices were low and many natural areas were cultivated. The production of *major crops* continued growing, especially cereals,

fodder crops and energetic crops. The demand for renewable energy (biomass and bio-fuels) increased because of the rapid increase of world oil prices. *Surfaces still in grass* decreased because large parts were changed into arable land. *Permanent crops* decreased rapidly. Orchard surfaces for instance further decreased in northern Europe but increased in Southern Europe and in Turkey because of the introduction of better irrigation techniques and genetically modified trees. These trends caused a reduction of *territorial cohesion.* The discipline of the market led to a further dualisation generating outspoken 'winners' and 'losers' among farmers and rural areas. This was only limited to some extent by the fact that CAP measures benefiting richer areas most were almost completely abolished.

Rural areas in urbanized regions, particularly in the Pentagon and in the metropolitan areas in the CEECs and Southern Europe, benefited economically from the further growth of residential areas, industrial estates etc. At the same time they were affected by increasing population and urbanisation causing more urban sprawl. *Rural areas with a variety of activities* also developed further in the Pentagon and in other metropolitan areas in Europe. Many of these areas, which were successful in selling luxury homes for retired people or building invented traditions, like 'shopping castles', flourished economically. In *rural areas attractive for tourism* mass-tourism became booming business. Especially at the Mediterranean and Black Sea coasts and in the Alps and Carpathian mountains local recourses were commodified and marketed successfully. *Rural areas where agriculture dominates* developed in different directions. Areas with fertile land in the Basin of Paris and in large parts of Poland and the Ukraine became economically more successful because of the (further) industrialization of production. In these areas food production competed with the production of energy crops. In Southern Europe, however, areas with less favourable conditions were confronted with the abandonment of large surfaces of agricultural land, causing an intensified downward spiral ('desertification') (Clout, 1998). *Rural areas with low accessibility* were also facing a genitive spiral. Regional actors in the North of the Nordic countries and in the East of the CEECs were not very successful in commodifying their local resources. As a result, many young people out-migrated, causing an ageing of the remaining population. All these trends caused a further reduction of territorial cohesion on the macro level (AIRDR, 2004).

Natural areas were seriously affected. Particularly in the CEECs and Turkey many natural areas were cultivated. The EU measures for afforestation were almost completely abandoned. These trends were only compensated to some extent by some regional governments and NGOs investing in nature development and by the abandonment of agricultural land, which led in some areas to natural afforestation, thus improving the potential for biomass energy production. In the open fields (e.g. in the Basin of Paris) and in the polders and deltas (e.g. in the Netherlands) scaling-up of production led to the removal of many *landscape elements*. In Western France and on the British islands many bocage landscapes were changed into open fields. The *environment* was also affected. Crop production was intensified by the increased use of nutrients, pesticides, and irrigation. This tendency was only limited to some extent by the introduction of genetically modified crops and new production techniques. The intensification of livestock-farming caused increased production of manure and emissions of ammonium. This was further enhanced by the abolishment of the cross-compliance principle. The abandonment of farmland in the Alps and the Carpathian Mountains, however, led to lower risks of avalanches, landslips, and mud-floods because of the growth of natural vegetation.

Meso level

On the national level the scenario implies also a trend towards less territorial cohesion. The trend even accelerated during the scenario period. This is true for agriculture as well as for rural areas. In the urbanised regions of the Member States, parts of land, among which high quality arable land, was given up to the ongoing process of urbanisation. But the remaining agriculture was highly profitable since intensive cattle farming and horticulture both

increased their production for the world market. In the most productive rural areas agriculture became also more profitable but in rural areas with less favourable production conditions agriculture increasingly marginalized.

The socio-economic viability of *rural areas in urbanized regions* increased during the scenario period. As part of the urbanisation process they became more and more urbanized themselves. The same is to some extend true for several *rural areas attractive for tourism* and *rural areas with a variety of activities.* The first mentioned became more urbanised by developing an extended tourist and commercial infrastructure and the last mentioned by building homes for retired people and developing service industries. At the same time the socio-economic viability of some *rural areas where agriculture dominates* and *rural areas with low accessibility* was rapidly going down. Marginalising agriculture and decreasing employment caused increased migration of younger people to urbanised areas.

Micro level
In many regions of Europe territorial cohesion was enhanced. Rural and urban areas became more and more economically, socially and culturally interlinked with one another. In rural areas in urbanized regions this was caused by the ongoing process of physical and mental (sub)urbanisation. The same is true – although to a lesser extend – for rural areas with a variety of activities because of the homes for retired people which were built and the service industries which were developed. The towns in these areas functioned more and more as regional economic, social and cultural centres. In other regions, however, territorial cohesion was going down. In rural areas in which agriculture had a weak production structure the negative spiral caused larger economic, social and cultural differences between urban and rural people.

7.2.1.6 Final territorial image

In 2030, a decade after the transition of the agricultural sector the image of the EU is quite different from that in 2005. The Union has been substantially enlarged. Its borders have been shifted a long way to the East, Russia, Syria, and Iran now being the new neighbour states. The entry of Bulgaria and Romania in 2007 and especially the entry of Ukraine and Turkey in 2025 have significantly extended the surface of agricultural land. Agriculture is characterized by a high measure of dualisation. Large-scale arable and dairy farming decreased in Northwest Europe but increased more in the CEECs and Turkey because agricultural conditions in terms of land-prices are much better there. Intensification and scaling-up of production has led to large-scale dairy and arable farms in these countries. Intensive cattle farming and horticulture are concentrated in Northwest Europe because the highly urbanized character of this region and the highly developed infrastructure enable them to efficiently produce for the world market. Experience farming occurs only on a small scale in urbanized regions. And nature and landscape management by farmers has almost completely disappeared.

Rural areas are characterized by a very high measure of dualisation as well. Most of the rural areas in urbanized regions have become urbanized themselves. This means that many rural areas where agriculture dominates have changed into rural areas in urbanized regions. Rural areas attractive for tourism have extended significantly. The enlargement of the EU has created many opportunities to exploit new coastal areas, like the Black Sea coast, and mountain areas, like the Carpathian and Balkan mountains, for mass-tourism. The intense dualisation of agriculture and rural areas has become most clearly visible in rural areas where agriculture dominates. Most of these areas are dominated by large-scale industrialised farms. These areas are densely populated and socio-economically viable. Other areas, however, are characterized now by large surfaces of abandoned farmland, many of which are now eroded or naturally forested. The same is true for rural areas with low accessibility, like the Northern parts of the Nordic countries. Socioeconomic viability and

population density in these areas are very low. In the CEECs many natural areas have been changed into farmland.

7.2.1.7 Summary

After being confronted for several years with a low economic growth rate the EU decided that the Lisbon Strategy could not be achieved without a serious reconsideration of the efficiency of EU policies. In a tense debate the policy-coalition promoting the open market strategy proved to be most influential. This coalition was supported by the WTO negotiations, the fact that the CAP was felt too much a burden for the EU budget, and the awareness of the agrarian lobby that the sector should become more competitive on the world market.

The open market strategy transformed the agricultural sector rapidly into an open and competitive economic sector. This happened in three stages: a preparation stage, an acceleration stage, and a realisation stage. During the implementation Pillar 1 and Pillar 2 measures were first gradually and then more rapidly reduced and finally almost completely abolished. In order to implement the process successfully and to provide farmers and rural areas the opportunity to adapt to the free market the implementation was stretched-out over a period of more than a decade.

The liberalization of agriculture had substantial impacts on general welfare. It stopped the large transfers from consumers/taxpayers to the agricultural sector and generated more economic growth in Europe and in the developing countries. With regard to agriculture and rural areas, however, territorial cohesion decreased substantially, particularly on the macro and meso level. The average farm-size rose substantially. Large-scale arable and dairy farming decreased in Northwest Europe but increased more in the CEECs and Turkey. Like intensive cattle farming and horticulture they were very successful on the world market. Experience farming and agricultural nature and landscape management, however, hardly survived. Rural areas in urbanized regions, which were attractive for tourism or with a variety of activities were very successful in terms of socioeconomic viability and also became more populated, but many (less successful) rural areas in which agriculture dominated or with low accessibility were faced with a downward spiral. The intensification and scaling-up of agricultural production and the booming of mass-tourism severely damaged nature, landscapes and the environment.

7.2.2 Scenario 'Sustainable rurality'

7.2.2.1 Scenario hypotheses

In order to stimulate the transformation of the enlarged internal market into a sustainable market, competition as well as environmental conditions and territorial cohesion are stimulated. The EU gives priority to a further integration of agricultural, regional, and other sectoral policies. Spatial development policies play an important role as a reference for the integration and coordination policies in rural areas. This takes the shape of a sophisticated system of cooperation between the different sectors. The CAP and RDP are reformed in an economically, socially and ecologically sustainable way. Criteria for food safety, animal welfare and environmental protection are given priority even when they conflict with economic growth. The reason for this is that the EU considers ecological and social sustainability as preconditions for economic sustainability. In the same way, rural development is considered to support the economic competitiveness of rural areas but also job creation, social cohesion in rural areas and the quality of the environment. To this end, the economic diversification of rural areas is actively promoted. This implies, however, that some protectionist elements of the CAP are maintained.

7.2.2.2 Driving forces

Driving forces behind the transition to a sustainable *agriculture* are:
- *WTO negotiations,* aiming at the reduction of market distortions caused by import tariffs, export subsidies etc. and at the same time stimulating the implementation of 'non-tradables'.
- *Consumers*, becoming more capable of steering production in the direction of organic and regional products by their spending behaviour and becoming more aware of that.
- *Technological innovations*, not only leading to higher agricultural production but also to reduced pollution and reduced water-use for irrigation.
- Rising *energy prices*, stimulating the building of (sustainable) agro-production parks and leading to a growing demand for biomass.

Important factors behind the development towards sustainable *rural areas* are:
- Because of the rise of the *experience economy* consumers / tax payers are more willing to pay for a higher quality of landscapes and the environment in general.
- *Migration* of urbanites and retirees to rural areas has an impact on the socio-economic viability of these areas but also on the demands for the quality of the landscape and the environment.
- This tendency is further stimulated by the increasing amount of *leisure* providing people more opportunities to spend time and money in attractive rural areas.

Key factors stimulating the sustainable character of the *CAP and related EU policies* are:
- *WTO negotiations*. The US and other countries put significant pressure on the EU to reduce protective measures.
- *EU Enlargement.* The accession of the CEECs is a stimulus to increase the budget for Pillar 2 in order to protect the natural and cultural heritage in the rural areas in these countries and to improve their socio-economic viability.
- *Interest groups*. Environmental groups, third world groups and other NGOs become more effective in lobbying for policy changes in the direction of sustainability.
- *Animal diseases.* Epidemic diseases like BSE and FMD contribute to the effectiveness of the lobbying activities of interest groups.

7.2.2.3 Contextual elements of the transition to sustainable rurality

Like in the 'Open market' scenario, the EU was by 2006 for the fifth year confronted with a low economic growth rate. The midterm assessment of the Lisbon Strategy in 2004 revealed that the targets of European competitiveness could not be reached without a serious reconsideration of the efficiency of all EU policies. The increase of unemployment resulting from further globalisation and in particular from enterprise relocation towards low-wage countries outside Europe was a determining factor for the reconsideration.

Like in 'Open market' a tense debate took place at EU level and within the Member States, in which two policy coalitions dominated. One coalition promoted the 'liberalization model' and the other one the 'European model'. Unlike the first scenario the coalition promoting the 'European model' now proved to be most influential. At the end of 2008, a decision was made on the EU level that the reforms of *Agenda 2000* (1999) and the proposal of the EC in 2004 were considered as first steps in the direction of a more fundamental reform of the CAP and RDP in a sustainable direction. Social and ecological sustainability were considered as preconditions for economic sustainability. More market principles would be introduced in the agricultural sector but in a framework of regulations for environmental protection and social security. In order to successfully implement the reform and to provide agriculture and rural areas the opportunity to adapt to the new conditions this would happen in a gradual way. The same decision was made regarding the Structural Funds.

The 'sustainability coalition' was supported by the growing awareness of the environment. Incidents like more frequent droughts and heat waves in Southern Europe, excessive rainfalls and floods in Northwestern and Eastern Europe, and retreating glaciers in the mountain areas convinced more and more people that the climate was changing. The incidents 'proved' that the environment should be considered as a precondition for economic and other human activities. New outbreaks of animal diseases like BSE and MFD gave further impulses to this vision. Besides, after the enlargement of 2004 the EU faced a great challenge regarding territorial cohesion. At the time of their entry the new Member States were at only 40% of the average GDP of the EU-15 and Bulgaria and Romania were even at less than 30%. Furthermore, in the subsequent WTO negotiations the EU was put under increasing pressure by the US, the Cairns Group of agricultural exporters and major developing countries like China and India to liberalize its markets for agricultural products (Rollo, 2003). At the same time agreements were made to give more weight to 'non-tradables'.

7.2.2.4 The sustainable rurality strategy

The reforms of the CAP, RDP, and the Structural Funds in the 1992-2005 period were limited to some adaptations of existing policy measures, like a reduction of market price support and an increase of income support, or the introduction of new policy measures, like production quotas and set-aside measures. It was decided, however, that in the years to come not only the policy measures but also the policy objectives should be fundamentally changed. In subsequent steps the agricultural sector would be transformed from a largely protected sector putting nature, landscapes and the environment under high pressure into a sustainable economic sector. Liberalisation within a framework of regulations ('licence to produce') and freedom to innovate within certain limits played an important role in this transition process (Dammers et al., 2003).

The main objectives of the reforms were to make agriculture and rural areas sustainable, to improve the quality and quantity of the natural and historical heritage, to make the agricultural sector more competitive on the world market, and to reduce the huge transfers from consumers / tax payers to agriculture. In cases of conflict between economic growth and the implementation of criteria related to food safety, animal welfare, and the

environment, priority would be given to these criteria. In order to achieve the 'transition towards sustainability' successfully and to provide farmers and rural areas the opportunity to adapt to the new conditions the transition was implemented in a gradual way. The following reforms were milestones in the transition process.

Reform of 2010
The aim of the reform of 2008 was to prepare the transition process. In this phase some policy changes were implemented in the direction of liberalization within the framework of regulations. Import tariffs and export subsidies were reduced to 90% of their original value.[34] Budgets were further transferred from Pillar 1 to Pillar 2 (modulation). The budget for Pillar 1 (commodity market support and direct payments) didn't change in absolute terms because the heads of state had decided in 2002 to freeze the budget at the level of € 37.5 billion until 2013.[35] The reform implied, however, a relative reduction of the budget because a consequence of the entry of Bulgaria and Romania in 2007 was that the budget had to be divided among a greater number of farmers. Besides, it was decided to further shift the direct payments from market support to income support. Regulations in the field of environment, animal welfare, animal health, and food quality (cross-compliance) now became compulsory for all Member States.

The budget for Pillar 2 (rural development) was gradually increased to € 7 billion (150% of the budget for 2005). At the same time priorities changed. Most of the budget was spent on the stimulation of the wider rural economy (axis 3), especially on the diversification of economic activities by stimulating various non-farming activities, e.g. in the tourist and service sectors. Co-ordination between public authorities was stimulated by subsidizing rural development perspectives. Cooperation between public authorities, NGOs, and business became conditional for payments. Investments were made in the tangible (roads, ICT) as well as the intangible infrastructure (institutional capacity), particularly in the CEECs. A significant part of the budget was spent on land management / environment (axis 2), which was concentrated on *maintaining* nature and landscape and preventing the abandonment of farmland. Competitiveness of agriculture (axis 1) was concentrated on increasing competitiveness of the sector, *respecting* criteria for animal welfare, environmental protection etc.

The budget for the Structural Funds related to rural areas (EAGGF) was increased to € 4.5 billion (150% of the budget for 2005). The priority objectives were concentrated on the *improvement* of economic, social and territorial cohesion, especially in the new Member States. This is true for Objective 1 (promoting the development of and structural adjustment of areas most lagging behind) as well as Objective 2 (supporting the economic and social conversion of areas facing structural difficulties). Regional Policy, like Rural Development Policy, was also aimed at stimulating the co-ordination and co-operation among actors.

Reform of 2014
The reform of 2014 marked the beginning of a period in which the 'transition towards sustainability' was accelerated. Import tariffs and export subsidies were further reduced to 60% of their 2004 value. For the first time in history it was decided to reduce the budget of the CAP not only in relative but also in absolute terms. Moreover, budgets were further transferred from Pillar 1 to Pillar 2. In the period until 2023 the budget for Pillar 1 (commodity market support and direct payments) was gradually reduced to € 22.5 billion (60% of the budget for 2005). Market support was almost completely abolished in this period; only income support remained. Criteria for environmental protection, animal health, animal welfare, and food quality were increased.

[34] All percentages presented in this section are relative to the budget level in 2004.
[35] All amounts are expressed in constant 1999 prices.

The budget for Pillar 2 (now defined 'integrated rural development') was now increased to € 11.5 billion (250% of the budget for 2005). A sophisticated system of co-ordination and co-operation on the regional level was introduced. This system consisted of integrated rural development perspectives, made by regional innovation networks, facilitated by regional knowledge centres, and implemented with the aid of regional development funds (Smeets & Blom, 2002). Wider rural economy (axis 3) was concentrated on further diversification of economic activities, e.g. by stimulating high-tech and foot-loose small and medium-sized enterprises (SMEs). Land management / environment (axis 2) was concentrated on *improving* nature and landscape and preventing the abandonment of farmland. Competitiveness of agriculture (axis 1) was not only concentrated on increasing competitiveness of agriculture but also on respecting *higher* criteria for animal welfare, environmental protection etc.

Regional Policy was gradually integrated with Rural Development Policy. The budgets for the Structural Funds related to rural areas were increased to € 7.5 billion (250% of the budget for 2005) and added to the budget for Pillar 2 (total amount: € 19 billion per year). The payments aimed at *further improving* economic, social and territorial cohesion in the new Member States. Payments were first of all applied in rural areas with a high growth potential.

Reform of 2024
The 'transition towards sustainability' was completed by the reform of 2024. In the period until 2030 import tariffs and export subsidies were further reduced to 30% of their 200µ4 value. Pillar 1 payments (commodity market support and direct payments) were reduced to € 11.5 billion (30% of the budget for 2005). Further reduction was avoided in order to be able to cope with the irregularities characteristic for the agricultural sector (Griffiths, 2002). This was considered necessary because of the climate change and its impacts on weather conditions (droughts, floods). A desire for a certain level of protectionism was, however, also at play. Concerning the direct payments income support was maintained for farmers in less favourable areas in order to guarantee a level playing field and to prevent the abandonment of farmland in these areas.

Budgets for Rural Development Policy (Pillar 2) and Regional Policy were further increased to a total amount of € 23 billion (300% of the budgets for 2005). The system of co-ordination and co-operation on the regional level was further improved by stimulating the ambitions during the making and implementing of integrated rural development schemes. Mutually learning by working visits and round-table meetings and facilitating by so-called flying brigades (teams helping to tackle bottlenecks in the process) played an important role (Dammers et al., 2004). The priorities of the three thematic axes of RDP were maintained.

7.2.2.5 Impacts of the strategy

The sustainable rurality strategy generated large *macro-economic impacts* but not as large as the open market strategy. The reason for this is that the transfers from consumers / taxpayers to agriculture were only reduced to 30% compared to 2005 in this scenario instead of 10% in the first scenario. If the sustainable rurality strategy was implemented in 2005 at once, transfers of approximately € 85 billion would have been avoided.[36] In the scenario the reduction is, however, larger because the new Member States abolished their protective measures as well. The welfare impacts for Europe in the scenario are less than the 3 percent additional economic growth (compare Gylfason, 1995). But again there is a welfare impact now in the new Member States as well.

[36] All amounts are expressed in constant 1999 prices.

As has been remarked before, developing countries could generate € 20 billion extra welfare per year if the EU abolished its protective measures completely (Swinbank et al., 1999). In the scenario the impact is on the one hand limited because the import tariffs and the export subsidies were 'only' reduced to a level of 30% compared to 2005. On the other hand the impact is enhanced because the EU counts much more Member States at the end of the scenario period. According to a rough estimation, developing countries could gain approximately € 15 billion per year. Developing countries that used to enjoy preferential assess to protected Western markets would suffer less than in the first scenario.

Macro level
The vicious circle, set in motion in the last decades of the 20th century was intensified but not so much as by the open market strategy. The reason for this is that agriculture was not completely left to the mercy of the world market. Nevertheless, the number of farms decreased and the average farm-size increased gradually but certainly. This is especially true in the CEECs and later in Turkey. Although small farms no longer dominated in these countries, many of them survived, e.g. by alternative income resources. In the period 2000 – 2030, the UAA in the EU-15 was almost tripled from 20 to 60 ha. The SGM increased more than in the 1990s.

The concentration and scaling-up of *large-scale agriculture* was moderated. Arable and dairy farming increased most in rural areas with low land-prices in Poland, the Baltic States, and the Ukraine. In Northwestern and Southern Europe both types of farming decreased. Many *intensive cattle farms and horticulture* settled on agro-production parks, mainly in the Pentagon. Scaling-up and clustering reduced production costs and provided possibilities for recycling manure, waste etc. Regulations for animal welfare, however, limited further intensification. *Experience farming* broke through in the metropolitan areas inside and outside the Pentagon and in rural areas with small-scale landscapes in East and South Europe. Consumers' preferences for organic and regional products and for services provided by farmers (camp-sites, training facilities) increased. RDP facilitated farmers to professionalize themselves (Van Eck et al., 2002). The growing demand for cultural landscapes provided opportunities for agrarian *nature and landscape management*, particularly in small-scale landscapes. The increased and intensified programmes for rural development made *subsistence farming* more and more superficial in the peripheral regions of the CEECs.

The trend of agriculture developing in the most fertile areas and giving up less-favoured areas and areas in urbanised regions was first limited and later even reduced. The surface of agricultural land decreased to a certain extent in the EU-15 because in urbanized regions land-prices rose. In Eastern Europe and in Turkey the surface, however, increased because land-prices were low and 'waste land' was cultivated. The production of cereals, fodder crops, energy crops and other *major crops* increased moderately. New farming technologies and chemicals made increased production without excessive pollution possible. Moreover, several genetically modified energy crops were introduced. Large parts of the *surfaces still in grass* – but not as large as in the first scenario – were changed into arable land. Regarding *permanent crops,* orchard surfaces decreased in Northwestern and Eastern Europe. They increased, however, in Southern Europe and in Turkey because better irrigation techniques were introduced and orchards were cultivated for experience farming and landscape management. The trend of reduced *territorial cohesion* was first limited and later changed into a tendency of increased cohesion. The principle of liberalization within a framework of regulation was successful to a great extent, particularly the measures stimulating diversified farming.

Rural areas in urbanized regions in the Pentagon and even more those around the metropolitan areas outside the Pentagon benefited from the further growth of residential areas, cultural amenities etc. At the same time, they were affected by further population

and urbanisation. *Rural areas with a variety of activities* developed throughout Europe, particularly in Finland, Poland, the Czech Republic and Spain. Investments in the tangible infrastructure (including park-like environments) and intangible infrastructure made these areas attractive for knowledge intensive SMEs and wealthy urbanites (households with children as well as retirees). *Rural areas attractive for tourism* flourished without putting the environment under too much pressure. This was not only true for coastal and mountain areas but also for small scale landscapes, like the 'bocages' in France and the UK and the 'montados' in Spain and Portugal. *Rural areas where agriculture dominates* diversified. In the fertile areas of France, Germany, Poland and the Ukraine, agricultural production further modernized. In these areas food production increasingly competed with the production of energy crops. In Eastern and Southern Europe rural areas, stimulated by RDP and Regional Policy, became economically more diversified. Some *rural areas with low accessibility* were successful in commodifying and marketing local resources, particularly rural areas with large-scale natural landscapes in the North of the Nordic countries and the East of the CEECs. Luxurious forms of nature-tourism were developed together with the necessary tourist infrastructure. Other rural areas, however, continued to face a negative spiral because of their lack of institutional capacity. Like agriculture, the trend of reduced *territorial cohesion* was first limited and later changed into a tendency of increased cohesion. Only some rural areas with low accessibility lagged behind.

Natural areas increased in this scenario. Although nature in the CEECs and Turkey was changed into farmland this was more than compensated by afforestation and nature development on less productive and abandoned farmland in these countries. Increased agricultural productivity was combined with development of *landscape elements*. In the open fields, where intensification and scaling-up dominated, farmers were paid to develop large scale landscape elements. Agro-production parks, where intensive cattle farming and horticulture concentrated, were also embellished with landscape elements. Many bocages and other small-scale landscapes were restored. Increased agricultural productivity was also combined with reduced *environmental* pollution. The introduction of new techniques and chemicals and the increase of organic farming played an important role in the decreasing use of chemicals. The recycling of manure and waste in agro-production parks reduced pollution as well. Compulsory cross-compliance and subsequent enhancement of agri-environmental payments further stimulated this tendency. Afforestation and extensive farming on abandoned farmland in the Pyrenees, the Alps and the Carpathian Mountains reduced the risks of avalanches, landslips etc.

Meso level
On the national level the same tendency could be observed as on the macro level regarding territorial cohesion. In the urbanised regions of the Member States parts of land were given up to urbanisation but not so much as in the first scenario. The remaining agriculture continued to be profitable since intensive cattle farming and horticulture as well as experience farming gained market shares. In the most productive rural areas agriculture became more profitable because of further modernisation and the introduction of energy crops. In the most productive areas of the CEECs agriculture became even more profitable than ever before. In rural areas with less favourable production conditions marginalization was limited by diversification of activities.

The socio-economic viability of *rural areas in urbanized regions* increased but not so much as in 'Open market'. The attractive park-like environment in many of these rural areas attracted small-scale enterprises and urbanites. In many Member states *rural areas attractive for tourism*, *rural areas where agriculture dominates* and *rural areas with a variety of activities* also improved their socio-economic viability. This was stimulated by sustainable tourism, modernisation of agriculture, and diversification of economic activities respectively. Many *rural areas with low accessibility* improved their socio-economic viability

as well by stimulating luxurious forms of nature-tourism. Several rural areas with a weak institutional capacity, however, lagged behind.

Micro level
In many regions of Europe the same tendencies regarding territorial cohesion could be observed as on the macro and meso level. Rural and urban areas became more economically, socially and culturally interlinked with one another than in the first scenario. In rural areas in urbanized regions this was caused by the process of urbanisation. The same is true – although to a lesser extend – for rural areas with a variety of activities because of the homes for retired people which were built and the service industries which were developed. Only in some rural areas with low accessibility, particularly those which were not successful in mobilising enough institutional capacity, territorial cohesion continued to go down.

7.2.2.6 Final territorial image

In 2030, after the transition of the agricultural sector, the image of the EU is quite different from that in 2005. The EU has been substantially enlarged. Its borders have been shifted a long way to the East. The entry of Bulgaria, Romania in 2007 and especially the entry of the Ukraine and Turkey in 2025 have significantly extended the surface of agricultural land. Arable and dairy farming have increased in these countries because agricultural conditions in terms of land-prices and wages are better. In Northwestern and Southern Europe, however, both types of farming have decreased. Many large scale farms have developed here. Intensive cattle farming and horticulture are concentrated in agro-production parks in the Pentagon because the highly urbanized character of this region and the highly developed infrastructure enable them to efficiently produce for the world market. Experience farming takes place in urbanized regions and in small-scale landscapes. Nature and landscape management by farmers is also found in small-scale landscapes.

Many rural areas in urbanized regions have become urbanized themselves, but not so many as in the first scenario. Some rural areas where agriculture dominates have changed in their turn into rural areas in urbanized regions. Rural areas attractive for tourism have extended moderately. The enlargement of the EU has created new opportunities to develop tourism and outdoor recreation in coastal areas, like the Danube delta, but also in small-scale landscapes, like Bohemia. The dualisation of agriculture and rural areas has noticeably been reduced. Although the most fertile areas in Europe are dominated by large-scale dairy farming and to a lesser extent by arable farming, both farm types are not as dominant as in the first scenario. Abandoned farmland also occurs to a much lesser extent. Various rural areas with low accessibility, like the North of the Nordic countries and the East of Poland, are preserved for luxurious forms of nature-tourism. In the CEECs a limited surface of natural areas has been changed into farmland. This has been more than compensated by nature development in other areas.

7.2.2.7 Summary

After being confronted for several years with a low economic growth rate the EU decided that the Lisbon Strategy could not be realized without a serious reconsideration of the efficiency of EU policies. In a tense debate the policy-coalition promoting the sustainable rurality strategy appeared to be most influential. This coalition was supported by the growing awareness of the environment (which was in its turn stimulated by several incidents related to climate change), the fact that the EU after the enlargement of 2004 faced a great challenge regarding territorial cohesion, and the increasing pressure of the WTO to liberalize the markets for agricultural products.

The sustainable rurality strategy transformed the agricultural sector to a large extent into a sustainable economic sector. This happened in three stages: a preparation stage, an acceleration stage, and an implementation stage. During the implementation Pillar 1 measures (commodity market support and direct payments) were significantly reduced but at the same time Pillar 2 measures (now defined as 'integrated rural development') were strongly enhanced. In order to implement the transformation successfully and to provide farmers and rural areas the opportunity to adapt to the new conditions, implementation was stretched-out over a period of a generation.

The sustainable rurality strategy had large impacts on general welfare but not as large as the liberalization strategy. It reduced the large transfers from consumers/taxpayers to the agricultural sector and generated more economic growth in Europe and in the developing countries. Regarding agriculture and rural areas the same tendencies could be observed on the macro, meso and micro level. The trend of reduced territorial cohesion was first limited and later changed into a tendency towards increased cohesion. Many large-scale diary and arable farms moved to the CEECs and Turkey. Dairy farming and intensive cattle farming were successful on the world market. Experience farming and agricultural nature and landscape management were successful on regional markets. Arable farming, however, lost market shares. Rural areas in urbanized regions, which were attractive for tourism or in which agriculture dominated experienced increasing socioeconomic viability and further population growth. The same is true for many rural areas with a variety of activities and some rural areas with low accessibility. Only rural areas with low accessibility which were not able to mobilise enough institutional capacity lagged behind.

7.2.3 Main issues resulting from the scenarios

The open market strategy and the sustainable rurality strategy generate various issues for policy-makers on the EU-level and other levels of decision-making. Some important issues are mentioned below together with their links to the policy-options in the ESDP (between brackets). Most of these issues are related to both scenarios although not to the same extent:

- Mobilisation of the local recourses ('territorial capital') of the various rural areas in Europe.
- Promoting diversified development strategies sensitive to the local potentials of rural areas (13, 21).
- Promoting and supporting information exchange between rural areas in the enlarged EU (16).
- Exploitation of the development potential of tourism in rural areas (18).
- Preventing downward spirals in rural areas with low socioeconomic viability.
- Commodifying and marketing of cultural landscape and other local qualities of rural areas (53).
- Guaranteeing a minimum acceptable level of environmental protection in rural areas (14).
- Preventing the dissemination of genetically modified plants and seeds.
- Preventing abandonment of farmland or using it in other productive ways.

7.2.4 Possible ESPON indicators for the rural development scenarios

The 'ESPON-Database' contains the following key indicators and variables related to agriculture and rural development. The indicators are the same for both scenarios.

Agriculture
- Total agricultural areas: percentage of total area which is UAA.
- Agricultural area by main crops: percentage of UAA which is arable, fallow, under permanent crops or permanent grass.
- Average farm-size per region: hectares of UAA per holding and SGM per holding.
- Agricultural subsidies per region: value of agricultural subsidies per hectare UAA.
- Pollution: value of fertilizer input per hectare of arable land.

Rural development
- Location of rural areas: urban – rural typology.
- Land-use in rural areas: arable land, pastures, permanent crops, heterogeneous agricultural areas, forests, open spaces with little or no vegetation, inland waters, inland wetlands, marine waters, marine wetlands, and seas and oceans.
- Wealth and income in rural areas: GDP in PPS per inhabitant and GDP in PPS per inhabitant in EU average.
- Population in rural areas: population density, population by age groups, percentage share of population in the ages over 65, and migratory balances pr 1.000 inhabitants.
- Rural development subsidies per region: not available yet.

8. Thematic scenario 'Climate change'

Aldert de Vries (NISR)

8.1 Scenario base: climate change

8.1.1 Present situation and trends

8.1.1.1 Current state of affairs

Climate change is supposed to be the biggest environmental threat in future, with rather unpredictable consequences. Dealing with climate change means dealing with long-term processes (decades to centuries), with a large degree of uncertainty. In this text, magnitude, time span, uncertainties and impacts of climate change are put into perspective, as well as current and possible policy reactions.

The causes and consequences of climate change can be simplified by a chain of causalities and consequences. Emissions from transport, industry and other sectors lead to increasing atmospheric greenhouse gas (GHG) concentration. This concentration, in turn, leads to many climatologic changes: temperature rise, difference in annual precipitation, and occurrence of extreme weather events. As a consequence, ecosystems change or move geographically, hydrological regimes of rivers change, and ice and snow cover are retreating. Both climatologic and other natural consequences of climate change affect society in a number of ways, varying from increased natural hazards to persistent water scarcity.

8.1.1.2 Trends and territorialization

Many figures have been published on climate change. Emission rates have started to increase since the 1850s at the beginning of the industrialization age. Atmospheric concentrations of greenhouse gases started to rise from 280 ppm to 375 ppm from 1900 to 2000, with a sharp increase in the last decades. Concentrations in 2000 are the highest of the last 400,000 years (IPCC, 2001).
The most evident climate response is the rise of average world temperature by 0.7 C; in Europe average temperature rose by 0.95 C (EEA, 2004). Precipitation patterns have changed, too, with a 10 to 40% increase in Northern Europe, and up to a 20% decrease in the south. The occurrence of extreme weather events has not convincingly changed, although some indicators point in this direction.
Some natural consequences are very clearly related to climate change. Sea level has risen by 15 cm on average due to melting of arctic ice. Mountain glaciers in the Alps are retreating, and growing season in Central Europe has increased by 10 days since 1960.
Other events are harder to relate to climate change, both because of other factors interfering, the incidental nature of certain extreme events, and increasing vulnerability of societies. Floods might for example be caused by increased built up areas, and the damages might have increased due to recent urbanization in flood-prone areas.
Nevertheless, indicators exist that different parts of Europe are experiencing some consequences already. In the past 20 years, the number of large floods has been exceptionally high in Central Europe, whereas drought has seriously affected agricultural production systems in the south.

8.1.1.3 Projections and expert visions

To estimate future climate change, the IPCC has identified six scenarios of greenhouse gas emission, according to different socio-economic and technological developments. For each emission scenario, climate change has been quantified by applying a range of models. The difficulty with these models, though, is the uncertainty about the exact mechanism of climate change. The influence of CO2 emission on climate change is (almost) without dispute, but the interactions between emission, concentration and climate change are not fully understood. As a result, each scenario presents a range from a possible minimum to a possible maximum climate change impact.
Between the scenarios and the uncertainties altogether, the minimum expected temperature rise is expected to vary between 1.4 and 5.8 C worldwide in the year 2100, as compared to 1990 levels. For Europe, figures are slightly higher: 2.0 and 6.3 C. All European regions will be affected, although to a lesser extent in the north. In all scenarios, rainfall will be less in the South, whereas Northern Europe is expected to receive more rainfall. Extreme weather events are expected to increase, although very little has been unraveled by science so far.
For the year 2030, the difference between scenarios is very small. This is illustrated by the small variation of temperature rise predicted by 2030, all less than 1° C. The small differences are due to the large time lag existing between changing emission rates, and the consecutive climate change and its impacts. A reduction of CO2 emissions within 10 to 50 years leads to a stabilization of atmospheric CO2 concentrations in 100 years, a temperature stabilization in a few centuries, while sea level rise continues even up to millennia.

Impacts on natural systems and society will be large, but only be felt seriously after the year 2030. Most important impacts are water shortage, desertification, forest fires, decreasing tourism and agriculture in Southern Europe. In the north, floods are expected to be more intense and frequent. Agriculture will expand northwards. Mountainous areas are affected by shrinking winter seasons, negatively affecting tourism. Biodiversity is at threat in most areas. And with frequent heat waves, human casualties will increase. Coastal areas will be affected on a very long term by sea level rises of almost 1 meter by 2100 and possibly up till 5 or 10 meters in the century thereafter.
A more precise estimation of climate change impacts on a regional level has not been published, yet. This is due to the difficulties to regionalize climate change itself, particularly the extreme weather events leading to floods, draughts and storm surges. Several projects are under way to fill this gap (PRUDENCE, ENSEMBLES), but scientists state that they are not yet at the promised level where regional climate models can really influence policy-making.

8.1.1.4 Coping mechanisms

There are two coping mechanisms to deal with climate change: mitigation and adaptation. Mitigation measures try to reduce greenhouse gas emission and therefore temper the magnitude of climate change. Results can only be expected at the very long run. Mitigation can be in the form of emission reduction (reducing transport or cleaner technology) or capture of CO2 (forest, agriculture).
Adaptation measures are interventions to deal with the impacts of climate change. Adaptation can be pro-active, or preventive, which means that investments take place to prepare for events that might eventually happen. Reserving more space for river beds is a preventive measure; transformation to a less water consuming agriculture in drought areas is another example. Measures can also be re-active. Actions of this kind only deal with the consequences of events as they happen. Reparation of farmers´income after misharvest or flooding is an example.

In producing scenarios for climate change impacts, mitigation and adaptation measures must be taken into account. If mitigation proves successful, emission rates are lower. If adaptation measures are put in place, climate change impacts will not be as serious as they will be without. The other side of the coin is that both measures require visionary and often costly measures. These measures in themselves might have large spatial impacts, too, like the promotion of sustainable energy by wind and bio energy, by water pricing in drought areas, by maintaining landscapes against desertification, or by capturing CO2 through large scale reforestation programs. Politicians might be reluctant because the results of their efforts might never be proved, given the enormous uncertainties and large time span of climate change processes.

8.1.2 Existing relevant EU policies

8.1.2.1 Existing policies

Until now, explicit EU climate change policies are exclusively focused on mitigation efforts to reduce emission of greenhouse gases. They are geared along two lines: first by defining targeted climate change policies, and second by integrating climate change in sector policies. Examples of specific climate change policy are the implementation of a greenhouse gas emission monitoring system and the Directive on Greenhouse Gas Emission Trading (2003) which allows for flexible application of trade schemes. Best example of integrated sector policies is the European Program on Climate Change (EPCC, 2001). Most involved sector policies were energy (energy efficiency, promotion of renewable energy, CO2-energy tax, energy networks) and transport (energy efficient transport, focus on rail and water transport, road pricing).
Aside from the Kyoto targets, the EU has put a long term goal to limit global mean temperature increase to 2° C above pre-industrial levels. This requires in the long term a stabilization of GHG atmospheric concentration of well below 550 ppm. The EU stated that this requires a serious limitation of emission rates to 60% below the 1990 level by 2050. How this should be achieved is still to be negotiated.

An EU framework for adaptation measures to climate change impacts is missing so far. The Sixth Environmental Action Program says the EU should prepare for measures aimed at adaptation to the consequences of climate change, by 1) reviewing Community policies, in particular those relevant to climate change, so that adaptation is addressed adequately in investment decision; 2) encouraging regional climate modeling and assessments both to prepare regional adaptation measures, and to support awareness rising among citizens and business. The 6EAP also underscores the need for consistent policy on prevention, preparedness and response to natural man-made and other risks.

8.1.2.2 Policy impacts

The two main topics in emission reduction are the internalization of climate costs of energy use by taxes, and the way technological innovation should be promoted. On the internalization issue, little progress has been made. Commissions´ initiatives in this direction have been vetoed since 1992. Only in 2003 the first agreement on taxes has been made, with many exemptions, long introduction periods and applicable only to a few sectors. Technological innovation, on the other side, has been successful to some extent. The car industry has voluntarily committed to emission reductions in EU negotiations, and governments have also invested in clean technology implementation, like wind energy.
These and other mitigation measures have to some extent been successful: emission has fallen by 3% since 1990. However, reduction targets are not being met, and emission rates

are increasing again since 2000. Measures currently in place will not allow the EU to achieve its Kyoto target (Commission of the EU, 2003).
The spatial effects of these measures have not been significant so far. The only exception is the promotion of wind energy, which has increased and changed landscapes in some parts (Germany, Spain). Limitations due to taxing high emission use of transport or conventional technology are not being felt.

Impacts of adaptation measures have not been systematized due to the lack of a EU policy framework on climate change adaptation. Programs addressing issues which can be classified as adaptation measures have not been reviewed for the purpose of this text.

8.1.2.3 Current relevant policy debates

The EU policy debate on climate change focuses on three issues: the extent to which climate change policy is needed, the mechanisms which are most appropriate to reduce emission rates, and the way adaptation measures should be carried out.
Firstly, European countries generally consider climate change as a serious threat which requires immediate action. The latest EEA publications urge for accelerated GHG emission reduction if the 2° C target is to be met. Although the EEA is rather optimistic in possibilities to do so, the additional measures would cost up to 0,6 % of EU GDP. Is Europe prepared to pay that price?
Secondly, there is a large difference of opinions between those advocating enforcement of lower emission rates by pricing the polluters, and those in favour of stimulating measures to shift towards clean technologies. Another debate concerns the way emissions can be traded. Disagreement exists whether emission reduction should be achieved in a nation's own territory, or if excessive emission rates can be compensated by buy-offs from other countries.
Thirdly, the need for EU-funded adaptation measures is discussed. Since damages of any kind are so difficult to relate to specific climate change impacts, adaptation measures are hard to quantify. On the other hand, solidarity in handling climate change impacts between countries which are and are not hit by its consequences appeals to the basic principles of the EU.

8.1.3 Most important driving forces

8.1.3.1 Driving forces of climate change

Evidently, the driving force behind climate change is the emission of greenhouse gases. The rate of greenhouse gas emission depends positively on economic growth and negatively on the introduction of clean technologies. There are, on the other hand, some forces which temper or aggravate this force. These forces are the natural systems of sinks and emissions of CO2. Vegetation captures CO2, therefore an increase of vegetation cover worldwide extracts greenhouse gas from the atmosphere. Water, snow and ice also store CO2. Although these natural forces are to be taken into account, human induced emission rates are potentially much higher in quantities.

8.1.3.2 Driving forces from science, society and policy

Climate scientists determine to a large extent the agenda for climate change policies. If they would not have published about the issue, society would not be alarmed. As a result, there is a pressure on scientists to produce more consistent predictions on climate change impacts than what is currently available. If scientists fail to minimize the current uncertainties, certain parts of society might lose interest in the issue.

In society, environmental lobby groups have been important in putting climate change on the agenda. On the other hand, business groups are often combating measures which might harm economic growth. Overall, societies attitude is crucial in the way policy changes are acceptable. Road or water pricing in an atmosphere of urgency tends to be more successful than in an adverse climate of uncertainties whether these measures will at all address the problem.
The political arena about climate change is very much determined by worldwide developments, particularly on mitigation measures. Any emission reduction in Europe is worthless if the US, Asia and other rapidly developing countries are rapidly increasing their emission due to economic growth and limited convincement to reduce emission rates.
It is important to stress that European regions contribute differently to climate change by varying emission rates, and that the consequences of climate change are unequally spread over Europe, too. Regions which hardly produce greenhouse gases, but receive many impacts might have a different standpoint to climate change policies than other regions.

8.1.3.3 Relation with other themes

Causes and consequences of climate change, together with the coping mechanisms proposed by society and policy make the issue of climate change extremely interdisciplinary. The most relevant issues are mentioned, without intention to prioritize or to be exhaustive.

- Economy: high growth means more emission and more climate change
- Technology: clean technology means less emission.
- Agriculture: potentials for agriculture change according to changing climate zones and water availability.
- Energy: alternative energy means less emission, but potentially large spatial impacts (generation of wind energy, production areas for biofuel, other mechanisms of transport of energy).
- Transport: as alternative sources of energy do not become available, reduction of transport might be enforced.
- Hazards in general: these might increase due to climate change (floods, droughts).
- Tourism: areas which become less or more attractive.
- Nature: ecological zones shift geographically, stressing the survival of many vulnerable species.

8.1.4 Identification of scenario hypotheses

It could be argued that the magnitude of climate change and its impacts should be put at the core of scenario building. However, differences between climate change projections are only becoming significant after a 30 to 50 years time period. Any extreme climate fluctuations before 2030 would be rather unrealistic.
Since ESPON scenarios look forward to 2030, only one storyline for climate conditions has been put forward. Global warming has continued, northern Europe has received more intensive rainfalls, and southern Europe has faced serious droughts and heat waves. However, the magnitude of these developments has not been dramatic until 2030.

What might considerably differ in the next 25 years is societies and politicians´ attitude towards climate change. Two different scenario hypotheses are built around two extreme policy standpoints on climate change: *face consequences as they come* or *prepare for the worst*. These two opposing standpoints are the base for the story lines of both sketches. In the first scenario, only weak measures are taken, whereas in the second sketch, all will be done to reduce emissions, and to prevent disastrous damages by taking adaptation measures.

The reason for identifying coping mechanism as a base for the two climate change scenarios is the developments of the past three years, which point to an increasingly difficult situation to achieve international commitments to reduction of greenhouse gases. This alarming situation, also stressed by the G8 presidency, justifies the standpoint that the world, and Europe in particular might be at a breakpoint between the two scenarios.
The emphasis of the scenarios is on the impacts of climate change and adaptation measures to deal with those impacts. Impacts might have very different consequences across the European territory. At the same time, no scenarios have been made before on impacts and the effect of adaptation measures. Scientific knowledge about the effectiveness of adaptation is still immature. Therefore, the scenarios provide for a thinking exercise on how adaptation could help alleviate the worst consequences of climate change.
Greenhouse gas emissions and mitigation measures to reduce them, are briefly included in the scenarios. For this purpose, the EEA scenarios, published in 2005, are copied. Scenario 1 coincides with the baseline GHG emission scenario; scenario 2 is based on the low GHG emission scenario. The pathway how to get to these emission reductions are taken from EEA scenarios as well.

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8.2 Scenarios

8.2.1 Scenario 1: 'Repairing instead of preventing'

8.2.1.1 Scenario hypothesis

The potential magnitude of climate change over a long time period has been recognized, but the main players in the policy arena are reluctant to take preventive, sometimes drastic measures. As a result, emission rates are slightly higher in 2030 than they were in 1990, and climate change impacts hit as they come along. Only reparation measures are taken after events happened.

8.2.1.2 Driving forces

Driving forces related to possible attitudes and policy responses regarding climate change are among others:

- The existence of other important priorities in the public debate which overshadow the issue of climate change, such as security and terrorism, immigration and integration, population ageing, boosting economic development;
- Uncertainty about magnitude and impacts of climate change;
- Difficulties to identify cost-effectiveness of long term adaptation measures.
- Insufficient awareness about the potential impacts of prevention measures;
- Resistance of society and stakeholders towards changing attitudes and practices.

8.2.1.3 Context

Although growing evidence and public concern about climate change took place between 1990 and 2005, this issue could not improve its position in the political agenda. Alternative proposals based on a trust in market-driven development of clean technologies by US and Asian countries gained positions as compared to the Kyoto emission regulation approach advocated by the EU.
Moreover, no clear ideas about adaptation strategies had been developed by 2005, more than general statements about the high vulnerability of developing countries. Extreme weather events in 2002 and 2003 led to the initiation of the most relevant prevention measures, such as an EU flood regulation plan, and some local initiatives on the prevention of deaths in case of heat waves. In spite of initiatives in some countries (UK, Finland, Spain) to think of long term adaptation planning, this way of thinking was still at a very early stage.

8.2.1.4 Scenario process

The implementation of the Kyoto Protocol in the EU followed a problematic pathway. Although the Protocol came into force in 2005, and despite the introduction of an emission rights market, few additional measures were taken. No tax was put on conventional energy, because this was hampering economic growth. Public spending on R&D efforts for the development of clean technology was not increased. Optimism reigned that market forces would promote this technology, pushed by high oil prices.
In 2008, it was clear that the EU emission rate was 10% higher as the Kyoto targets proscribed (1% above 1990 level), and emission levels worldwide increased even more. Although a new climate protocol was drafted, its targets were considerably less ambitious as foreseen by the original EU position in 2005.

Meanwhile, climate change took its toll in different ways across several regions in Europe. In southern Europe, 2004/2005 drought was followed by more and longer drought periods in the years after. Northern Europe was hit by floods of different magnitude, whereas some years with heat waves of the magnitude of the 2003 summer repeated. Average climate values like temperature and growing season increased on general.

As a result, many problems unfolded. *Energy supply* was threatened in several occasions. In some regions, such as Corsica, it had been necessary to urgently import oil-fuelled machinery to produce electricity, because hydro-electric plants had no more water reserves. Over all Europe, power plants temporarily decreased their capacity in times of low river discharge, causing some alarming shortages of electricity in times of heat waves, when consumption of air-conditioning was at its highest.

Water scarcity was an important issue in many southern European countries. Serious shortages only occurred for agriculture, however, it had its effect on the price of industrial and drinking water.

Agriculture was affected mostly negatively in southern Europe. Existing production systems with a high demand for irrigation water were facing heavy losses due to years with water shortages. Changing climate affected all regions in Europe, where ideal growing conditions for a certain crop shifted northwards. This process put particularly dryland agriculture in southern Europe at stake, whereas regions like southern Scandinavia saw there agricultural potential increase. Numerous rural areas in the central and northern parts of Europe had to compensate for the decline of agricultural production in southern Europe. Production of dairy products, vegetables and fruits intensified and the production of energy crops strongly developed. Rural areas were therefore put under high production pressure while they were more and more abandoned by farmers in southern Europe.

Heavy rainfall caused more *floods*, particularly in northern Europe. Damages were significant, because a lot of factors were working against the development of prevention measures. New settlements were developed along rivers due to land speculation and existing building rights.

Sustainable landscape management in southern rural areas became extremely difficult. Extreme rainfall events caused numerous damages to soil structures, but were not very beneficial to the re-constitution of underground water reserves, because their duration was too short and their occurrence too irregular. Every year, in particular in summer time, numerous forest fires destroyed large forest areas in southern regions, causing damages also to settlements. The more forests were destroyed, the more the water and humidity retention capacity was reduced. This vicious circle led to more severe constraints in terms of water management and occasioned the washing of soil through periodic heavy rainfalls.

Biodiversity decreased or altered in most areas due to changing climatic conditions. Some species could migrate, but many couldn't because of the isolated location of their living environment. As a result, many species became extinct.

Tourism was affected, too. In southern coastal regions, mass tourism was confronted to a significant shortage of water supply. The construction of de-salinisation plants of sea water became generalized and this absorbed important amounts of resources and increased the price of holidays. The attractiveness of these regions was also reduced by the fact that numerous highly water consuming facilities such as golf terrains, large swimming pools, artificial parks and green areas etc. had to be restricted. Winter tourism in mountain regions also lost importance, because the occurrence of snow falls became more and more irregular. Seasons for skiing started later and ended sooner. On the other hand, new tourism opportunities grew in central Europe, particularly in coastal areas, where a more stable weather conditions attracted new tourists. All together, the economic importance of tourism in southern Europe declined, whereas it increased in Northern Europe. A significant revival of tourism could be observed in central and northern Europe, but benefiting also to a number of mountainous areas. Winter sport in Nordic countries became very popular.

All material damages caused by the different hazards summed to ever growing losses in terms of money. Insurance companies were forced to change their business models, because costs became far to high to maintain full coverage of all risks.

Human losses were becoming important in times of heat waves and floods, notwithstanding some measures like better attention to elderly people. The spread of lyme disease had accelerated because of favorable conditions for its transmitter; teak.

By 2015, these developments delivered a picture of increased vulnerability to climate change, in an environment which was adverse to taking costly measures for both mitigation and adaptation measures. Therefore, politics reacted in a defensive way to these developments.

On mitigation, ongoing energy intensity measures were successful. However, the role of hydro-electricity in energy supply, which had been the most important renewable energy source in southern mountainous regions, decreased significantly. Political pressure for building new nuclear and coal power plants developed.

The intensity of damages generated by climate change had reached such levels that national governments could not cope with the numerous requests for subsidies to finance repair works and to compensate for the loss of farmers' revenue. After difficult negotiations, a specific fund was created in the EU budget, on the model of the budget line for natural hazards created at the end of the 1990s, but with a significantly higher amount of resources. This amount had to be regularly increased. However, no large investments were made for adaptation measures in the long run. The lack of cost-effectiveness calculations refrained the EU from doing larger investments.

By 2030, mitigation measures proved to be too small to make a difference. While new technologies made it possible to reduce nominally the amounts of greenhouse gas emissions, the increase of traffic flows, the development of new coal-fired power plants aiming at counteracting the high price levels of oil and gas, generated large volumes of greenhouse gas emissions. EU greenhouse gas emission was still 8% above the 1990 levels. Climate scientists agreed that a temperature rise of 4° C by 2100 was unavoidable, even if drastic measures would be put in place before 2050.

Damages caused by natural hazards had further increased, and the production basis of the most affected regions (like rural and coastal areas in the south) was seriously deteriorated. EU hazard funds could not cope anymore with the magnitude of the damages.

8.2.1.5 Impacts

Macro-economic impacts

Macro-economic impacts of mitigation measures were negligible, since only cost-effective measures were put in place. However, the costs of new measures towards 2050, needed to prevent a catastrophic climate change towards 2100, are huge.

The macro-economic impacts of natural hazards caused by climate change have been significant. On the one hand, sudden events, such as forest fires of flooding caused important damages to settlements and landscapes which made expensive measures for repair and maintenance necessary. On the other hand, the economic capacity declined structurally in a number of regions, in particular in southern Europe, and more particularly in rural regions and in tourist areas (coasts and mountains). The loss of revenue of the economic stakeholders concerned had to be compensated for by the distribution of resources from public budgets.

Regional impacts

At macro-scale, a clear difference existed between northern and southern Europe. Mediterranean, South-West and Southeast Europe were most severely hit by climate change impacts through highest temperature rises, combined with prolonged drought periods. The attractiveness of southern Europe decreased, causing a slowdown of the southward migration flow. Economic development was hampered in the south, causing the economic gravity point to move northward. Central and Northern Europe experienced a boost on agricultural development, whereas Southern Europe saw this sector decline.

At meso-scale, several territorial divisions can be made. In *rural areas* in southern Europe, emigration processes that already took place in 2005 have become more widespread, due to a worsening situation in the agricultural sector, and a lack of alternatives. Abandoned, desertificated regions could be found in large parts of all Mediterranean countries. Rural areas in northern Europe were undergoing increasing pressure to expand agricultural production, due to the decrease of production in Southern Europe. This could affect negatively on natural and environmental conditions.

Mountainous areas proved particularly vulnerable to climate change. The loss of biodiversity was high in these regions, making natural management by corridor development extremely difficult. Decreasing snow cover led to declining winter tourism; by 2030, there were no more ski resorts below 1500 meters in the Alps. Water retention in mountainous areas became more difficult, particularly in the south, which led to the loss of another production basis for these areas: hydropower and irrigation water.

Coastal areas throughout Europe experienced large changes. Large scale tourism in the Mediterranean had suffered losses due to adverse climate conditions in summer time. These could not be compensated by increased attractiveness in spring and autumn. On the other hand, coastal areas in Central Europe were more and more invaded by mass tourism due to stable weather conditions in summer. All coastal areas throughout Europe experienced serious decline of biodiversity, because of fragmentation of ecosystems and the lack of migration possibilities. Coastal plains on or below sea level experienced an increased threat of floods, although no calamities occurred so far.

At the level of *river basins*, problems with water management increased. While mountains are generally considered as water providers, valleys and plains are the beneficiaries. If mountains become dryer, valleys and plains will be negatively affected.

At micro-scale, *flood prone areas* were indeed more severely hit by floods. This caused numerous deaths as well as a large economic loss. The losses were so high because the construction of housing in flood prone areas had continued.

8.2.1.6 Final image

By 2030, climate change, accompanied by a lack of prevention policies, has led to important modifications of the European territory.

In southern Europe, large stretches of hilly and mountainous areas which were in 2000 covered by oak and pine forests, have burnt and drought had not made possible the reconstitution of forests. They have become arid and desert areas with only little vegetation. A number of rural areas have been abandoned by farmers. Rural landscapes have no more been maintained and cared for, so that they are invaded by wild vegetation drying in summertime and particularly prone to fires. Life in villages and small towns has been shrinking, with less services and jobs and more ageing population. A number of holiday resorts in coastal areas and in southern mountains have become derelict sites.

In central and northern Europe, the situation is strongly different. Rural areas are more intensely used, both for food and energy production. Tourism is flourishing again, in particular in hilly landscapes and medium-sized mountains. Nordic areas also benefit more from tourism.

Damages to the environment are significant. In southern Europe, valuable Mediterranean landscapes have been destroyed. Numerous areas have become more sensitive to external pressure (sensitiveness of soil to heavy rainfalls, higher risk of fires, fragilisation of ecosystems etc.). Water resources are largely exhausted and do not enable any more the development of large-scale projects. The abandonment of rural areas by farmers has severely affected the cultural landscapes. Derelict sites have emerged in tourist areas.

In central and northern Europe, damages to settlements, infrastructure and landscapes have been caused by flooding in numerous valleys. Stronger environmental pressure can be observed in a number of rural areas due to more intensive agriculture.

8.2.1.7 Main issues resulting from the scenario

Climate change seems unavoidable and brings with it long-term effects and impacts on the territory. If public policies limit themselves to the Kyoto Agreement and its successor, hoping that the reduction of greenhouse gas emissions will solve the problem, then two types of problems may appear. First, the implementation of the Kyoto Agreement (and the elaboration of a successor) may prove more difficult than expected and second, even if successful, its impacts will be noticeable only in the very long-term. In between, numerous negative aspects of climate change will cause serious damages to the European territory.

8.2.2 Scenario 2: 'Anticipation of climate change by prevention measures'

8.2.2.1 Scenario hypothesis

Politicians and society are thoroughly tackling the climate change issue as a result of a common sense of urgency. Mitigation measures result in drastic cuts in emission rates by 2030, at the expense of some economic growth. Adaptation measures are taken, not only in reaction to extreme weather-related events as they happen, but also envisioning impacts in the long run. As a result, the negative territorial impacts of climate change are at least alleviated by 2030.

8.2.2.2 Driving forces

Driving forces behind this scenario are all related to a growing sense of urgency amongst politicians and other stakeholders to deal with climate change impacts:

- The awareness of damages already caused by climate change in European regions and the need to urgently take measures in order to avoid the amplification of such damages in future;
- The awareness that the deterioration of the European territory by natural hazards has extremely negative economic and social impacts and endangers the mobilization of the territorial potential of European regions;
- The political willingness to tackle the issues related to climate change at European and world level with strategies additional to the Kyoto agreement.
- Growing scientific input on regional climate change impacts and instruments to plan for long term adaptation measures.

8.2.2.3 Context

During the decade 1995-2005, Europe has been affected by a series of natural hazards related to climate change (flooding, hurricanes, drought, forest fires etc.) which had a strong psychological impact on the European population and on elected people. The drought in southern Europe during the winter 2004/2005 showed the amplitude and extent of territorial damages and acted as a kind of catalyst for awareness rising. It became clear at European level that more resources should be invested in prevention measures instead of distributing EU money case by case to repair the damages already caused by natural hazards. The first calls for an adaptation framework at EU level were made in 2004.
In 2005, the Kyoto Protocol came into force, thereby facilitating mechanisms like the exchange of emission rights. Although emission levels were rising in the years 2003-2005, the EEA showed that the Kyoto targets could be achieved with additional measures at national and EU level.

8.2.2.4 Scenario process

The Kyoto Protocol had been taken seriously by the EU. Signs that pointed to an increasing emission in the 2003-2005 period were responded by more severe actions on emission reductions. The emission rights market was successfully implemented. The carbon permit price was steadily increased to EUR 65/t CO2 by 2030. Public spending on R&D increased, and potentially environmentally harmful subsidies were removed.

The development of renewable energy sources was considered as important because the increase of average temperature has significant impacts on energy demand, in particular in summer time. The objective was to reduce electricity demand from hydro-electric, conventional oil or gas fired power plants as well as from nuclear power plants. To this end, solar and wind energy were significantly promoted and generalized. This made possible the saving of water in mountain and river barrages and to limit the emission of greenhouse gas. An additional advantage was that imports of electricity from northern and central European regions could be restricted.

Transport policies had to be re-considered from the point of view of greenhouse gas emissions. New technologies were promoted in order to limit the consumption of fossil energy, especially oil. New types of engines were developed, using less energy as well as other types of fuels. Hydrogen powered engines were experimented, developed and promoted. The problem remained that of the production of hydrogen which is energy intensive. Electricity from renewable energy sources was used to produce a part of the hydrogen needed. It proved to be more difficult to influence the use of trucks and motor cars. Modal shift policies were not so successful as expected. Nevertheless, more and more people were inclined to use public transportation, the quality of which had been significantly improved and the transport of goods was partly shifted onto railways and maritime routes.

By 2008, the emission target of 8% below 1990 levels was reached. Other nations outside the EU also achieved some emission reductions, and believed in the regulatory principles of the Kyoto Protocol. By 2010, a new Agreement comes into force which establishes new emission targets at 40% below 1990 level by 2030.

These drastic measures were not only driven by worrying signs of long term climate change, but also by immediate impacts experienced throughout Europe. Impacts took place as described in the other scenario: droughts, heat waves, floods, water scarcity, declining or increasing tourists, worsening conditions for agriculture, etc.

The response was different, however. In response to the discussions about the need for a EU climate change adaptation policy, a framework had been adopted by 2007. Part of the framework was already addressed in the reform of EU structural policies in 2005/2006. The eligibility of EU-supported actions to measures related to the prevention of natural hazards was enlarged, in particular in relation to climate change. Main building blocks were the protection of water resources, the management of rural landscapes and forests, the relationships between territorial development and renewable energy sources, the prevention of flood damages and the promotion of corridors for migration of species. Although cost-

effectiveness was an important issue, it was not a condition for adaptation measures, since the effectiveness could not be measured according to the scientific knowledge at that time.

The integrated protection of water resources was a particularly important and ambitious priority, especially for the countries and regions of southern Europe. It called for numerous innovative techniques and practices and interfered strongly with a large number of fields of activity. The future of agriculture was one of the most central activities concerned. Crops requiring intensive irrigation were re-considered and adapted. The cultivation of various crops such as maize, requiring large quantities of water, was strongly restricted. Water-saving techniques and technologies were generalized and supported by public resources. Area-specific strategies were elaborated in order to optimize the cultivation of soil in relation with the characteristics of the area (hydrology, local climate, natural vegetation etc.). New types of cultures were introduced which took account of the increase of average temperature and of the scarcity of water. Awareness raising campaigns for farmers were systematically organized. Innovative experiments carried out outside Europe, in particularly arid regions, such as in Egypt, were used as sources of inspiration to match successfully agricultural development with the scarcity of water resources.

Action was also taken in the sector of tourism. Large-scale tourist projects in coastal areas dedicated to mass tourism were abandoned. Solutions were looked for in the case of existing resorts threatened by water scarcity. Reconversion programs were elaborated to promote the quality and diversification of supply in order to avoid the concentration of tourist frequentation in summer time when water scarcity is highest. Specific facilities and utilities were developed, combining hinterland tours, pedestrian and cycling activities, heritage-related and other cultural activities etc. In mountain areas, the relative decline of winter tourism was compensated by new forms of summer tourism; more diffuse and less damaging for the environment.

Agriculture and forestry were not re-considered only from the perspective of their relation to water resources, but also in relation to the maintenance of landscapes and vegetation. The search for new forms of cultivation followed also the objective, in addition to water saving, of maintaining and safeguarding agricultural activities in the southern European regions, in order to protect landscapes from wild vegetation drying in summer time and prone to fires. The management of forests was significantly improved with the implementation of important prevention measures against fires. This included also the promotion of specific tree species, less sensitive to drought. Despite the intensification of such measures, forest fires occurred. In such cases, new forestation measures were undertaken in order to avoid soil erosion and to favor the capture and retention of humidity.

The prevention of flood damages was another important priority, both in northern, southern and central European regions. The experience gained during the period 1995-2005 was used to generalize solutions. A number of measures were developed such as the extension of retention areas for water along rivers, the construction of new dikes to protect settlements, the removal of settlements unlikely to be efficiently protected against floods, the enforcement of measures prohibiting constructions and economic activities other than agriculture in areas threatened. In addition to these measures, specific radar-based weather forecast facilities were developed in Mediterranean regions to inform the population in due time about the occurrence of heavy rainfalls, so that necessary actions can be taken to protect human and animal lives.

The Natura 2000 plan was augmented with the construction of corridors between existing natural areas. The aim of the corridors was to enable species (fauna and flora) to migrate northwards or to higher altitudes in response to climate change. These corridors would not necessarily be protected areas; large tracks constituted of farmlands were assigned to be 'naturally managed'. A monitoring unit was established to verify the effectiveness of the corridors in nature's response to climate change.

By 2015, the strategy was considered as rather successful. The number of natural hazards related to climate change had increased, but their impacts had been relatively contained.

These encouraging results led to a generalization in the implementation of the strategy. The reform of structural policies in 2013/2014 was again used to increase the volume of resources devoted to the prevention of risks and damages related to climate change, considering that this was a precondition to maintain a minimal production basis in the most vulnerable regions.

By 2030, the reduction of GHG emissions was so successful, that stabilization of climate change at a temperature rise of 2° C by 2010 was still a realistic target. Damages related to climate change had increased again, but its magnitude could well be handled due to the adaptation measures put in place.

8.2.2.5 Impacts

Macro-economic impacts

The costs of all mitigation measures mounted to 0.4% of the EU GDP by 2030. The other side is that the development of more indigenous forms of energy production and the reduction of external energy dependency contributed to lower energy costs and a technological advantage over the rest of the world. Adaptation measures also absorbed significant amounts of resources, in particular during the first decade of its implementation. Benefits were difficult to establish. Adapted forms of agriculture and tourism in the southern European regions could for example not avoid economic stagnation. However, things would be much worse if no adaptation would have taken place.

Regional impacts

At macro-scale, the contrast of impacts of climate change between southern and northern Europe remained limited. Migration flows of people from northern Europe towards Mediterranean regions (mainly retired people) were reduced, but did not stop, while emigration from southern regions towards more northern regions was contained. Economic development took place along the traditional patterns of hexagon versus periphery.

At meso-level, changes were also much less significant than under Scenario 1, although some changes were unavoidable. The changing water regimes of rivers in valleys and plains, conditioned by changes in the hydrologic systems of mountain areas, could unfortunately not be improved, but water-saving techniques in agriculture and energy production reduced the negative impacts of changing water regimes of rivers. Rural-urban relationships remained rather balanced, due to the fact that rural areas did not lose their vitality in southern Europe. In central and northern Europe, pressure on rural areas was less intense. Peripheral areas without fast train and maritime transport connection faced stagnating economic development, since the use of motorcars increased sharply in price.

At regional/local scale, damages caused by floods in the whole of Europe could be significantly contained, although the occurrence of floods increased. In southern European regions, landscapes could be safeguarded and the impacts of forest fires remained limited. Success in the management of water resources and in renewable energy production opened new development perspectives. The containment of road traffic especially the reduction of greenhouse gas emissions which it generates acted positively along the objectives of the Kyoto Agreement.

8.2.2.6 Final image

By 2030, natural hazards related to climate change had significantly increased, if compared with the situation prevailing in the early 2000s. The impacts of such hazards were however contained and the European territory had become significantly more resistant against floods, drought, forest fires etc.

A number of changes had taken place, when compared with the situation in 2005, in particular with regard to vegetation and ecosystems. Mediterranean vegetation had progressed towards the north. Ecosystems had significantly changed in nature, but disruptions remained limited.

Intensive agricultural production moved north- and eastwards into Southern Scandinavia and the Baltic States. Southern European regions became famous for the techniques they had developed to cope with climate warming, in particular in the fields of integrated approaches in water management, renewable energy production, maintenance of rural landscapes, development of new forms of tourism in coastal, rural and mountain areas.

8.2.2.7 Main issues resulting from the scenario

Even if climate change is a fatality, a number of prevention and mitigation policies can enable the containment of negative impacts and the limitation of impacts of generated natural hazards. Through various well conceived and integrated policies, the European territory can be made more resistant to the impacts of climate change. A number of opportunities generated by climate change can also be exploited.

8.2.2.8 Possible indicators for the climate change scenarios

Some indicators are readily available from IPCC, EEA and ESPON. However, the most interesting indicators which show costs and effects of adaptation measures are very difficult to operationalize.

Indicator	**Scale**	**Source**
Climate change and GHG emission		
Temperature rise	500x500 km	IPCC
Change of precipitation	500x500 km	IPCC
Emission rate	Country level	EEA
Cost of mitigation measures	Europe	EEA
Impacts		
Loss of biodiversity	Country level	EEA
Floods	NUTS3	ESPON .. / EEA
Growing season	Country level	EEA
Impacts, unknown sources		
Cost of adaptation measures		
Changing tourism		?
Deaths due to heat waves		?
Desertification		?
Changing GDP due to change of production system	NUTS2/3	?
Changing agricultural production		?

Table 13 Possible indicators

9. Thematic prospective scenarios 'Socio-cultural evolution and integration'

Jacques Robert (Tersyn)

9.1 Scenario base 'Socio-cultural evolution and integration'

9.1.1 Present situation, trends and forecasts

Socio-cultural issues are as numerous and as diversified as European society itself. They include a wide range of factors which strongly interfere with demography and economy, but have their individual characteristics and dynamics.

They are related to 'large-scale' issues such as the impact of globalisation on the lifestyles, the relationships between ethnic or religious groups, immigration from outside Europe and also terrorism. They also concern the increasing social divide with its growing negative impacts in the field of poverty, social exclusion and crime. The transition which has taken place in Central and Eastern Europe from the former communist regimes towards democracy and market economy has been accompanied by a thorough transformation of socio-cultural values and systems. A number of issues have more regional or local roots, in particular in the case of cultural and ethnic minorities. Most socio-cultural issues have strong territorial impacts.

Opinions about the impacts of globalisation on the socio-cultural evolution of Europe are strongly diverging. The most widely spread opinion is that in a global society the risk is high that Europe has no identity any more. Globalisation, driven by technological development, is changing people's life globally, their customs and institutions and their views on the future. The human existence perspective is being narrowed by the technological imperative to concentrate on economic and political utility. On the other hand, Europe has the ability to become a key actor on the globalisation process thanks to its human capital stock, its historical roots, its capacity of overcoming intercultural tensions and its environment-friendly attitude. Another aspect is that the economy being far ahead of culture in terms of integration, globalisation is also perceived as a danger to weaken identities, prompting local cultures to defend themselves from the emerging global culture. The widespread anti-globalisation movements and even the revival of religious fanaticism are signs of this problem.

The lifestyles of Europeans are changing and becoming more differentiated over time. During the decades of high economic growth in the post-war period, the western world experienced consumerism as the dominating lifestyle. During the 1980s and 1990s, lifestyles have changed under the pressures of economic constraints and growing unemployment as well as under the emergence of environmental consciousness. Other factors led to strong differentiation of lifestyles in Europe. The most important factor has been sustained immigration from outside the EU and largely from outside Europe (North Africa, Black Africa, Middle East, Asia etc.) which has generated a multicultural society in Europe. Although their importance varies among European countries, large ethnic and religious groups of non-European origin are present all over Europe and their size is

increasing because of both continuing immigration and higher birth rates than in the native European population. Not only Western Europe is concerned. In central and eastern Europe, the apparition of immigration as a mass phenomenon (from the Far East, and South-West Asia, from the ex-USSR, from Africa and from the Balkan countries) is important. The cultural differences among the various ethnic groups have impacts on the lifestyles.

Demographic changes, in particular population ageing, also influence the lifestyles. There are for instance clear indications of increasing mobility and different consumption pattern of the aged.

Consumption patterns are an important component of lifestyles. These are undergoing substantial changes. More and more people in Europe are coming to the awareness that an ever-improving economy can no longer be expected. They design their lifestyle without the expectation of continuing economic growth and therefore pursuit security and adopt a more passive, but rational attitude towards consumption. Quality is progressively becoming more important than quantity and volatility. In the past decades, ecological awareness has been instrumental in bringing about changes in production, products and consumption patterns. It has curbed, but not more, the tremendous waste in manufacturing, marketing and usage of the products. An increasing trend can however be observed towards ecological and ethical consumption. There are nevertheless considerable differences among social and ethnic groups.

In the countries of Eastern and Central Europe, the situation is quite different as regards the history of consumption patterns. These countries were not affected by the consumerism wave which flooded Europe from the 1960s to the end of the 1980s. On the contrary, consumption was severely constrained by the former regimes. Since the beginning of the 1990s, consumption patterns attempt to catch up, but are still limited by the purchase power. Simultaneously, these countries are also subject to the new consumption trends and changes which take place at global scale, so that an overlapping of contradictory trends can be observed there.

In addition to consumption patterns, mobility patterns are also shaping the lifestyles and are equally subject to structural changes. In general terms, people's mobility has been steadily increasing and diversifying as far as the purposes are concerned. As far as work-related mobility is concerned, a number of contradictory trends exist. The globalisation of production and trade systems increases the long-distance mobility of professionals. At local level, commuter flows are also growing in distance and in volume as a result of progressing suburbanisation. On the other hand, tele-work and homework are also progressing and have a clear impact on the reduction of mobility. They will continue to spread in the world of work, whereas tele-working will be more and more substituted by home-working: employees are turning into contractors and salaried people becoming self-employed. Increasingly, consumption and entertainment-oriented lifestyles are important factors driving the growth on non-work-related mobility. This trend spreads more and more also towards lower income households, implying a change in lifestyles as well. Cultural forces of change are at work which influence the development of leisure-oriented mobility. A significant impact on mobility is resulting from changes in the pattern of work, with travels during a larger number of longer week-ends and more numerous, but shorter holiday periods. The decreasing price of air fares encourages long-distance leisure mobility.

Finally, lifestyles are also affected by trends towards gender equality. Over the past decade, the employment rate of women has regularly increased. Despite the slowdown in economic growth during the last few years and the limited employment growth, a positive trend towards closing gender gaps could be observed in education and employment in the enlarged EU-25, while the pay gap between women and men remains almost unchanged.

Social cohesion and integration have become major sources of concern in the evolution of European society. A number of factors are at the origin of current problems, such as high unemployment levels, deficits in the integration of marginal or ethnic groups etc.

Access to employment is of key significance for social inclusion, since it determines in most cases whether people are able both to enjoy a decent standard of living and contribute fully to the society in which they live. Unemployment became a significant problem in the EU during the 1970s (impacts of oil shocks) and high unemployment rates remained up to now in most countries, with a few exceptions. Unemployment has also severely affected the countries of central and eastern Europe after the breakdown of former regimes. The situation has improved in between in a number of them thanks to courageous reforms which attracted significant levels of foreign investments.

Presently, all European countries are concerned, with more or less intensity, by poverty and social exclusion. Poverty is closely linked to unemployment. Only 7% of the employed population in the EU had income below the poverty line in 2000, as against 38% of the unemployed and 25% of the inactive. The risk of poverty is higher for particular household types. In the EU-15, some 35% on average of those living alone with dependent children and almost 30% of people of 65 and over living alone have income below poverty line. The risk of poverty and social exclusion is also important in the new member states. Poverty affects particularly ethnic minorities facing cumulative handicaps in terms of access to employment, to education, social services, housing and health care.

Social exclusion is a very broad concept which includes not only deprivation, but also problems of social relationships, including social isolation and failures in social protection. The impacts of social exclusion, poverty and deficits in integration are particularly visible at local level, especially in cities. Homelessness and multiple deprivation combined with growing insecurity and criminality are the most apparent manifestations of current problems. Typical problems in poor areas are inadequate play space, educational problems, problems of home maintenance, lack of community facilities, vandalism etc. It should not be overlooked, however, that inner cities and other urban deprived areas, where 'social exclusion is concentrated, equally function as 'spaces of inclusion' for those societal groups that are not accepted by mainstream society.

At a wider scale, regional identities are by essence a complex set of socio-cultural factors which play also a significant part in integration. A new development paradigm has emerged over the past decades, according to which strong regional identities favour territorial development. Identification with the region, combined with a distinct regional culture is seen as vital when striving at creating an atmosphere of trust, entrepreneurship and creativity among citizens. The discourse on culture within the new development paradigm aims at strengthening the feeing of solidarity and symbolic community among citizens. The promotion of regional identities has become a common element of numerous regional development strategies and not only in regions where clear deficit in regional identity can be observed. Nevertheless, strong regional identities may also generate drawbacks and lead to shortcomings in development and integration (provincialism and 'backward looking' cultures, social marginalisation of ethnic groups etc.).

In the countries of central and eastern Europe, a number of new tendencies are developing (in addition to immigration from outside) which strongly influence the integration process:

- Cultural and ethnic tensions between majority (ies) and minorities (Jews, gypsies, Aromanians etc.);
- Social and economic polarisation;
- Housing crisis, urban crisis;
- Strong suburbanisation, rise of gated communities;

- Isolation of the peripheral regions and sub-regions;
- Acculturation (by mass media, by demonstration effect, by circular migration);
- Growth of economic and general criminal activities.

9.1.2 EU policies related to socio-cultural development and integration

The EU has not a strictly defined policy of socio-cultural development and integration, but various EU policies deliver contributions in this field. IN this respect, the EU policies concerned can be divided in:

- employment-related EU socio-cultural policies. The European Employment Strategy, supported by the Social Fund, has three interrelated objectives: working towards full employment; quality and productivity at work and social cohesion and an inclusive labour market. To achieve this, the Strategy lays down employment guidelines, valid for the whole EU. Quality is the watchword: investment in education and training; schemes to help women, the long-term unemployed and older workers return to or remain on the labour market reduce unemployment and boost productivity. Progress in labour law, health and safety and social dialogue have helped the EU to develop its social model. Faced with far-reaching changes in the economy and the labour market, new responses to improving working conditions are needed: fostering economic dynamism and innovation, ensuring social stability and accommodating the needs of those adversely affected by the changes. The Social Agenda (2000) aimed at implementing the Lisbon Strategy with the objective to return to full employment. The Agenda has been putting forward new and better forms of governance of social policy. This means involving the different actors –unions, employers, local and national authorities and NGOs – more fully in shaping and implementing the policies and creating the right mix of policy instruments. The new Social Agenda (2005) has two key priorities: employment and fighting poverty and promoting equal opportunities.

- non-employment related EU socio-cultural policies. These comprise the EU cultural policy, public health policy and policy aiming at eradicating poverty and combating discrimination. EU initiatives in the cultural sector aim at encouraging cooperation between Member States and, if necessary, supporting and supplementing their actions. The aim is to encourage the creation of a 'European Cultural Area'. Cultural cooperation is encouraged by means of the Culture 2000 Programme, but also by specific actions financed by other European programmes. These involve European cooperation in the broad sense, since the majority of the programmes are open to the Member States of the European Economic Area and to the applicant countries. Various other policies are also supporting cultural activities in the EU (structural policies, R&D policy, European Neighbourhood Policy etc.). On 23 September 2002, the European Parliament and the Council adopted a Decision on the programme of Community action in the field of public health (2003-2008). This programme entered into force on 1st January 2003. In 2002, the Commission proposed a new Community strategy on health and safety at work to cover the period until 2006. It builds on the knowledge that the absence of high quality occupational health and safety policy generates a significant economic cost. In the context of the Lisbon Strategy, the EU governments set the goal of making a decisive impact on eradicating poverty by 2010. Commission's plan was for Member States to coordinate their social protection policies within a single coherent framework. Under the plan, national action plans set targets for reducing the number of people significantly at risk of poverty and social exclusion with measures to help the most vulnerable as one of the priorities. Non-discrimination is considered as important to tackle poverty and deprivation and bring the marginalised into mainstream society. Ground-breaking EU legislation on combating discrimination based on race or ethnic origin, religion or belief, age, disability.

9.1.3 Main driving forces

Driving forces in the socio-cultural field or with significant impacts in this field are in particular:

- growing social-economic dualisation in a context of high unemployment, rising poverty and increasing concentration of wealth;

- the globalisation and European integration processes (unification of lifestyles and of cultural behaviour);

- continuation of immigration into Europe, bringing with it different socio-cultural patterns and behaviours; increasing size of population groups of non-European origin (high fertility rates of women belonging to these groups);

- technological evolution (impacts on consumption, leisure and mobility patterns; on employment/unemployment and social exclusion);

- population ageing, bringing with it different values, lifestyles, mobility patterns;

- perception of integration problems by the European population (potential political impacts)

- EU-enlargements (past and future);

- socio-cultural integration policies at various levels; multiculturalist approaches.

9.1.4 Towards hypotheses for prospective scenarios on socio-cultural evolution and integration

The wide diversity of aspects and dimensions in the field of socio-cultural evolution and integration makes the choice of hypotheses for prospective scenarios particularly difficult. Looking however at the aspects causing presently greatest concern and likely to increase in significance in future, the socio-cultural integration of marginal and ethnic groups, in relation with immigration, has a prominent place in the list. Taking into account the context of population ageing and the growing immigration into the EU, it seems appropriate to investigate two opposite possibilities:

- a situation where current integration problems will amplify under the effect of growing immigration and inappropriate public policies at various levels. Lack of coordination and insufficient efficiency of public policies will favour the development of a segmented European society with increasing economic imbalances between groups, growing social and cultural tensions and conflicts. Impacts on cities will be particularly severe. In terms of policies applied, the scenario hypotheses are rather close to trends, but combined with an increase of problem intensity calling for new policy responses which do not take place.

- an alternative situation where problems of socio-cultural integration have been recognised as a priority issue at highest level in the European context and where innovative integration policies are being developed and applied in a coordinated way so as to shape a peaceful multicultural society in Europe.

9.1.5 Sources of information

The scenario base results from a compilation of information from the following documents:

'Third Cohesion Report'. European Commission. 2004.

'The spatial effects of demographic trends and migration'. ESPON Project 1.1.4. ITPS. Swedish Institute for Growth Policy Studies.

'Observatoire National des Zones Urbaines Sensibles. Rapport 2004 ». Paris

'The English Indices of Deprivation ». Office of the Deputy Prime Minister. London. 2004.

'Globalisation or regionalisation?'. NIC 2020 Europe Group Driver Paper. Budapest. 2004.

'Urban Audit'. European Commission. 2004.

'Inner-city misery. Real and imagined'. Guy Baeten. City. Vol.8. N°2.

'Lifestyles and the environment'. C. Harrison; G. Davies. ESRC Global Environmental change Programme. University College. London. 1998.

'Lifestyles, mobility and the challenge of sustainability. A survey of literature'. L. Hilty; A. Vollmer; D. Schulthess; T. Ruddy. Solothurn University of Applied Sciences. 2000.

'Europe: expectations and reality'. Reports of the Second European Social Science Conference. Slovak Commission for UNESCO. Bratislava. 1999.

'Communication of the Commission on the Social Agenda' COM(2005)33 final. European Commission. 2005.

'Communication to the Spring European Council: working together for growth and jobs. A new start for the Lisbon Strategy'. European Commission. 2005.

'Commission working document. Application of Art. 151(4) of the EC Treaty: use of the Structural Funds in the field of culture during the period 1994-99. European Commission.

'Modernising the European social model'. European Commission. 2003.

'Scoreboard on implementing the social policy agenda'. European Commission. 2004.

'Regional identity and information society'. J. Millard, A.L. Christensen. BISER. Domain Report N°4. 2001.

'Cultural identity and political responsibility'. N. Burgi-Golub. Cultural Policy. Vol. 0. 2000.

'L'impératif de la sécurité culturelle dans l'Europe morcelée'. E. Delgado (1995).

' Culture, identity and regional development in the European Union ». J. Süssner. Informationen zur Raumentwicklung. Heft 4/5. 2002.

'Regional identity and social capital in regional economic development and planning'. Gaari Raagma. University of Tartu.

9.2 Prospective thematic scenarios 'Socio-cultural evolution and integration'

9.2.1 Scenario 1: Non-mastered socio-cultural integration

9.2.1.1 Scenario hypotheses

The main hypothesis of the scenario is one of increasing socio-cultural tensions and disruptions in Europe. Tensions between income groups, ethnic and religious groups are increasing and public policies are not successful in promoting social inclusion and integration as well as tolerance between the various cultural communities. Numerous elements of the scenario's hypotheses are derived from the extrapolation of trends.

9.2.1.2 Driving forces

The main driving forces leading to socio-cultural tensions and disruptions in Europe are:

- the increasing dualisation of European society resulting from higher remuneration of capital than of labour as well as from larger segments of the European labour force excluded from the labour market;

- the growing (mainly uncontrolled) immigration from outside the EU;

- insufficient public policies related to education, social inclusion, multiculturalist approaches, enhancement of regional identities and heritage.

9.2.1.3 Context

The EU has difficulties in reaching a sufficient growth rate in a context of challenging globalisation and devotes most of its energy and resources in promoting and liberalising the economy while neglecting the social impacts of economic transformations as well as the socio-cultural constraints resulting from progressing immigration and exclusion. Within the EU member countries, various types of socio-cultural policies are carried out by the different administrative levels, the efficiency of which varies widely from country to country. The lack of real coordination between the various levels and the pressure put on the lower levels result in the fact that socio-cultural tensions and conflicts cannot be mastered.

9.2.1.4 Scenario process

After 2005, a number of trends observed during the decade starting in 1995 intensified, mainly in metropolitan areas. Social segregation progressed in inner-city areas and in peripheral housing estates accompanied by urban deprivation, homelessness, insecurity and criminality. Urban areas with high accessibility through public transportation (railway stations, crossings of subway lines etc.) became also subject to increasing insecurity. Degradation expanded around these areas, a factor which contributed to accelerate segregation. People sufficiently well off chose more and more locations distant from the most socially problematic areas. A large number of them working in inner cities moved to the surrounding rural areas and became long-distance commuters. Those who remained within or at proximity of these deprived areas were low income often aged people.

Numerous well-off retired people decided to move from large cities towards distant, attractive and climate-favoured rural areas or small cities. This trend accelerated after 2010 when large cohorts of baby-boomers reached retirement age.

Social differentiation of lifestyles increased and was accompanied by a qualitative differentiation of the image and endowment of areas with services and amenities. The better offs have shown higher mobility (work and leisure commuting, long-distance trips by car, train and plane) and stronger consumption patterns, not only of goods, but also more and more of all kinds of services in various fields (health, culture, leisure etc.). The number of private schools and hospitals strongly developed in such areas. Because of increasing insecurity in public transportation, a large number of people have been using their cars, even for short-distance trips and mobility of the less well off diminished.

The failure of public policies in including the socially disabled population of working age into the labour market generated a growing scarcity of manpower in a context of accelerating population ageing. The employment rate decreased strongly after 2010. Caring services for the elderly could not be sufficiently developed. In a context of growing dependency rate, the less well off among the elderly became strongly disfavoured in terms of caring services.

A strong competition developed for attracting young qualified people. In order to successfully match this constraint, numerous footloose enterprises moved towards areas and regions with a good image in terms of attractiveness and safety.

Until the mid 2010s, problems were mainly concentrated in metropolitan areas. Nevertheless, a number of regions were confronted with problems at a larger scale. Regions along the Mediterranean coast (Spain, France, Italy and to a lesser extent Greece) had to face more and more the cumulative effects of growing immigration flows from outside Europe (Africa, Middle East) and flows of European migrants looking for favourable climatic and environmental conditions. The first 'gated communities' had emerged in these regions before the year 2000. Their number significantly increased over time. In central and eastern Europe, the impact of immigration became more and more sensitive.

In the new member countries, the growing polarisation of economic activities in metropolitan areas generated strong increase in housing price, so that numerous people excluded from the labour market or with insufficient income to cope with growing costs of living in large cities moved towards distant small and medium-sized towns and rural areas. Insecurity in large cities had started increasing during the transition period. It continued growing because of larger numbers of marginalised people. The cities of central and eastern Europe were not excluded from these trends.

After 2015, xenophobia, cultural intolerance, racist attitudes, political radicalism had reached such levels that cohabitation between groups with different income levels, ethnic or religious origin became increasingly difficult. In the countries of central and eastern Europe, problems related to minorities became acute, with increasing tensions and radical attitudes.The problems of metropolitan areas propagated towards medium-sized and small towns. The number of gated communities boomed throughout Europe. Electronic control and security systems generalised and affected most segments of everyday life. Numerous re-education centres and jails were built to alleviate the feeling of insecurity. Tensions between cultural, ethnic and religious groups exacerbated in such a way that multiculturalist approaches became unrealistic and even counterproductive in the political sphere. Radicalisation of political attitudes worsened the situation. New forms of nationalism or 'comunitarism' developed.

By 2030, European society was strongly divided and segmented. The new regulation processes which had become necessary to maintain a certain level of stability has severely

endangered democracy at various levels. Europe had moved towards a system of authoritarian governance which did not exclude a number of socially chaotic situations in numerous regions and cities.

9.2.1.5 Impacts

Macro-economic impacts

The failure in integrating the socially disabled groups of working age into the labour market has reduced the employment rate and has had strongly negative impacts on economic development. The shortage of qualified manpower has been a severe constraint with regard to the objectives of the Lisbon Strategy. A weaker economic situation had also indirect impacts on the provision of public services (health, culture, public transportation etc.), inhibiting growth in the service sector. Furthermore, the socio-cultural fragmentation of the European society and the rigidity of the new governance systems have been acting as significant obstacles to the exploitation of the 'territorial capital' of the various European regions, the success of which largely depends upon networking, exchange of information, cooperation, flexible attitudes, public-private partnerships etc.

Neglecting the enhancement of regional identities (culture, heritage etc.) has had detrimental effects on the economy also. The deterioration of urban areas, comprising the related infrastructure and facilities, has generated significant costs with long-term impacts.

Regional, territorial and environmental impacts

Territorial impacts of socio-cultural disruptions in Europe are stronger at the meso and micro levels that at the macro level. This does not exclude that the intensity of tensions and chaotic situations in a number of regions and cities may have large-scale impacts, for instance on the intensity of transnational migration flows within the EU.

Socio-cultural tensions and disruptions are favouring the move of people out of large cities and urban regions towards more 'socially quiet' areas (small and medium-sized towns, rural areas). This has been particularly obvious for retired people which are no more bound to their workplace. Other segments of the population have however also been concerned. An increasing number of active people have chosen to commute over long distances or to turn towards home-working. Pressure on attractive areas has been increasing because new forms of Greenfield settlements with more secure character could be developed. The suburbanisation trends also exploded in central and eastern Europe.

There have been significant negative environmental impacts from growing motor-car traffic, resulting from both substitution to increasingly insecure public transportation and stronger commuter flows. In cities, dereliction and multiple deprivation have significantly expanded.

9.2.1.6 Final image

By 2030, a number of components of the European territory have substantially changed. The territory is much more segmented and divided according to socio-cultural characteristics. Attractive rural areas have been invaded by various groups of people, in particular by retired ones and by an increasing number of home workers. Rural areas surrounding large cities have been affected by large flows of newcomers commuting to their workplace. All these groups have in common the search of a more secure and more friendly socio-cultural environment. A large number of gated communities have been developed and are scattered throughout the most valuable and attractive landscapes in tourist areas or at proximity of large and medium-sized cities.

The counterpart is the presence of large urban areas with multiple deprivation which have expanded because of the deterioration of the economic situation and of the departure of the most well offs, but also of medium-level income groups. Social segregation in urban areas is extremely accentuated and is reflected in very different townscapes, some being slums, other being well protected high-standing estates. Areas in between are unstable.

The environment has deteriorated, both in urban areas where dereliction has progressed and in attractive rural areas where settlements and transport infrastructure have strongly developed. Suburbanisation has significantly expanded at the expense of valuable natural areas near cities. Air pollution has increased as a result from more intensive use of motor-cars.

At a wider level, a number of regions with insufficient economic development resulting from low attractiveness, neglected territorial potential and regional identities (often offset by general socio-cultural tensions), are laying behind. Numerous of them could not catch up; so that the European situation in 2030 is one of increased regional disparities, when compared with that prevailing in 2005.

9.2.1.7 Main issues arising from the scenario

The scenario highlights the fact that Europe has come into a stage of its history where socio-cultural factors are gaining increasing importance and may have a leading and strategic role in future. Neglecting this dimension in the context of European integration is likely to generate significant socio-cultural disruptions which may be seriously detrimental to economic development. The potential territorial impacts of socio-cultural tensions and disruptions are numerous. Not only urban areas are affected, but also the surroundings of cities, attractive rural areas and, as a counterpart, less attractive regions.

9.2.2 Scenario 2: Towards a sustainable multicultural and socially cohesive Europe

9.2.2.1 Scenario hypotheses

The scenario is a policy scenario. It assumes that new public policies are defined and implemented at the various levels which aim at integrating as many people as possible into the labour market through education policies, at facilitating social cohesion through dialogue and tolerance between the various ethnic and religious communities, at promoting regional identities as factors of integration and development. It also assumes that the EU immigration policy will be better targeted and orientated towards attracting people with a sufficient level of qualification.

9.2.2.2 Driving forces

The main driving forces leading to the adoption of public policies as described above are:

- the increasing social tensions, troubles and criminality in a large number of European metropolitan areas related to the growing importance of marginal groups excluded from the labour market and from the mainstream society;

- the growing poverty and exclusion in the European society;

- the ageing of European society and the need to replace retiring people by a sufficient number of qualified people;

- the recognition of socio-cultural factors as essential for economic development and for the achievement of the Lisbon Strategy.

9.2.2.3 Context

The context which has made the emergence of new public policies in the field of socio-cultural integration possible after 2005 has been the growing awareness that the achievement of the Lisbon-Göteborg Strategy was not possible in a climate of growing social tensions and disruptions and of cultural intolerance. The challenge generated by population ageing and the related scarcity of qualified manpower was an additional argument to promote the integration of people excluded from tha labour market and, more generally from the mainstream society. It was also recognised that the growing cultural heterogeneity in Europe resulting from immigration but also from the successive EU enlargements called for a positive multiculturalist approach.

9.2.2.4 Scenario process

Substantial changes in public policies in the years following 2005 resulted from the convergence of two main factors: the awareness that the increasing number of people excluded from the labour market was economically counterproductive and the growing exasperation of urban dwellers about increasing insecurity and criminality in cities. The resulting climate of xenophobia and political radicalisation in numerous European cities was considered as serious enough by the various national governments to envisage the strengthening of coordination of policies at EU level, together with the involvement of a higher amount of EU resources in activities the most likely to contribute to the solution of problems.

In the context of the open method of coordination, member states decided to give an absolute priority to education and training of those groups already marginalised or threatened to become marginalised, with a specific attention to young people (early school leavers with or without diplomas). An efficient system was set up which benefited from significant EU support and combined fellowships (conditioned to assiduity and success in learning), actions of awareness rising and civic education, repression of criminality always combined with education and/or vocational training measures, coaching of socially disabled people, in particular when entering into the labour market. Not only social workers and educators and teachers, but more and more retired people with a successful career in enterprises were involved in training and coaching actions of young and/or marginal people.

A great attention was paid to the maintenance of urban areas affected or threatened by multiple deprivation, addressing not only the physical aspect of the urban fabric, but also the endowment with services and facilities favouring social inclusion. Efforts were developed to support specific ethnic and religious cultures in a climate of tolerance.

A particular consideration was given to the promotion of regional identities in less prosperous regions in order to both promote the indigenous potential and regional capital of these areas and to counteract trends of xenophobia and racist/nationalist attitudes.

The governance of the strategy actively involved all levels from the municipal to the European ones. At EU level, in addition to the mobilisation of significant resources from the EU budget, transnational actions in the field of socio-cultural integration and promotion were developed and supported. The various EU polices in the field of culture, education and training, regional and local development etc. were more integrated and better targeted in

order to better correspond to the strategies developed at regional and local level. Networking of local experiences was developed. It contributed to strengthening the multiculturalist approach. The EU immigration policy changed substantially. While illegal immigration was more severely controlled, the (temporary or definitive) immigration of qualified people was favoured.

By 2015, the first significant results of the strategy could be observed. Criminality and insecurity in cities had generally decreased, a fact which contributed to weaken attitudes of xenophobia and racism/nationalism. Social stability could be improved in numerous European cities.

The promotion of regional identities in relation with the mobilisation of territorial potentials made the development of economic activities possible, also in disfavoured regions. The availability of qualified and motivated manpower enabled innovation and networking activities in line with the objectives of the Lisbon Strategy.

It was however after 2015 that the strategy proved to be the most useful. After the retirement of large numbers of people from the labour market, demand of qualified people increased significantly. Education, training and social inclusion activities which had been developed during the period 2005-2015 proved to be extremely fruitful. Not only enterprises benefited from them, but also the whole caring sector for the elderly.

In such a context, the reluctance of numerous Europeans with regard to further EU enlargements had been alleviated and negotiations with a number of new candidate countries could start, so that by 2030 the EU borders coincided more or less with those of the 'wider Europe'. This had only been possible because the Europeans and their governments and institutions had learned that continuous and intense activities of socio-cultural integration accompanied by a multiculturalist approach was an essential and strategic activity to ensure European development, integration and expansion.

9.2.2.5 Impacts

Macro-economic impacts

The strategy is based on the involvement of larger amounts of resources in the sectors of education, training, social inclusion, culture etc. As far as resources from the EU budget are concerned, savings in other sectors had to be made and more integrated and targeted approaches had to be developed. In the various member states, similar re-organisation of resource allocation had also to be carried out. Main constraints existed in the first years of implementation of the strategy. From 2010 onwards, return on investments was already significant in terms of savings of public resources for the unemployed and the socially disabled, the number of which had seriously diminished. The increase of the employment rate generated not only higher tax revenue for public budgets, but also stronger purchase power and more economic activities. The strategy contributed significantly to alleviate the shortage of qualified manpower which resulted from the emergence of large number of retiring people.

Regional, territorial and environmental impacts

At macro-level, the strategy contributed to reduce the volume of transnational and interregional migration flows which are often generated by economic as well as social factors. The fact that the strategy was strongly coordinated and promoted at EU level ensured high efficiency in the various European countries and regions, so that the potential increase of regional disparities was alleviated. This favoured slower concentration of people and activities in the Pentagon.

At meso-scale, within the various member countries, less people, in particular the retired ones, were inclined to leave the cities and to settle in distant rural areas. The spatial segregation of generations was alleviated.

Most positive impacts were to be observed at the regional/local level, especially in and around metropolitan areas as well as in less important cities. The expansion of deprived areas could be limited and the rehabilitation of a number of these areas was successful. The development of gated communities was contained and concerned only a limited number of sites attracting 'international clients' (tourist, retired people) in high-standing, highly attractive areas.

A relatively peaceful urban climate enabled to maintain compact cities serviced by public transportation and less dependent upon motor-cars. Pressure on surrounding open spaces and rural areas was limited as the progress of suburbanisation could be contained.

9.2.2.6 Final image

Through the implementation of the strategy, the European territory will have maintained by 2030 numerous characteristics it had in 2005. A number of changes will however have been caused by the structural evolution of the economy and of demography (provided no other perturbing events will have happened in between). Attractive rural areas are more densely populated than they were in 2005, especially in regions of southern Europe, due to population moves of retired people and of people in situation of working far away from cities. Cities are more lively with a clear cosmopolitan touch reflecting the success of integration policies. Social and cultural segregation has not completely disappeared, but is less visible. People with non-European origin have to a significant extent reached middle-class and even upper-class level, so that the areas where they are living have the character of specific cultural communities and do not, for the largest part, reflect poverty and deprivation.

A number of disfavoured regions have benefited from the promotion of cultural identities and developed their territorial potential in such a way that their competitiveness and resistance capacity in the context of globalisation have increased. They are no more marginalised territories.

9.2.2.7 Main issues arising from the scenario

The scenario highlights not only the benefits which may result from renewed and sustained socio-cultural policies in terms of economic development and social cohesion, but also the need to involved more the European level in such policies, both as a level of coordination between the various EU countries and as a provider of financial resources. With such an approach, undesired spatial evolutions are likely to be avoided and restrained.

9.2.3 ESPON core indicators related to the scenarios

- Households
- Household-oriented infrastructure
- Population growth
- Natural population growth
- Net migration rate
- Ageing/ Dependencies
- Reproduction potential
- Population in 'functional', 'strategic' age
- Total fertility rate
- Proportion of households with Internet access
- Proportion of households with broadband Internet access
- Population density
- Population by age
- Labour force
- Activity rates
- Unemployment rates
- Total employment
- Employment by qualification and profession
- Human capital
- Purchasing power indices

ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

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Volume 3
Draft integrated scenarios

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

This basic report exists only in an electronic version.

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1 Introduction

This volume presents the current state of work on the integrated scenarios. Four such scenarios are currently being developed and are at different stages of advancement: one baseline (or reference) scenario (chapter 3.1), two prospective policy scenarios opposing cohesion-oriented (chapter 3.4) and competitiveness-oriented (chapter 3.5) policy choices and one roll-back scenario (chapter 4) based on a final image of an 'ideal' combination of the two policy orientations. All these scenarios are based on the vast amount of information collected and synthesised in the integrated scenario base (chapter 2).

Next to the scenarios themselves, two other elements make up this volume. In order to test the scenarios and the territorial organisation resulting from each of them, it is foreseen that they be submitted to a wild cards procedure. This is presented in chapter 5. Finally, as scenarios are also communication tools, visualisation is a main element of their presentation. Chapter 6 presents results of first brainstorming attempts at visualising in different ways the contents of the scenarios.

This report is the last interim report of the project before the final report in October 2006. As such it is the last occasion to present the work in progress and to submit the choices made to external scrutiny. However, while reading this volume on the integrated scenarios, **please bear in mind that this is an instant snapshot of an ongoing process**. As the scenario building process is qualitative and cyclical (see next section), looking at its state in the course of one of the cycles obviously means that the reader only get a partial impression of what the final product will look like. This also means that some of the elements in the scenarios are weaker then others and that the entire battery of support tools to the scenarios has to go through more interactive revisions.

In light of the highly political nature of this particular project, this entails **the risk of misinterpretation and misuse of the current 'results'.** We, therefore, urge the reader to take this report for what it is, i.e. **preliminary, draft versions of the scenarios which still have to go through a first phase of political validation**. These scenarios are to be understood as the first basis of discussion and the feedback collected will flow back into a new cycle of revision, both of the scenarios themselves and of the tools developed in their support. More interaction will, therefore, be necessary between this project and the ESPON Monitoring Committee in the next 6 months.

A brief reminder of the methodology

This project proceeds to a more differentiated evaluation of spatial trends by elaborating future scenarios in support of informed decision making. The team approaches scenario writing as a cyclical process. Each cycle can be characterised by the following elements:

- Assessment and revision of existing knowledge in order to identify trends and driving forces
- Definition of policy relevant hypotheses
- Elaboration of a scenario story based on hypotheses, trends and driving forces
- Evaluation of the territorial impact of the story and elaboration of (future) territorial images

Each of these elements builds on the others and the cycles have to be run through several times. This process involves constant back and forth movements at different levels:

1. between the basic information about trends and driving forces and the scenario stories
2. between the qualitative scenarios and quantitative tools
3. between the scientific team and the policy stakeholders (MC)

So far the team has gone through four such cycles:

- First cycle: thematic scenario bases and definition of thematic scenario hypotheses
- Second cycle: draft thematic scenarios
- Third cycle: finalisation of thematic scenarios integrating feedback
- Fourth cycle: draft integrated scenarios

We are, currently in the last phase of this third cycle, presenting in this report first draft integrated scenarios and awaiting feedback on them. This will then lead into the fifth cycle which will allow the revision of the scenarios themselves, but also of the quantitative support tools and of the scenario knowledge bases wherever necessary. This cycle should come to its end by September this year, when the elaboration of the final report will begin.

2 Integrated scenario base

Dynamics and challenges of the European territory by 2005

Before entering into the elaboration of integrated prospective scenarios, it is appropriate to examine cross-sectorally which dynamics and challenges the European territory is confronted to by 2005. In this respect, the following aspects will be investigated: the situation after the recent EU-enlargement of 2004, the acceleration of the globalisation impacts, the European efforts towards the knowledge society and economy, the emergence of a new energy paradigm, the challenge of population ageing and of immigration and socio-cultural integration issues, the territorial impacts of climate change, the breakthrough of new key technologies, the issues of accessibility and transport efficiency, the territorial dimension of environmental sustainability and the territorial footprints of changing lifestyles. Only the most important and striking thematic aspects of the dynamics and challenges will be considered in this section which will be concluded by an examination of the resulting issues in terms of territorial cohesion and integration.

2.1 One year after the most significant EU enlargement

Although the legal basis of the European Union was for a long time dominated by economic considerations (the Union was then called 'European Economic Community'), most EU enlargements had a political dimension, thus corresponding to the very origin of European unification[1]. Especially the southern European EU-enlargements (Greece, Spain, and Portugal) had a strong political significance, because all three countries emerged from dictatorships before joining the EU.

In the case of the EU-enlargement of May 2004, the political dimension was even stronger, as 8 out of the 10 new member countries had spent four and a half decades of the post-war period under communist totalitarian regimes. In addition to the elimination of economic backwardness, the restoration and maintenance of political stability in the wider Europe was an essential objective of the last enlargement.

In global terms, the EU-enlargement of May 2004 added 5% to the GDP of the EU-15 and 20% to its population, which means that the average GDP/head in the EU dropped by 12.5% on the very day of the enlargement.

[1] The European Coal and Steel Community was created for the joint management of coal and steel in order to prevent wars.

The enlargement fundamentally changed the scale of economic disparities within the EU. Only Malta, Cyprus, the Czech Republic and Slovenia had in 2002 a GDP per head in PPS terms above 60% of the EU-15 average. In Poland, Estonia and Lithuania, it was only around 40% of the average and in Latvia, just 35% of the average.

In the new member states, growth of GDP averaged just over 4% a year between 1994 and 2001 in all, except Hungary and the Czech Republic. In Bulgaria and Romania, GDP increased barely at all. Over this period, growth of GDP/head in real terms in the new member states was around 1 1/2 % a year above the EU-15 average and therefore contributed as a driving force to European economic development.

After the enlargement, the EU territory has nearly reached continental size, considering Bulgaria and Romania as the next member countries and the fact that close cooperation exists between the EU and Switzerland and Norway. The characteristics of the territory of the new member states, especially those of Central and Eastern Europe differ in various respects from those of the EU-15. For instance, in the new member countries of Central and Eastern Europe, the proportion of population living in rural areas is generally higher than in the West-European countries, corresponding to a higher employment share in the primary sector. In the context of the catching-up process, which is significant but uneven in territorial terms, advanced tertiary functions such as R&D, technology development and transfer as well as other functions related to the knowledge economy, financial and banking activities, higher education etc. are progressing and benefit largely to large agglomerations.

The infrastructural endowment of the new member countries is weaker and, in various regions, rather obsolete. Although their situation, in terms of global European multimodal accessibility, is not worse than that of a number of peripheral regions of Western Europe, the new member countries have many areas with low internal accessibility (at regional and local scale). Significant levels of road traffic congestion, caused by strongly increasing motorisation rates, and low security standards add to the other handicaps of the transport situation. The modernisation of transport infrastructure is progressing, especially on major corridors, thanks to the support of the cohesion and structural funds.

In the early 1990s, environmental challenges were severe in the former communist countries of Central and Eastern Europe. In the context of the transition period, numerous industrial polluting plants were closed down and efforts were made to eliminate the environmental damages inherited from the former regimes. By 2005, the situation has significantly improved, but environmental standards are generally still below those of Western Europe. Financial resources from the cohesion fund and the structural funds are being used to implement the environmental norms and regulations of the 'acquis communautaire'.

The territorial impacts of the last EU-enlargement on west-European regions is far from

being negligible, but it is not always objectively appreciated. While the issue of enterprises' relocation from western to Eastern Europe is a very sensitive one and cannot be denied, the positive impacts of the enlargement on exports from west-European regions and on the further specialisation of the western economies in more advanced sectors is often overlooked. It is likely that the structural adjustment related to the last enlargement will continue over a significant period of time.

2.2 Accelerating globalisation dominates most driving forces of territorial development

In the last decades, the expansion of international trade and international investment far outpaced the growth of output and income. Opportunities have expanded for two reasons. First, technical improvements have led to significantly lower transport and communication costs. Second, successive multilateral agreements have significantly brought down the barriers to trade. While in 1930 the average import tariff for manufacturing was 21% in Germany, 30% in France and 48% in the United States, after the Uruguay Round in 1994 it fell to 4.8% for the European countries and 3% for the United States. In 1820, world exports represented only 1% of world production. This measure for openness increased to 9% in 1913 and to 17.2% in 1998. Clearly, countries have become more integrated in world economy during centuries. But this has not been a continuous process. With the Great Depression in the 1930s came an era of protectionism in which countries raised import tariffs and countries became less, rather than more integrated.

European integration has contributed to the internationalisation of European economies. Since the Treaty of Rome, Europe has gradually deepened its economic integration, widened its competences and enlarged its membership to a club of 25. Intra-EC trade and investment flows illustrate the achievements of European integration. The share of intra EC-trade as percentage of all EU exports grew from 37% in 1958 to 56% in 1980 and to 61% in 1998. The share of intra-EC investment flows as percentage of total European FDI almost doubled during the last two decades. This actually shows that internal demand is an important factor of economic growth in the EU.

The WTO has succeeded in removing a number of major trade barriers in manufacturing, while the Single Market Programme of the European Union has gone beyond that by removing technical barriers of trade. This does not imply that integration cannot proceed much further. National borders still exert a large impact on trade. According to some research findings (Brewer et al. 2001) the trade between regions within the same country is about 80 times more intense than is trade between two regions which are in two different countries. The creation of a single currency in the European Union may help to make borders less important as barriers of trade – an effect that has not yet fully materialised. Bilateral trade flows halve when distance is doubled and decrease by roughly 80% when the

languages of the two countries are different. This indicates that transaction costs are still important barriers of international trade. It also suggests that the process of international economic integration has further prospects.

There are, however, uncertainties concerning the further liberalisation of world trade. This is especially because of the more heterogeneous membership of the WTO, which leads to a wider variety of interests. The recent outcomes of the Hong Kong WTO negotiations, as part of the Doha Round, will have impacts for the EU, especially in the agricultural sector, as export subsidies will be completely abolished in 2013. The other major uncertainty is the volatility of international financial markets. Today huge flows of money move across the globe and react to even the smallest differences in profitability. Although, not every country has access to international capital markets and arbitrage is still imperfect, the mobility of international financial capital is indeed fairly high.

The most sensitive aspect of globalisation is however the emergence of new large economies at world scale, in particular in Asia. The European economy is affected in various ways by this dominating trend. First, it has to cope with increasing imports of a variety of low-cost products in low and medium technology sectors. Second, foreign investments, including European ones, are more and more directed towards these emerging economies, mainly in the manufacturing but also in the service sectors. A direct impact is the increasing number of relocations of European enterprises into these emerging countries, in particular into China. The third impact is the need for the European economies to further specialise in advanced economic activities (R&D, new technologies and innovation, advanced services). Increasing external competition is expected in future also in the high-tech sectors. The accelerating globalisation process has important territorial impacts in Europe.

If Europe wishes to play a major part in the globalisation process to protect and strengthen its own global role at world scale, it should pay particular attention to its 'neighbourhood policy', in order to increase its 'economies of scale' in the globalisation process. Compared with other large regions in the world, Europe stands out in its potential to integrate the economies of its neighbours. The human capital of EU's neighbourhood (Ukraine, Turkey, Maghreb, a number of Middle East countries) is significant in quantitative terms. Should Europe be able to access and integrate in one way or another its neighbouring human capital stocks, it would not only contribute to large-scale stabilisation in the region, but also contributing to the building of a powerful economic block at world scale. In this respect, Europe would have a stronger weight in shaping the process of globalisation.

2.3 Europe on the move towards the knowledge society

The growing importance of knowledge for the economic development is accelerating the structural change of the economy in the EU (and elsewhere). New, knowledge-based sectors, e. g. bio-, nano-, material- and ICT, can potentially significantly influence the economic growth and increase productivity, whereas the 'old' branches are undergoing either a deep restructuring or a decline in the course of globalization pressure. The structural change is accompanied by and its economic success can be enhanced by policy reforms which set incentives for a prosperous development of knowledge-driven sectors.

The impact of the knowledge society to a large extent does not result from few high tech sectors, but more from the use of the advanced technologies, developed in the leading high tech-branches, in all sectors of the economy. ICT and other advanced technologies are undergoing a broad cross-sectoral diffusion process. However, this diffusion requires the combination of investments, e.g. in ICT, with fundamental organizational changes. These organizational changes concern the intra-firm relations as well as the inter-firm relations and the firm-customer relations (e. g. e- commerce), and probably the implementation of these organizational changes might be more costly than the investment itself. It can be expected that large firms will be more capable to implement the organizational changes than small ones.

According to previously published EU Competitiveness Reports, investment and diffusion of ICT were regarded as important factors for productivity growth in the US, whereas the EU showed a relative backwardness in terms of productivity impacts of ICT. The European Competitiveness Report 2003 highlighted that ICT capital contributed more to the *growth of labour productivity* (measured as productivity per hour) in the US than it did in Europe (ibid.: p. 8). Furthermore, the productivity impact of ICT grew faster in the US than in Europe in the second half of the 1990s. The Commission's 2004 Review on the EU Economy emphasizes the main reasons why the EU is lagging behind in terms of ICT. First, a strong focus of the European economy is on industries with a technological level from low to medium. Second, in contrast to the US economy, the ICT production sector in Europe is of relatively small importance. Third, the benefits from ICT use fell back behind those, gained in the US economy. The cited report comes to the conclusion that the US lead regarding the production and absorption of knowledge is primarily because 'the USA's overall innovation system is superior to that of the EU's, both in terms of the quality and funding of its knowledge sector and the more favourable framework conditions prevailing'. The report comes to the conclusion, that in the beginning of the 1990s a successful turnaround took place in the US towards an innovation system and a regulatory frame which supports the most advanced knowledge based sectors, but not so in Europe.

The acceleration of productivity growth due to ICT, experienced in the US economy, is largely the result of *ICT production*. Because ICT has a lower share in production in Europe than in US, in the 2004 Review of the EU Economy it is assumed that the productivity

impact of ICT in Europe will not reach the same level as in the US economy (ibid.: p. 29). To explain the US-EU differences in productivity growth, the lower production share of ICT in Europe is not sufficient. A number of other reasons are listed in the 2004 Review, particularly the inadequate 'national champion' policy is regarded as very problematic (ibid.: p. 183). Instead, to belong to the worlds leading players in the knowledge-based sectors requires at least an EU-wide or even a global approach to attract the best brains and resources (ibid.).

As far as the *use of ICT* is concerned, several studies emphasize the capability to interlink the use of ICT with complementary organizational changes in the business sector (Commission of the European Communities 2003: pp. 9-11). Empirical data which stem from the so-called e-business watch, done by the European Commission, show that industries with higher qualified workers and with a higher intensity of information technology use e-business applications more frequently than other industries (see ibid., p. 10). However, the adoption of e-business solutions is still low in small and medium-sized enterprises (SMEs). Particularly low e-business activities are found in low-skill industries (ibid.: p. 11).

Against the background of the necessary catching-up process in terms of the use of ICT for reaching a greater productivity growth in the EU, a need for *policy actions* came up. The Lisbon Strategy set 'a challenging programme for building knowledge infrastructures, enhancing innovation and economic reform, and modernising social welfare and education systems' (Presidency Conclusions 2000, p. 1). The Lisbon Strategy seeks to make the EU '*the most competitive and knowledge-based economy in the world*' (ibid., p. 2, italics in original). The Lisbon Strategy was refurbished in early 2005 after its mid-term assessment had shown that its main objective was only weakly achieved.

The structural change, induced by the knowledge society, requires high and permanently renewing skills of the workforce. The growing economic importance of a number of knowledge- based sectors goes along with a growing proportion of workforce employed in knowledge-related economic activities. The acquisition and retention of top researchers towards/in Europe is a necessary requirement, when it comes to the production of new knowledge and its economic use. However, skill requirements are much broader; they include more or less all branches and professions. General education is thus an important driving force. Against the background of an ageing population in Europe, life-long learning will also become a pre-condition for coping with the challenges of the knowledge society. Advanced technologies, e.g. the use of ICT for tele-learning will create new opportunities for training and qualification.

Both the production of new knowledge and its diffusion and use across all sectors of the economy require strong ties between research institutions and businesses. So far as the innovation process is concerned, spill-over of non codified 'tacit' knowledge will be of growing importance for the economic success of the innovator. Spill-overs of tacit

knowledge typically require spatial proximity of the partners (universities, research institutes, businesses). However, so far as codified knowledge as a pre-condition for production is concerned, spatial distance doesn't matter. ICT creates new opportunities to distribute information and (codified) knowledge over large distances in a few seconds.

The use of ICT as an essential knowledge-based technology creates growing opportunities to modernize the public sector too. E.g., e-governance creates new opportunities for the rationalization of administrative procedures and it will create new chances to improve democracy and to mobilize citizens' initiative.

During recent decades low-skilled wages have lagged behind high-skilled wages in a number of countries, while the unemployment rate among the low-skilled has risen more sharply. This divide between skill levels may intensify in the coming decades. Changes in technology – especially the widespread application of ICT – could raise the demand for skilled workers. Together, this would raise the skill premium, thereby increasing income inequality.

During the 1980s and 1990s, the United Kingdom and the United States experienced a notable increase in income inequality. However, not only in these two countries do we observe that high-income groups saw their income increase faster than low-income groups.

One factor that can assist in the development of a strong and innovative economy is the strength of supporting innovation infrastructure[2]. At a European level the strength of the local university base and the presence of recognised science parks and Business Innovation Centres can play a role. Analysis of the location of this infrastructure across Europe demonstrates some strong patterns, reflecting wide territorial disparities:

– 4% of EU regions account for 40% of the leading research universities and institutes, 46% of recognised Science Parks and 25% of Business Innovation Centres, while 76% of regions contain none of these;

- all EU-15 Member States have at least one region in this leading group, although the institutional mix varies between having a very strong university base, or a balance between Science Parks, Business Innovation Centres and Universities;

- in the 12 new member Countries and Accession Countries (Bulgaria, Romania) the distribution of research infrastructure is spread more thinly, with just 18 recognised Science Parks and 10 Business Innovation Centres; and

- the concentration of research infrastructure is not just at a national level, with more than half of the research infrastructure in the leading EU regions located in just 7 regions, representing a significant endowment of knowledge and opportunity. Another issue is the

[2] ESPON in Progress. Preliminary Results by autumn 2003.

low competitiveness of the European universities compared with their American counterparts.

The promotion of innovation is therefore characterised by very strong territorial imbalances throughout Europe. This concentration varies in intensity according to the indicators considered. Strong territorial concentration at EU level is observed in the fields of R&D intensity, employment in high technology services and R&D infrastructure. Concentration in the northern half of Europe is observed in the fields of R&D personnel and population with tertiary education. In the case of employment in high and medium/high technology manufacturing, the contrast is pronounced between the manufacturing heartlands of Europe and the rural periphery. A number of new member countries perform well, but important differences exist between countries, in particular in the field of R&D intensity and employment in high technology services. Important imbalances also exist between regions at national level in most countries.

The growth in information intensification is providing society with a host of new means for both information collection and communication. Under the influence of economic globalisation, international experience is becoming an increasingly common phenomenon among the life of average European people. It is virtually certain that such international experience affects lifestyles, consumption patterns and basic values, spurring attempts by an increasing number of people to replicate diverse cultures, concepts, consumption patterns and lifestyles.

2.4 Europe on the way towards a new energy paradigm

2.4.1 EU growing external dependence in the field of energy supply

The EU is relatively poor in conventional energy reserves. However, this fact has not affected the rise in energy demand over the past decades and is not expected to act as a brake on consumption for the foreseeable future. As a result, Europe is increasingly dependent on energy imports. Looking at the situation for the various energy commodities, the situation is as follows:

- the EU imports around 80% of its oil. With the foreseeable depletion of North Sea oil reserves and still growing demand, external dependence would rise, under baseline hypotheses, up to 90% by 2020. Main suppliers are presently OPEC countries.

- gas import dependence of the EU is presently 40%. It is expected to rise to 66% by 2020. Main suppliers of the EU are Norway and Russia. Although new suppliers are entering the

market (North Africa, Middle East, Central Asia etc.), dependence on Russia is considerably increasing as a result of EU enlargement.

- as far as coal is concerned, the enlarged EU still has substantial reserves (UK, Germany, Spain, Central and Eastern Europe), but imported coal is far cheaper than domestically produced coal (four times cheaper in the case of German coal). Production in Europe is falling and is likely to do so, in particular in the new member states of Central and Eastern Europe. As a result, coal imports into the EU are increasing although demand is decreasing.

- Europe is poor in nuclear resources (uranium). EU demand for uranium has stabilised at about 20 000 tons per year. Future trends in demand are unclear, given the uncertain future for nuclear power in several member states. Demand for uranium in the EU will increase if demand for nuclear electricity significantly increases. This will create greater dependence on external resources (from Russia, Canada, Australia).

2.4.2 Strategic energy issues at world level

The increasing external dependence of Europe for its energy supply implies that strategic issues at world level are of considerable importance for the future of Europe.

In the world context, the most strategic energy commodity is oil and the issue is the evolution of the relationship between global supply and demand. As far as world oil demand is concerned, it is strongly growing under the influence of large emerging economies such as China, India, Brazil as well as of other developed economies like the USA. Presently, oil demand is higher than supply. This explains the sharp increase of crude oil price since 1999 ($9/barrel in 1999; $70/b by mid 2005). Constraints to the rise of present oil production (which amounts to 78 million b/d) are numerous: the steady reduction of large oil discoveries since the 1970s, the decreasing level of investments in oil search and exploitation as well as in refining capacities, wars and conflicts etc. Looking at the future, the evolution of the oil sector is even more serious because of progressive depletion of oil resources. According to a number of experts, a geological process of oil production peaking at world scale is likely to happen between 2010 and 2020. This does not mean that oil resources will be totally depleted, but it implies that world oil production, after a period of 'plateauing' will regularly decrease, independently from the level of investments made to increase production. This process is related to the specific geology of oil fields and to the fact that the conditions of exploitation of remaining reserves are much more difficult and expensive than those which prevailed up to now. The combination of declining oil resources with regularly increasing demand at world scale is likely to generate extremely high oil prices and even oil scarcity after the oil peaking process has occurred. Because of the role

played by oil and oil products in the European economy, the impacts of oil production peaking may be rather severe.

Gas reserves are, compared with oil, relatively well distributed around the globe. The former Soviet Union is the major source of gas reserves, with the Middle East a close second. Other major reserves are spread in Asia-Pacific, the Americas, Africa and Europe. Worldwide, the prospects for gas supply are relatively good in the short term with a peaking point coming in perhaps 20 years or so. This will depend upon the rate of global gas consumption. In the long range (by the year 2030), however, gas production peaking at world scale will most probably have taken place and the situation will be similar to that of oil.

Almost 80% of world coal reserves are concentrated in North America, Asia-Pacific and the former Soviet Union. Reserves in Europe, based on caloric value, are estimated at 72 billion tons of coal units (of which 70% is hard coal). Coal reserves are being used at a far slower rate than oil and gas.

Current annual world uranium production is 31 000 tons, compared with needs of some 60 000 tons. Secondary supplies (stocks, military material, recycling) cover the gap. Since around 1984, substantial quantities of uranium, coming from inventories, USSR or CIS countries, or from uranium no longer needed for defence purposes, have been put on the market, resulting in an oversupply situation and a substantial price decrease. These secondary resources have been largely exploited and uranium price is likely to increase again. In addition, demand is higher than the production of conventional uranium at world scale, so that significant expansion of nuclear energy production would be confronted to limitations and obstacles in the medium range.

2.4.3 Potentialities for renewable energy sources

The contribution of renewables to energy production across the EU is around 6%, of which hydropower represents 4% (2/3). Renewable energy sources are currently unevenly and insufficiently exploited in the European Union. Some countries, such as Austria, Sweden, France and Italy have a large renewables sector. Some, such as Germany, have intensive programmes or legislation in favour of renewables and some have little exploitation of renewable resources. Outside the EU, both Norway and Switzerland have significant renewable resources, mainly hydropower.

Large-scale hydropower is the largest renewables producer. It is the best exploited and the most mature. Within the EU, hydropower supplies cover around 14% of electricity demand. Most economically feasible sites have been exploited in Europe. Reserves still exist in small-scale hydropower (< 10 MW) for local decentralised generation. A growth of some 2500 MW

is anticipated in the EU by 2010. Further potentialities exist in the offshore sector (wave and tide energy). Technologies still have to be developed.

Installed capacity for wind energy has more than doubled during the 1990s and the same happened over the past five years. There is potential for further strong growth. A quadrupling of market potential by 2020 is possible thanks to offshore installations, greater capacity wind turbines, large dispersed wind farms etc.

There is also significant potential for solar, thermal collectors which produce low temperature heat for domestic applications. Installed capacity is increasing, but paradoxically, more in the northern half than in the southern half of Europe. Photovoltaic electricity production is on a very small scale in the EU. Cost is a decisive factor. Installed capacity has not grown as quickly in the EU as in the rest of the world. It is however estimated that a significant market potential exists, as high as 2000 MW by 2010, compared with 200 MW in 1999.

As far as biomass is concerned, potential is very significant and there are numerous applications. Biomass is used for the production of heat and/or electricity, for instance in CHP plants (Combined Heat and Power). Biomass will also be more and more used to produce biofuels for the transport sector (mainly bio-diesel and bio-ethanol) as complement or substitute to oil products.

Geothermal energy depends on similar technology to the oil industry. 'Hot dry rock' technology aims at 'mining' heat of 200-250°C which is available in many places in the EU at a depth of 5000 m. The installed capacity in the EU has risen gradually in the 1990s and is likely to do so, but the market potential by 2010 is unlikely to exceed 2700 MW. As far as heat pumps are concerned, there is significant potential for the heating of dwellings and offices. It is however necessary to take account of the real energy efficiency of such technologies (ratio between energy produces to primary energy consumed), which is less favourable than the ratio energy produced/electricity consumed.

2.4.4 Main characteristics of the new energy paradigm

A logical consequence of increasing imbalance between energy supply and demand is the increase of energy price. This is already obvious in the oil sector. Gas prices, which are indexed on oil prices, are progressively following the trend. Through substitution effects, other energy sources are also likely to become more expensive. Europe is therefore moving towards a new energy paradigm driven by the increasing prices of oil and gas and their potential depletion, the main characteristics are the following:

- the need to further improve the energy efficiency at consumer's level. The energy intensity of the European economy (share of energy consumption in total GDP) has significantly decreased since the oil shocks of the 1970s. This results from the adoption of energy saving measures and of energy efficient technologies, as well as from the structural changes in the European production systems (abandonment of heavy industries which are highly energy consuming and development of high-tech industries which produce higher added values with far less energy consumption). This trend is likely to continue and even to be accelerated. High oil price generates investments in energy efficient production techniques. It will also accelerate the structural transformation of the European economy towards a more technology and service-based pattern.

- the need to accelerate the exploitation of renewable energy sources, in particular, solar and wind energy as well as biomass and biofuels;

- the need to reconsider the issues around 'conventional energy sources', such as coal or nuclear energy. Significant societal debates related to environment and security will emerge soon to which appropriate answers have to be prepared, including those related to technological solutions (for instance coal gasification or production of nuclear waste with low radiation capacity);

- the need to reconsider energy issues in the transport and mobility functions. This is not only related to the possible evolution of modal shift, but also the potential for mobility reduction, including wider use of telecommunications and also the development of new settlement systems requiring lower mobility levels;

- the need to consider the impacts of climate change on the energy sector. Climatic conditions have important impacts on energy consumption patterns. Climate change with longer periods of high temperatures in summer time generate higher energy consumption for cooling offices and dwellings in a number of regions of southern and even Central Europe, but less heating in the winter in the northern parts. Climate change also has impact on energy production systems. Sustained drought in southern Europe has significant negative impacts on the production of hydro-electricity, because of lack of water in barrages. Acceleration of climate change will not be neutral in energy terms.

- the need to strengthen at EU level the geopolitical dimension of energy supply issues. The growing external dependence of the EU for its energy supply gives a new dimension to the EU external policy. Energy supply in Europe is becoming an integral part of geopolitical relationships. In case of oil depletion and scarcity, it is likely that international tensions will emerge. Peaceful solutions will have to be looked for at highest level.

2.5 Population ageing becomes a tangible reality

On 1 January 2004 there were 380.8 million inhabitants in the EU-15 and 74.1 million in the Acceding Countries (according to the first demographic estimates for 2003, published by Eurostat in June 2004). In the EU-15 the population grew by 3.4 per 1000 inhabitants in 2003, due to natural population growth and net migration of +0.8‰ and +2.6‰ respectively. Three quarters of the growth was therefore a result of immigration. On the other hand, and despite net migration (+0.4‰), the population fell by 0.8‰ in the Acceding Countries, due to a negative natural growth of 1.2‰. The natural population growth in the EU-15 (live births minus deaths) was estimated to decrease from +309 000 in 2002 to +294 000 in 2003, and net migration should be also down, from +1 260 000 in 2002 to +983 000 in 2003. In total, the EU-15 population was estimated to have increased by 1 276 000 in 2003. This is in line with the past few years, but still modest compared with growth in the 1950s and 1960s.

Europe has, over the past three decades entered its 'second demographic transition' with populations failing to replace themselves which is itself a major driving force for change. Structurally then, there is an increasing proportion of old people which is likely to continue as the 'baby-boom' generations reach retirement age. Irrespective of how this phenomena is explained (post-industrial etc.), it is clear that the contemporary demographic behaviour in the EU is different to what it was 30 years ago.

Compared with major global population trends at world scale, Europe is famously out of line with its natural population declining or at zero in the majority of European states, but as other parts of the world, is experiencing high levels of immigration. Immigration from outside Europe is the sole means by which many national population levels are being maintained. While most countries in Europe have been a desirable destination, some countries are considered much more so (such as the UK and France) resulting in imbalances across the EU and high rates of illegal immigration. Nonetheless all EU countries with the exception of Latvia, Lithuania and Poland currently have a positive crude net migration rate.

At territorial scale, European demographic developments are characterised by extremes; parts are very congested, others experiencing severe depopulation. On the whole the natural population movements are negative, but this is not generally the case in areas of high density. In such regions, generally large agglomerations, a combination of a high proportion of young people and immigrants have produced populations out-growing available jobs and services and out of synchronisation with the demographic situation across the rest of Europe.

In nation state terms, the countries with the highest levels of population ageing are Italy (share of population over 65 in total population: 18.0%), Greece and Sweden (17.3%), Belgium and Spain (16.8%), Portugal (16.4%), Germany and Bulgaria (16.2 %) and France

(16.0%), while those with youngest populations are Cyprus (11.6%), Slovakia (11.4%) and Ireland (11.2%).

The Central and East European new member and accession countries have slightly higher mortality rates for men than the rest in the EU. In fact, in some regions this has worsened since 1989. In the Baltic countries the gender gap in mortality is especially wide averaging 15 years (just over 6 years in the rest of the EU).

If the former trend continues on its present path the labour force will inevitably shrink as there will be insufficient entrants to replace those leaving, although the decrease of unemployment will compensate this at least partly. This would make economic expansion difficult to sustain and make preserving welfare levels difficult. Specifically as the number of people dependent on retirement benefits increases, the viability of this expanding element of social security systems may become fiscally unviable, though increasingly difficult to challenge as the political weight of the aged constituency grows. There are also clear indications of increasing mobility and different consumption patterns of the aged.

To meet the challenges of an ageing society, Europe attempts to mobilise people to enter the labour market and to create policies to further promote women's employment in all age brackets but in particular in the older ages, and to fully utilise the female employment potential among immigrants. The challenge is also to close the gender pay gap and to facilitate reconciliation of work and family life for both women and men. All these measure are however limited by the fact that if job creation remains low, these new entrants will not find employment, or only displace existing job holders.

2.6 Immigration and integration issues are gaining in importance

2.6.1 A variable but growing number of immigrants in EU member countries

Inter-country migration is the trend which affects most total demographic evolution. The maintenance of Europe's population has relied on external immigration, as have those of most developed industrial countries – including the USA.

It is very difficult to find comparable data on the size of foreign residents and their dependents, legal and illegal immigrants across Europe due to the fact that each country measures their populations differently. Variations in immigration and asylum policies compound the problem. In spite of these quantifiable issues, it is generally accepted that at the nation state level, France has the largest proportion of '*etrangers'*, who (including their

French-national children and grandchildren) account for about 25% of the population (14 mill). Germany has approximately half this number (7 mill). The UK which has persisted with its official policy of multi-culturalism records the ethnic origins of all citizens. According to such data, 'non-white' ethnic groups count for 6.5% of the population (3.8 million), added to the white immigrants (especially from Eastern Europe). The number of residents descending from immigrants, immigrants seeking residency or nationality, etc. is a much more contested issue as numbers are not reliable at the national level. Individual research indicates that there are enormous regional variations: a recent study of Wembley in London, for example, found that more than one in two residents were born outside of the UK.

An additional factor which is key to the significance of identifying areas with high shares of foreign populations relates to the reasons for immigration and the culture and religion[3] of the new communities. The composition of the immigrant population according to nationality obviously varies in each destination country, being dependent upon the migratory tradition within the country, the nature, scope and coverage of the networks established by previously established foreign communities, the employment opportunities offered at the destination, the geographical proximity between the country of origin and the destination country, and certain determining factors such as historical and cultural links with former colonies and protectorates. Hence immigration to Portugal is sourced largely by Cape Verde, Angola, Guinea and Brazil, the Netherlands by Surinam and the Former Dutch West Indies. Recent developments in Central and Eastern Europe have given rise to new migratory waves, thereby increasing the in-take of immigrants from neighbouring states. Eastern European countries host large numbers of refugees and internally displaced persons, in particular from Armenia, Bosnia and Herzegovina, Croatia, Georgia and the Russian Federation. Many of the refugees and internally displaced persons have not been able to return to their countries or homes and face an uncertain future throughout the region.

2.6.2 Immigrants generally concentrate in large urban areas

The significant variable when it comes to the location of a high proportion of foreign population is the urban – rural one. Most cities and most notably capital cities have a much higher proportion of foreign nationals, foreign-born and second and third generation immigrants than towns or outlying rural areas. For instance in the Netherlands, 48% of the population of Amsterdam can be defined as immigrant, approximately half of these being defined as ethnic minority, in the Netherlands as a whole it is 8%. Obviously, countries with a colonial past, and capital cities with a history of migration have a significantly higher proportion of foreign residents than those with neither. Thus the highest percentage of foreign citizens is maintained in countries such as Germany, France, the Netherlands and the UK and cities such as Luxembourg (59.15%). There are marked increases in capital

[3] In view of current concerns about sections of the Muslim community and the issues relating to security, separation and integration, it is notable that estimates suggest 10% of the French, 2.7% of the British population and probably a higher proportion in Germany are Muslim.

cities with a more recent history of immigration, such as Madrid (12.75%), Dublin (8.4%), Rome (6.6%) and Lisbon (6.27%). In capitals with a longer tradition of migration the percentage of children of immigrants (first, second and third-generation) is high such as in Amsterdam (20%), Luxembourg (23.7%) or Berlin (18%) and the proportion of foreign or ethnic minority communities will increase significantly over the next 25 years due to the higher fertility rates of most in-coming groups. Even in countries without links with former colonies and no strong history of immigration the pattern is clear, thus in Vienna the percentage of foreign nationals is over 16% compared to the national average of approximately 9%.

According to the Urban Audit (European Commission) European cities are becoming *more international and cosmopolitan. W*hile 84% of the cities have experienced a decline in the proportion of national citizens between 1981 and 1996, the average proportion of people of foreign citizenship – and especially non-EU nationals – increased from 4,6% to 6,6% in the same period. This is a trend characterising all European cities of today. According to the findings of this survey the attraction of cities as settings for migrants and ethnic minorities can also be explained by factors such as the extended supply of services available in the cities and access to housing. Quite often, especially immigrants just settled in the country need extra services with respect to housing, employment, education, etc. Furthermore, to a higher degree than smaller cities and towns larger cities enable migrants and ethnic minorities to live close to family and kin, which can be an important point of departure for integration in everyday life. In that sense, cities and larger urban areas constitute a kind of safety net for migrant and ethnic minority groups.

2.6.3 Multiculturalism: from factual evidence towards policy concept

Multiculturalism is a concept with a double significance. On the one hand it characterises a society composed of various cultural groups (ethnic, religious groups etc.), which is then denominated 'multicultural society'. On the other hand, it designates public policies aiming at preserving and promoting the cultural identities of the various groups composing society.

It is a common sense that Europe has progressively become, over the past decades, a multicultural society. The most important factor has been sustained immigration from outside the EU and largely from outside Europe (North Africa, Black Africa, Middle East, Asia etc.). Although their importance varies among European countries, large ethnic and religious groups of non-European origin are present all over Europe and their size is increasing because of both continuing immigration and higher birth rates than in the native European population. Within the EU itself, considering the native European population, it cannot be overlooked that significant cultural differences also exist, for instance between the Iberian and Slavish populations, or between the Nordic and Mediterranean people.

Access to employment is of key significance for social inclusion, since it determines in most cases whether people are able both to enjoy a decent standard of living and contribute fully to the society in which they live. For those of working-age, having a job or being able to find one within a reasonable period of time is therefore invariably a precondition of social inclusion. The employment rate of immigrants varies according to the place of origin. Foreign born from other industrialised countries have a similar or higher employment rate and a lower unemployment rate than the EU average, while immigrants from other parts of the world have substantially lower employment and higher unemployment rates than the EU average. Differences in employment rates are largest among women.

Poverty is closely linked to unemployment. Only 7% of the employed population in the EU-15 had income below the poverty line in 2000, as against 38% of the unemployed and 25% of the inactive. Social exclusion is a very broad concept which includes not only deprivation, but also problems of social and political relationships, such as social isolation, non participation in social protection measures and lack of citizenship rights. In practice, exclusion has a financial dimension (poverty) and, possibly, a relation with the labour market (long-term unemployment). People are considered as socially excluded when they are not part of the networks which support most people in ordinary life: networks of family, friends, community and employment. There is evidence that the share of people under the poverty level and of socially excluded is higher among the immigrant groups than among the native population.

In large parts of Europe, the most basic problem is a shortage of adequate housing, although most European countries have a crude surplus of houses over households. The apparent surplus includes, however, large numbers of properties which are unfit to live in. When these are excluded, the result is a net shortage. Immigrants are more severely confronted with the problems of housing shortage than other population groups.

A particular characteristic of the globalisation process has to be seen in relation to culture. The internal stability of the emerging global socio-economic system is being jeopardised by the fact that various societies are being unevenly integrated into the global system, the economy being far ahead of culture in terms of integration. This results in local socio-cultural instability, where a perceived or real danger of weakened identities prompts local cultures to 'defend' themselves from the emerging global culture. Aside from the obvious socio-economic elements, the recent riots in French suburbs were also a manifestation of, among other things (notably spatial planning policies which have led to segregation and ghettoisation), insufficient socio-cultural integration.

As a policy concept, multi-culturalism has become an issue within the EU, with the growing emancipation of previously marginalised national and ethnic minorities and immigrant

communities. The main instrument for preserving the cultural identity of the newly arriving immigrant communities is education in as far as this is really an effective tool of integration , but against cultural assimilation by the dominant majority culture. Whereas the North-American melting pot is dominated by the Anglo-Saxon culture and East-Asia has yet to embark on a regional level societal integration, Europe continues to make attempts to cope with and celebrate cultural differences, overcome historical cleavages and knows better how to use cooperation to avoid hostilities.

2.7 The territorial impacts of climate change cannot be ignored any more

Climate change is taking place mainly due to human induced greenhouse emissions. In 2005, this fact is hardly denied anymore by scientists or politicians. The Intergovernmental Panel on Climate Change (IPCC), which brings together the widest possible range of scientists and research results, has provided substantial evidence on this.

The indisputableness of human-induced climate change is the result of a long process of weighing the presumed evidence and of scientific and political debate. Nowadays, the debate has shifted from existence to magnitude and impacts of climate change. Although improvements are made in the scientific understanding of climate change processes, uncertainties about processes and impacts are still very large.

Looking at the current evidence of climate change, some important indicators speak for themselves. The earth's climate has warmed rapidly by about 0.7 □C in the last century, with an increase of 0.95 □C in Europe. These increases are significantly larger than temperature variations of the past 1000 years. The hottest years of the 20th century which were in the1990s, show an acceleration of the process.

Temperature rise is caused by increasing greenhouse gas concentrations (mainly CO2 and some other gases in smaller quantities). These gases have the ability to intercept and re-emit heat which is emitted from the earth's surface, thus leading to increases in global temperature (EEA, 2004). Although natural fluctuations of CO2 concentration occur, its concentration has never been as high as presently. Moreover, CO2 concentration has increased by 34% compared with pre-industrial levels, with an accelerated rise since 1950.

However, the processes of CO2 concentration influencing temperature and particularly precipitation are still not fully understood due to knowledge gaps about climate systems (EEA, 2004). The influence as such is there, and proved scientifically, but quantifications are hard to make. Aside from these uncertainties, there are still small groups of scientists that question the presented evidence at all (McIntyre and McKitrick, 2005).

Impacts can be categorized along two lines: the atmospheric events themselves and their indirect results. Atmospheric events, in turn, can be differentiated between long term trends (increasing average temperature) and changing frequency and/or magnitude of extreme events (storm surges, heat waves, etc.). Indirect impacts are related to these two categories. Sea level change or prolonged growing seasons result from changing average temperature. Increased flooding frequency is directly caused by more high-intensity rainfalls. Both processes taken together might exacerbate the impacts. More storm surges on a certain coastline together with a higher sea level increases the risk of coastal flooding.

Climate change has accelerated during the past decade. One can reasonably assume that it has already caused important damages in European regions and current evolutions are potentially threatening territorial and environmental balance. Most important physical aspects of climate change with damaging impacts are flooding, drought and storms/hurricanes. Increasing average temperature has also important impacts on the rise of sea level and the destruction of glaciers in mountain regions.

2.7.1.1 Glaciers, snow and ice

The retreat of glaciers, snow and arctic ice has globally been observed, with a 20% retreat in European Alpine regions since 1980. In Norway, glaciers are extending their volume, due to increased snowfall. In general, however, extent and duration of snow cover across Europe has decrease since 1960. Sea ice in the Arctic has been in decline as well.

2.7.1.2 Marine systems

During the last decades, sea level rise has been 0.8 – 3.0 mm per year. This has so far not had any severe consequences. More biological activity has been observed in the North Sea and the Baltic Sea, suggesting a shift of species towards the north.

2.7.1.3 Terrestrial ecosystems and biodiversity

A northward movement of species has been generally observed. In many areas, this led to an additional decrease of biodiversity on top of losses already experienced through habitat fragmentation and the like. At the same time, in some northern and central countries biodiversity increases by the intrusion of new species.

2.7.1.4 Water

Annual river discharge has changed substantially, increasing in North and Eastern Europe, and decreasing in Spain and Portugal. Part of this increase is attributed to changes of precipitation occurrence.

Floods have been numerous and very damaging during the past 10/15 years. Although most of them took place in the northern half of Europe (Rhine/Meuse basin, Elbe and Oder basins,

English river basins), a number of floods have also had tragic impacts in southern Europe (North-West Spain, Southern France, Northern Italy). Important prevention programmes and measures have been implemented, a number of them being supported by Interreg in the context of transnational cooperation.

Drought is particularly affecting the southern half of Europe. In recent years, it has been detrimental to agriculture with a significant reduction of harvest and yields. Usually, drought is mainly concentrated in summertime. Summer 2003 was a particular case affecting agriculture also in regions further in the north. A more recent and more damaging manifestation of climate change is drought in winter time. Drought during the winter 2004/2005 has particularly affected Portugal, Spain, France and Italy. In Portugal, water levels in barrages are extremely low, causing problems for electricity production. The same happens in Corsica, where electricity shortages in February/March have caused troubles. Agriculture is severely affected in all four countries. Cattle breeding and dairy production are suffering from the lack of fodder. Fruit production in southern regions is also affected, with a large number of trees threatened to die. Fish mortality in rivers is significant. Risks of forest fires have strongly increased. Numerous measures are taken in the field of water saving, in particular through the control of irrigation, but also in other sectors, such as tourism (golfs, swimming pools etc.).

2.7.1.5 Agriculture

The length of the average growing season has increased by 10 days between 1962 and 1995. Higher yields could have been expected due to higher CO2 absorption of plants, but this has not been registered yet. In the heat wave of 2003, agricultural losses in southern Europe were up to 30% (see above), whereas yields in Northern Europe were as high as usual.

2.7.1.6 Economy

Broadly 80% of economic losses caused by catastrophic events resulted from weather and climate-related events. Average annual losses are now estimated to be around €10 billion. They have increased significantly during the past 20 years, both due to wealth increase and more frequent events. Economic losses as a result of climate change related catastrophic events are expected to increase further in future.

Indirect economic impacts are manifold, like decreasing winter tourism, decreasing industrial activities due to lack of water, decreasing or increasing income from agriculture, etc. Other economic impacts are related to measures needed to prevent hazards, like investments in water systems, removals out of river valleys, etc.

Storms and hurricanes had strongly damaging impacts in winter 1999, in particular in France and Germany, as well as in winter 2004/2005 in northern England/Scotland, northern Germany, Denmark and Poland.

2.7.1.7 Human health

Heat waves, floods and the spread of ticks have caused numerous fatalities and diseases. These are expected to increase in future, too. The heat wave during summer 2003 has caused 30 000 human deaths in Europe.

2.8 Breakthrough of new key technologies

In general terms, the spatial impacts of technological evolution concern two main strands. First, the technological evolution may impact the spatial distribution of economic activities, or more precisely, its change. New technologies may then lead to a spatially more concentrated or to a spatially more de-concentrated locational pattern of production. Second, the spatial impact of technological evolution comprises the development perspectives of individual regions.

Before sketching the spatial impacts of certain future technological evolvements, some general remarks will be made to the regional economic point of view as well as on the channels through which new technologies might have spatial impacts on the location of economic activities.

A) The impact of new technologies on the spatial distribution of economic activities may occur in different ways.

A1) Spatially concentrated activities, agglomeration effects may be influenced by new technologies. The direction of influence on external agglomeration effects is depending on the concrete technology. While the evolvement of one technology may foster agglomeration effects and concentration tendencies, others may cause deconcentration tendencies. This ambiguous impact is characteristic, for instance, for the development of ICT.

Also, various technologies may strengthen internal agglomeration effects which arise from economies of scale and/or economies of scope. In turn, certain technologies allow a profitable small scale production, as, for instance, the introduction of a flexible automation and manufacturing system. Thus, internal agglomeration effects may contribute to the fact that spatial proximity to outsourced business services or other activities along the value chain become relevant. Also, one may have the idea that an opposed development of

location decisions may occur. Due to the introduction of flexible automation and manufacturing systems, a more disperse spatial pattern of production units may also be an effect in some cases.
s. All these effects obviously depend on the scale at which one observes them.

A2) The costs of transportation and communication (in a broader sense: the costs of overcoming spatial distance) may be influenced by new technologies. The latter typically implies a reduction of transportation and communication costs. As striking examples may be regarded the evolution of internet and e-commerce in the course of ICT use, in the context of which euphoric expectations of a 'death of distance' (Cairncross 1997) came up which in the meantime turned to a more realistic view.

This very brief sketch regarding the impact the technological evolution may have on the spatial distribution of economic activities, reveals a very fuzzy picture. The impacts of new technologies on the agglomeration effects on the one hand and their impacts on the costs of transportation and communication on the other hand shape a relationship the shift of which either may lead to further concentration or to further de-concentration of production activities. The so-called New Economic Geography as a relatively new strand of regional economics set this balance between agglomeration effects and transportation costs on the agenda, and it emphasizes to existence of multiple equilibrium, i. e. different patterns of spatial distribution of production may evolve.

B) New technologies lead to new combinations of production factors, i. e. fixed assets, human capital, which may allow an increase of productivity of the region where the new technology had been developed or/and is in use. The models of the New Growth Theory imply a certain path dependency for regions which are well endowed with R&D capacity (Romer 1990; Krugman 1991). However, it might be the case that regions which are capable to come up with a radical innovation undergo a 'leapfrogging' (Brezis/Krugman/Tsiddon 1993) which allows them to catch-up economically. The degree of uncertainty how it is influenced by new technologies is even greater.

2.8.1 New Technologies with Important Spatial Impacts

The evolution of the European territory will be substantially influenced, in the coming decades, by the spread of a number of technologies which have been recently emerging. These are mainly:

2.8.1.1 Biotechnologies

The biotechnology field can be subdivided into three sections (the green, red, and grey biotechnology), and concerns the fields of consumption and lifestyle.

Green Biotechnology in Food and Non-Food Production

Green biotechnology concerns food production such asfarming activities producing plants for food and for agricultural livestock breeding and non-food production which is related to raw materials for industrial applications (for example, products for the chemical industry are made such as tensides, lubricants, the production of paper and plastics etc.). The worldwide agricultural land used by gene-modified land extended from 1.7 million hectare in the year 1997 up to 81 million hectare in the year 2004. Concerning gene crops, only four types play an important role in European cultivation stock: Soy (48.3 hectares), maize (19.3 million hectares), cotton (9 million hectares), and rape seed (4.3 million hectares). While 59 % of the cultivated land is to find in the United States shares of gene-modified cultivated land in Europe are still very low and only occupy 0.3 % of the whole GM-cultivation worldwide in the year 2004 (see Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2005).
The green field is expected to fundamentally change agricultural livestock breeding and production of plants. Recent studies estimate market potentials of the first plant generation until 2015 to be around 30 billion US $ worldwide, while potentials for further plant generations are already expected to be of more than 100 billion US $ worldwide (see IG BCE 2005).

Red Biotechnology in Research & Development, and Production

Red biotechnology in R&D focuses on the development and production of new drugs and vaccines, for better diagnostic tools, and individual medical care. The red field owns a high share within the whole biotechnology field concerning the number of firms (EuropaBio 2005). Products are expected to have high medical benefits for consumers. Experts estimate a growth rate of 10 % p.a. until 2010. Although there has been research in this field since more than 20 years, lots of possible innovations are still to detect and to develop (see Deutsche Bank Research 2004).
The driving forces to foster research and development in this field are needed new health care products, the need for diagnostic tools as well as for incurable diseases. Due to modernization processes in Eastern Europe, more and more aging societies are concerned with a demand for new products. Another advantage of biotechnological products is the fact that they possess high product safeties according to their availability, pureness and tolerance.

Grey biotechnology

The application areas of grey biotechnologies refer to industrial production processes and environmental engineering. Such processes may reduce the development and use of fossil fuel and raw materials in order to generate sustainable industrial production. The result is that energy can be saved, less harmful substances can be used and waste can be reduced. Main efforts are put on the production of detergents in order to neutralize dirt, on the reduction of detergents, on energy savings as well as on the production of improved enzymes (for the production of detergents, paper, microorganisms).

2.8.1.2 Nanotechnologies (in production processes)

Nanotechnologies are to be found in several industries and represent a distinct cross-section discipline, illustrating further advances in miniaturisation. Developments and applications in this field offer the chance for successful product development with a reduction of weight, volume, and use of raw material and energy but also concerning the time of production. The spatial impacts of the application of such technologies are hardly predictable. However, it is a very R&D intensive field and as such probably more prone to localise where external agglomeration economies exist.

2.8.2 Emerging technologies in the energy sector

The energy sector is subject to a wide range of technological evolutions which will have considerable impacts in the coming decades, both in the field of the modernisation of 'conventional' energy systems and in that of the development of emerging technologies. Numerous technological evolutions will take place in the field of renewable energy sources and their exploitation.

New technologies for energy production and use could change the whole supply security debate. Technologies which today are at the demonstration phase may yet take 5 years to become commercially attractive, in terms of price and proven viability. In addition, the willingness of consumers to invest in new technologies is curtailed by the long lifetime of energy installations or machinery (10-30 years). Our ability to anticipate likely technological trends over a longer period (30 years) is limited because energy technology which is currently at a basic stage could become commercial over such a period – or it might be abandoned. Nevertheless, there are technologies under development today which have the potential to completely transform our current appreciation of energy demand and production.

Main emerging technologies in the energy sector are:

- Hydrogen technology and economy
- Decarbonisation of fossil fuel
- Clean coal technologies
- Gas to liquids technologies
- Nuclear fission developments (Fast Neutron Reactors FNR, Accelerator Driven Systems ADS)
- Thermonuclear fusion (long term)

2.8.3 Transport and technological development

Technological development interferes widely with the transport sector. It is not possible to provide an exhaustive overview of all fields of interaction.

2.8.3.1 Major innovations by transport mode

In the railway sector, a major technological jump has been the introduction of high speed trains twenty five years ago. This new technology is playing a strategic part in the revival of railway passenger transport in Europe. In terms of territorial impacts, it has benefited so far mainly to European central regions with a few exceptions (Andalusia). The projects presently in the pipeline will benefit also to a number of peripheral regions (Portugal, Spain, Italy, east-Germany). New technologies are also emerging, such as the magnetic levitation, which should find concrete applications in the coming decades. The motor car transport benefits from various technological innovations. Some are related to engines and their fuelling (energy saving engines, biofuels, hydrogen fuel cells, electric engines etc.), others to the reduction of air pollution, to the increase of security, to navigation systems etc. A major element of innovation in cars and trucks is to be found in electronic systems and applications. The aircraft sector benefits from innovations in the propulsion systems (energy savings, lower noise level), in security systems, in materials etc; Airplanes with very large transport capacity are entering the market. Innovations in electronic systems and applications also play a considerable part in airborne transport. In the sector of maritime transport, technological innovations concern new types of ships (catamarans, high-speed ships, self-loading ships etc.), security systems (for instance double-hull tankers), propulsion systems (gas turbines etc.).

2.8.3.2 Multimodality for passengers and freight

Multimodality for passengers and freight requires specific physical infrastructure and services. Technological innovations concern both fields, and in particular the exchange of information, automated procedures and integrated services. Multimodality for travellers means providing appropriate services, especially baggage handling. Such services include the possibility to check in for a flight at a station (integrated ticketing). Services of integrated baggage handling are currently at the test stage. Innovative and efficient services of this kind should help reduce congestion problems in some of Europe's main airports and improve the punctuality and quality of passenger transport. In the field of freight transport, electronic data interchange and telecommunications are essential to facilitate and integrate operations, since many different parties are involved in intermodal transport chains (tracking and tracing of goods). Automated terminal operations are also contributing to the efficiency of intermodal freight transport.

2.8.3.3 Intelligent Transport Systems

Technological innovation is particularly strong in the field of Intelligent Transport Systems (ITS). ITS use information and communication technologies to facilitate the seamless transport of people and goods. Three main issues are addressed by ITS:

- Congestion. Bottlenecks on the main international routes remain a major problem, while urban and inter-city congestion requires immediate action;

- Pollution and health. The emission of harmful gases is now widely recognised as a real danger for the future of mankind. Breathing problems are on the increase in urban areas, while increasing traffic congestion is making life more and more stressful;

- Safety. Road transport is by far the most costly mode in terms of safety, claiming 40 000 lives every year in Europe.

Main technologies in the context of ITC are satellite navigation systems, travel information and planning, improving transportation for the elderly and people with disabilities, freight and fleet management, electronic fee collection, transport safety, emergency and incident handling and management of urban transport.

2.8.3.4 Mobility and exchange of information

At the beginning of the 21st century, we are entering the age of the information society and virtual trade. However, this has done nothing to slow down the need for travel; indeed, the opposite is true. Thanks to the Internet, anyone can now communicate with anyone else and order goods from a long way away, while still enjoying the option of visiting other places and going to see and choose products or meet people. However, information

technologies also provide proof that they can sometimes help reduce the demand for physical transport by facilitating teleworking or teleservices.

2.9 Main transport challenges for the wider Europe: containing the increase of traffic congestion and improving accessibility

2.9.1 Increasing traffic congestion in central regions versus isolation of more peripheral regions

During the 1990s, Europe began to suffer from congestion in certain areas and on certain routes. The problem is now beginning to threaten economic competitiveness. Paradoxically, congestion in the centre goes hand in hand with excessive isolation of the outlying regions where there is a real need to improve links with central markets so as to ensure regional cohesion within the EU. To paraphrase a famous saying on centralisation, it could be said that the European Union is threatened with apoplexy at the centre and paralysis at the extremities.

The past decade saw not only a worrying increase in traffic congestion in urban areas, but also a new phenomenon of congestion on the major arteries of the trans-European network, increasing the number of bottlenecks. Missing links in the infrastructure, and a lack of interoperability within specific transport modes and for intermodal transport systems, are all reasons aggravating this congestion of the network. All transport modes are affected: road transport, but also railway transport – the railways themselves estimate that, on the basis of existing technologies, 20% of the railways track represent bottlenecks. Also air traffic is increasingly affected by delays. In contrast, the peripheral regions still suffer from isolation due to a lack of connections with the centre of the continent, and also congestion on the central parts of the network. The peripheral countries of the European Union are thus directly affected by the deterioration of traffic conditions in transit countries.

The phenomenon of congestion or lack of connections for the peripheral regions affects the competitiveness of companies by increasing their costs. Congestion also has a negative impact on the environment through extra fuel consumption, as well as on the citizens' well-being due to the many side effects of transport. According to the Commission, the external costs of congestion due to road traffic alone represent approximately 0.5% of the Gross Domestic Product (GDP) in the European Union.

Experience shows that the volume of overall traffic always, or almost always, increases more quickly than GDP and that inter-urban flows and, in particular, long distance flows, grow even faster. In addition, the EU-enlargement and increasing integration accelerates

this traffic growth, in particular for freight. At the same time, the provision of infrastructure does not keep pace because of, amongst other things, a lack of public financing and the current difficulty of mobilising private funds. This gap between transport needs and the supply of new infrastructure will lead to an impasse which will not be without negative consequences for the competitiveness of the economy of the Union.

Very rapid growth in traffic takes place across the Pyrenees and the development of new rail freight capacities is crucial given that land transport traffic amounts at 70 million tonnes in 1999 and will more than double by 2020. The current roads cannot absorb such an increase in traffic (+10% of yearly increase of road traffic). Personal mobility, which increased from 17 km a day in 1970 to 35 km in 1998, is now more or less seen as an acquired right.

If most of the congestion affects urban areas, the trans-European transport network itself suffers increasingly from chronic congestion: some 7 500 km, i.e. 10 % of the road network, is affected daily by traffic jams. And 16 000 km of railways, 20 % of the network, are classified as bottlenecks. A total of 16 of the Union's main airports recorded delays of more than a quarter of an hour on more than 30 % of their flights. Altogether, these delays result in consumption of an extra 1.9 billion litres of fuel, which is some 6 % of annual consumption.

2.9.2 Imbalance of transport modes

European transport suffers from an imbalance between transport modes, to the detriment of railways, more particularly in the rail freight transport, of maritime shipping and of inland waterways. While this reflects the fact that some modes have adapted better to the needs of a modern economy, it is also a sign that not all external costs have been included in the price of transport and certain social and safety regulations have not been respected, notably in road transport. Consequently, road now makes up 44 % of the goods transport market compared with 41 % for short sea shipping, 8 % for rail and 4 % for inland waterways. The predominance of road is even more marked in passenger transport, road accounting for 79 % of the market, while air with 5 % is about to overtake railways, which have reached a ceiling of 6 %. In present transport programmes of a number of member countries, motorways are consistently prioritised over other types of linkages, raising the spectre of Europe being unable to keep to its Kyoto deadlines on CO2 emissions etc. The trend towards wider car ownership continues apace and EU statistics as a whole for this factor will show a marked increase in the coming years as the new Eastern European members see a significant rise in personal car ownership. Though oil price increases may have an impact here it is likely that prices will have to rise to a truly phenomenal level to significantly impact this situation as the desire for the 'freedom' that car ownership potentially brings is basically inelastic in economic terms.

In the railway sector, for example, between 1970 and 1998, the share of goods market carried by rail in Europe fell from 21% to 8.4%, even though the overall volume of goods transported rose spectacularly. International rail haulage enjoys an average speed of only 18 km/h, due in particular to the priority given to passenger trains, deterring shippers from using rail freight. The growing imbalance between transport modes needs to be addressed, including through better transport management. Major stumbling blocks to the development of European rail freight are inefficient use and technical and physical insufficiencies of the rail infrastructure. Incompatibility of slow and fast trains as well as technical and operational differences between national networks in combination with a low priority for freight trains in train path allocation and daily train path management limit the growth potential of rail freight services.

Maritime transport represents more than 40% of the volume of intra-Community freight flows, i.e. almost on a par with road transport. But maritime transport could do more to remove lorries from the roads in congested areas. Maritime connections which better link countries isolated by natural barriers such as the Alps, the Pyrenees and the Baltic Sea, as well as island countries, could be as important as motorways or railways in the trans-European network.

Aviation is hampered by regular delays as a consequence of the limits of current air traffic management systems. Air transport suffers on the one hand from the fragmentation of the air traffic management services in Europe, with 29 national systems and 58 Air Traffic Control Centres developed to different standards with different systems and capabilities, and on the other hand, from the too slow implementation of new technologies.

A particularly important factor in the development of air transport is the emergence of low cost companies. This does not only increase general air traffic which becomes competitive even against railway transport on relatively short distances, but it boosts also the development of regional airports, including the related noise and air pollution. The map of air traffic flows in Europe has considerably changed in a few years due to low cost companies. Further changes may however happen, since the large number of low cost companies created is progressively being reduced for reasons of insufficient competitiveness. This may have impacts not only on fares, but also on the number and location of airports serviced.

2.9.3 Delays in infrastructure realisation and low levels of investments

The coherence of the trans-European network suffers from the actions of the past. The transport infrastructure networks in the various Member States were developed above all according to a national logic, giving priority to the development of radial routes serving major cities, thus affecting overall balance. Experience shows that it is the cross-border

sections which are generally the last to be carried out on a given transport route. Furthermore, the Member States do not all show the same interest in the other transport modes as alternatives to road .

As the White Paper on the European transport policy noted, six years after the adoption of Decision 1692/96/EC on the Community guidelines for development of the trans-European transport network, barely 20% of the projects planned for the year 2010 have been completed. The longest delays affect the cross-border and railway projects. Of the fourteen projects adopted by the Essen European Council in 1994, only three have been completed and two had even not been started in 2000. Recent estimates point out that overall investments in the trans-European transport network in the EU27 amount to less than €30 billion a year since 1996. With such a pace of investments, more than 20 years will be needed to complete the network.

In relation to networks, delays have accumulated for large-scale cross-border transport projects as a result of complex administrative procedures, low priority by Member States, uncertainties associated with the choice of routes and the planning process and the complexity of co-ordinating projects with a cross border dimension. This has been compounded by the difficulty of structuring supranational businesses to run such operations. The absorption capacity of the administration in the new member/accession Countries was also an important factor in the speed with which projects moved forward. Finally, even where Community funding has been available, the level of support and political commitment has not always been sufficient to encourage public or private actors to move ahead with investment. Experience from the Essen infrastructure projects selected back in 1994 and from the on-going projects funded by the EIB and through the Structural Funds show that non-financial factors can often be more powerful barriers to the viability and attractiveness of particular projects than the actual lack of funding.

2.9.4 Specific trends in new member countries

As a result of the economic reforms in CEEC during the transition period, the growth of passenger transport activity per capita in new member/accession countries was limited to just 2.4% in 1990-2000 compared to 15.7% in the EU-15. In new member/accession countries, the distance travelled per person reached 6665 km in 2000, considerably lower than the level in EU-15 (13260 km per capita in 2000). Overall passenger transport activity increased in the last decade by 1.9% in new member/accession countries and 19.7% in the EU-15. In freight transport, there was a strong decoupling of activity from GDP due to the restructuring of CEEC economies, which involved less trade between the CEEC and structural shifts towards less energy intensive manufacturing processes and services. This resulted in a decline of freight transport activity by -16% in the nineties in new members/accession countries, whereas freight transport activity in the EU-15 increased by

30% in the same period. Although, from their planned economy days, the candidate countries have inherited a transport system which encourages rail, the distribution between modes has tipped sharply in favour of road transport since the 1990s. Between 1990 and 1998, road haulage increased by 19.4 % while during the same period, rail haulage decreased by 43.5 %, although — and this could benefit the enlarged European Union — it is still on average at a much higher level than in the present Community.

2.9.5 Accessibility

Potential accessibility is based on the assumption that the attraction of a destination increases with size, and declines with distance, travel time or cost. The most accessible regions by road to the population (accessibility index higher than 120% of ESPON space average) are quite identical with the Pentagon, with an extension eastwards to include East-Germany. The least accessible regions (accessibility index below 40% of the ESPON space average) are all located in the European periphery (Nordic countries, north of Scotland, Ireland, Portugal, western and southern parts of Spain, Corsica, Sardinia, Greece, Cyprus, Malta, eastern parts of Romania, Baltic states). In terms of potential accessibility by rail, the most accessible regions (accessibility index above 120% of the ESPON space average) are largely contained in the Pentagon, with some extensions towards East-Germany as well as towards the Rhone valley and the Loire valley in France. Areas with low accessibility by rail in the European periphery (accessibility index below 40% of ESPON space average) are more extended in the case of Spain, Bulgaria and Romania. Potential accessibility by air provides a completely different picture, compared with those on land transport accessibility. The map of Europe is converted into a patchwork of regions with high accessibility surrounded by regions with low accessibility.

2.9.6 Restricted permeability on east-west cross-border and transnational corridors

Borders can be classified according to their permeability, on the basis of the frequency of border crossings and of the administrative arrangements which facilitate the crossing of these borders. As an average, there is an international road border crossing on each 60 km of borders in the Enlargement Area. But this density is largely differentiated: there are 3 crossing points per 100 km border between EU-15 member states and new member states, 1.5 crossing points per 100 km border among new member and accession countries, 0.75 crossing points per 100 km border on borders to and between third countries. But there are extreme cases. On the borders between Greece and Bulgaria, between Romania and Ukraine, the density is only 0.4 crossing point per 100 km. While in the past, a relatively dense network of roads and railways connected the areas of the new member/accession and neighbouring third countries, which are now on the two sides of the borders, according to

estimations, only 40 percent of built roads, and 50 percent of built railway lines crossing the borders are used presently as international border crossings. Some other roads can be used only by citizens of the two neighbouring countries or regions, some are open only for a couple of hours daily, some are open only on holidays or during some extraordinary events, others are never crossable, even the rails have been removed.

2.10 New territorial challenges for environmental sustainability

Environmental sustainability is an important objective of the EU Treaty. The environmental situation in Europe has generally improved over the past decades thanks to more constraining regulations and also to changes in the economic structure of the European economy. Nevertheless, a number of environmental challenges persist which have a particularly significant territorial dimension. These are mainly:

2.10.1 Water stress

Water stress is the excessive withdrawal of water in relation to the available water resources. In general, water stress in Europe has decreased in the 1990-2005 period. Determining factors leading to water stress are water availability, water consumption levels and water policy measures. The territorial characteristics of water in Europe

- Northern and Central Europe have higher water availability than Southern Europe due to climatic circumstances. This difference is increasing due to climate change.
- Water consumption takes place in four sectors: agriculture, power generation, households, and manufacturing. Each sector faces different trends. Consumption for power generation decreases dramatically due to improved cooling systems. Agricultural consumption rises slightly, particularly in the south. Household consumption is stable in the west, but rising in the east due to increasing welfare. Manufacturing water consumption remains stable. The total picture is a slightly decreasing water consumption.
- Consumption per sector varies largely between countries. Overall, agriculture, power generation and households each account for 30% of total consumption. But in Southern Europe, irrigation takes up to 60%.
- Water management policies are becoming stricter. Currently, the EU Water Framework Directive is being implemented, which heads for a stricter balance on water basin level, regarding both water quantity and water quality. National water pricing policies are determining water consumption as well. In general, there is a tendency to increasing water prices, although many countries still do not charge the real costs.

2.10.2 Water quality

Water quality can be identified by biological (e.g. organic oxygen-consuming pollution) and chemical (e.g. heavy metals) parameters. Water quality depends mostly on households or industrial waste water (point sources) and agricultural disposal (diffuse sources).

- Especially point sources have been combated following the 1991 EU urban waste water treatment directive. 50% of all environmental budgets went to water pollution control. Improving sewage systems and reducing pollutants at the source (e.g. phosphate in detergents) have had good results, particularly in Western Europe, where rivers became less polluted. The EU-10 are catching up, although major investments in sewage systems are still needed. These are mostly funded by cohesion funds.
- The new focus for EU activity to protect water bodies from pollution is likely to be diffuse sources. The main source of diffuse pollution is agriculture, particularly nitrate as a result of fertilizers and manure. Nutrient use (most importantly, nitrate) has been stable and is expected to be stable in the coming decades, even under the current EU Nitrate Directive.
- Particularly ground water is expected to become more polluted in the coming decades, since nitrate is reaching groundwater very slowly. The cost of removing nitrate from drinking water is much higher than preventing nitrates from reaching the water.
- Therefore, rivers are recovering from severe pollution by a sharp reduction of point source pollution. Diffuse pollution is going to continue for decades, and will pose a threat on the quality of drinking water in all agricultural areas.

2.10.3 Air pollution and greenhouse gas emission

Air pollution is a threat to human health and ecosystems. For human health, the main outstanding air pollution problems are ozone and fine particulates. Acidification (sulphur and nitrogen oxides) and ozone remain the main threats to ecosystems.

- Ozone is not directly emitted into the atmosphere, but caused by photochemical reactions, mainly of nitrogen oxides and 'volatile organic compounds'. These come mainly from fossil fuel burning (reduced by catalytic converters in cars) and solvents in paint, glue and printing. Emissions of both source elements have been reduced by a third since 1990. Ozone concentrations are highest during warm smog periods. Human health (lungs) is adversely affected.
- Fine particulates emission is declining (40% in EU-15 since 1990). However, uncertainty exists whether this will be reflected in air concentration, since other

factors play a role (such as weather conditions). Fine particulates are caused by direct emission or chemical reactions between other elements (nitrogen oxides, sulphur dioxide, ammonia and organic compounds). An important part of fine particulates is generated by natural processes (for example sea salt). The consequence of fine particulates is reduction of life expectancy: it represents the biggest air pollution killer in Europe today being responsible for 348 000 premature deaths in 2000. Up to 55 % of the urban population is currently exposed to fine particulate concentrations above the air quality limit of the EU. Greatest damage is in Benelux, northern Italy and in parts of Poland and Hungary.

- Sulphur dioxide emission has declined by two-thirds since 1980. Emission is mainly caused by fossil fuel burning. Shift to gas and technological developments have caused the reduction of emissions. Sulphur dioxide has caused serious acidification of ecosystems (lakes, forests), particularly in Northern Europe. Ecosystems are recovering now, but this recovery is slowed down by other acidifying gases like nitrogen oxides.
- Nitrogen oxide emissions have also reduced by a quarter on 1990 levels. The main source of nitrogen oxides emissions into the air is the use of fuels; road transport, power plants and industrial boilers account for more than 95% of European emissions. Catalytic converters have caused the reduction of emissions. However, reductions are not as much as needed to bring all ecosystems back to a healthy status, which means, receiving acid deposition below their critical loads. The corresponding area for eutrophication has remained stable – no progress has been made since 1985. In 40% of the EEA, in fact, the percentage of ecosystems exposed to damaging eutrophication has increased since 1990.
- EU policy on air pollution is manifold. Targeted directives (nitrate directive, solvent directive) aim at reducing one particular element. Multi-pollutant abatement strategy aims at reducing various air pollution problems reducing a limited number of pollutants (catalytic converters, Kyoto reduction of greenhouse gas emissions). This approach has led to international legal instruments that impose nationally-differentiated targets for emission reductions of four main pollutants.

2.10.4 Natural areas and conservation policies

- Europe has a rich natural heritage, reflected in 11 biogeographical regions. European nature is suffering from a loss of biodiversity, fragmentation, and a decrease of total area of natural value. Most vulnerable are wetlands, low-intensity farming systems, semi-natural grasslands, and mountain areas.
- Most important driving forces behind changes (mostly negative) in natural areas are the following: a) Urban sprawl and new infrastructure cause decrease and fragmentation of natural areas. b) Intensification of agriculture in the most

productive areas pollutes and eutrophicates the environment, thereby reducing biodiversity and the possibilities for migration of species between one natural area and the other. c) Abandonment of low intensity agricultural areas leads to the invasion of a limited number of shrub species and consequent forest fires lead to widespread desertification. d) Tourism and second housing in attractive areas put sensitive ecosystems as wetlands and particularly mountainous areas under pressure. e) And all these processes are further accentuated by climate change, causing droughts in southern Europe, and northward moving ecological zones in general.

- The EU policy objective is to halt the decrease of biodiversity by 2010. The EU Birds and Habitat Directive plays an important role, creating a network of protected areas across Europe. As a result, 18% of European territory is now protected, although the fulfillment of this objective took its difficulties due to resistance or negligence by some member states. They should be linked by a network of corridors; this objective is not yet fully reached. Other measures are the integration of sustainable management in other sectors, like the promotion of environmental practices in CAP, and responsible water management in Water Directive. 17% of Natura 2000 is dependent on farmland management. High nature value (HNV) farmland is very important, with even higher biodiversity value as undisturbed land, particularly in Southern Europe.
- There is still a limited understanding of the interplay between species, habitats, ecosystems and landscapes. As a result, the effectiveness of conservation strategies on the maintenance of biodiversity levels, particularly the assignment of protected areas, but also agricultural measures, is hard to measure.

2.11 Territorial footprints of changing life styles

Lifestyles are patterns of actions that differentiate people. Lifestyles map onto conventional social categories of class, income, age, gender and ethnicity, but also transcend them. Lifestyles are about identity choices.

During the decades of high economic growth in the post-war period, the western world experienced mass consumerism as the dominating lifestyle. This period has been highly detrimental to the environment. During the 1980s and 1990s, lifestyles have changed under the pressures of economic constraints and growing unemployment. Environmental consciousness started developing during that period. In the same time, a number of factors (growing immigration and related cultural differences, people ageing) led to strong differentiation of lifestyles in Europe leading to a more individualist form of consumerism, while others of more global character (technological developments in the field of media ICT etc.) caused stronger homogenisation of certain aspects of lifestyles.

Demographic changes have important impacts on the lifestyles. There are for instance clear indications of increasing mobility and different consumption patterns of the aged. Growing ethnic heterogeneity, associated with specific socio-economic characteristics also has a strong footprint on lifestyles. In a society often regarded as highly fragmented and individualised, lifestyles can also be new means of negotiating 'space' between the private and the public, demonstrating the active and engaged processes through which people construct their identities in relation to their lived experiences.

The growth in information intensification is providing society with a host of new means for both information collection and communication, leading to major changes in consumer lifestyles. Under the influence of economic globalisation, international experience is becoming an increasingly common phenomenon among the life of average people. It is virtually certain that such international experience affects lifestyles, consumption patterns and basic values, spurring attempts by an increasing number of people to replicate diverse cultures, concepts, consumption patterns and lifestyles.

More and more people in Europe, although not yet the majority of them, are coming to the awareness that an ever-improving economy can no longer be expected. They design their lifestyle without the expectation of continuing economic growth and therefore pursuit security and adopt a more passive, but rational attitude towards consumption. Commercial product ownerships is reaching a mature stage, although this still strongly varies among social and ethnic groups.

In the countries of Eastern and Central Europe, the situation is quite different as regards the history of consumption patterns. These countries were not affected by the consumerism wave which flooded Europe from the 1960s to the end of the 1980s. On the contrary, consumption was severely constrained by the former regimes. Since the beginning of the 1990s, consumption patterns attempt to catch up, but are still limited by the purchase power. Simultaneously, these countries are also subject to the new consumption trends and changes which take place at global scale, so that an overlapping of contradictory trends can be observed there.

Mobility is undergoing important structural changes which have significant impacts on lifestyles. In general terms, people's mobility has been steadily increasing and diversifying as far as purposes are concerned. On the other hand, the development of ICT is also important in terms of mobility. While in many respects telecommunication can be substituted to physical mobility, the increasing flows of information accessible through the Internet generate needs for higher mobility. As far as work-related mobility is concerned, a number of contradictory trends exist. The globalisation of production and trade systems increases the long-distance mobility of professionals. At local level, commuter flows are also growing in distance and in volume as a result of progressing suburbanisation.

On the other hand, tele-work and homework are also progressing in certain parts of society. In terms of lifestyles, the main perceived advantages of tele-work and homework are higher flexibility, greater time freedom to space work and leisure periods, private and quiet atmosphere, fewer interruptions and greater efficiency and productivity, better integration of work and family. The main disadvantages appear to be the loss of interpersonal communication, social isolation and loneliness, the fear to be cut from the company's information flows and the lack of contacts with superiors, colleagues and customers.

Tele-working and home-working will continue to spread in the world of work, whereas in some sectors tele-working will be more and more substituted by home-working with employees turning into self-employed contractors

Increasingly, consumption and entertainment-oriented lifestyles are important factors, driving the increase in non-work-related trips. This trend spreads more and more also towards lower income households, implying a change in lifestyles as well. Similarly, changes in cultural activities are influencing the rise in leisure-oriented journeys.

The lifestyles of Europeans with regard to leisure activities have undergone some substantial changes over the past few decades. Increases in disposable income, at least for a part of the population, and related consumer expenditure have brought about steady growth in leisure markets. This growth in demand has been sustained by the continued development of products that have relied for their success on technical developments such as CDs, videos, DVDs, the Internet and digital radio and television. New forms of consumerism are however more orientated towards the consumption of services and less towards the consumption of goods, as it happened to be from the 1960s to the 1980s. Changes in leisure lifestyles have in this respect been supported by the development of concepts such as branded restaurants, multiplex cinemas and fitness centres that have relied less upon technical progress and more on innovation and organisational and marketing expertise.

Demographic changes have also influenced the balance of demand for different leisure products. Of particular note are the changes that have taken place in the age structure of the population and in household composition, with the population becoming older and households becoming smaller. Mobility of elderly for leisure purposes has significantly increased.

Other social changes that have taken place over the past 25 years include the feminisation of leisure resulting from an increase in women's disposable income and a consequent opening up of new markets for female special interest activities (e.g. health and fitness).

Patterns of work have also been changing significantly, leading to increased pressure on time and encouraging a greater variety of leisure activities. A significant impact on mobility is resulting from this, with travels during a larger number of longer week-ends and more numerous, but shorter holiday periods. The decreasing price of air fares encourages long-distance leisure mobility.

During the past two decades, a crisis has progressively developed in Europe with eroding impact on social trust. Social institutions and public organisations are facing a sharp loss in public confidence. In addition to the crisis of the welfare state, there are growing uncertainties and fears, such as higher unemployment rates and the perception of worsening public safety. The perception of equality has been eroded and advancing hierarchies, based on and strengthening the social divide, are undermining the traditional occupational openness. All these changes point in the direction of developing more self-protective attitudes.

2.12 Urban and rural Europe

2.12.1 Evolution of urban Europe

The evolution of urban systems in Europe is conditioned by a wide variety of factors stretching from technological evolution to socio-cultural issues over accelerating globalisation. The impacts of such trends are however not similar in all countries and regions because the national urban systems are not all at the same stage of the long-range urbanisation cycle which has crossed Europe for more than a century, starting in England and reaching progressively the European peripheries. This cycle comprises various phases from urbanisation caused by rural-urban migration, maturation, de-urbanisation and urban sprawl, re-urbanisation combined with the widening of catchment areas of large agglomerations etc. It must be added to this that the countries of Central and Eastern Europe have been subject to a specific urbanisation process during the post-war period, related to the communist regimes and the planned economy. Urban Europe is therefore rather diversified, both in terms of morphological patterns, of evolution characteristics and of urban-rural relationships.

2.12.1.1 Global European level

Considered at this level, the EU urban system constitutes the main motor of the core-periphery divide of the European space. The 'core' corresponding to the Pentagon (i.e. the area cornered by London, Paris, Milan, Munich and Hamburg) includes both the European Global Nodes (Paris, London) and the large majority of strong MEGAs (Metropolitan European Growth Areas) which hold highly developed RTD, financial and tertiary education

activities, companies headquarters etc. It also benefits from a stronger networking / complementarity among Functional Urban Areas facilitated by a high accessibility.

In the present context of accelerating globalisation and growing external competition, of rapid technological development and of further European integration, the global European urban system is subject to both polarisation and dispersal forces. The pentagon, understood as the area comprising the leading European urban functions, tends to expand along major corridors in various directions: towards the East, as a consequence of the recent EU enlargement, especially along the corridors leading to Vienna/Bratislava/Budapest, Prague and southern Poland, Berlin and Warsaw, but also towards the north (Copenhagen and southern Sweden) and towards the south (Rhone valley and connection to the metropolitan areas of the 'Latin Rim'). In England, the pentagon progresses towards the Midlands.

The peripheries of the EU territory contain comparatively few MEGAs, unequally distributed over different macro-regions. The urban systems of the European peripheries are often characterised by a stronger hierarchy between cities and towns, according to their size and by much lower interactions and synergy within the urban system.

2.12.1.2 Intermediate level

Polycentricity at national level depends to a large extend upon national situations. In the southern European regions, strengthening the role of the capitals and other large cities in EU-wide perspective often occurs at the expense of polycentricity at national and / or regional levels. In the new member countries, a similar process is taking place. Restructuring (before and after the enlargement) favours the bigger cities, mainly the capitals, while cities with a large obsolete industrial sector as well as medium-sized and small cities located in rural areas face important pressures and are often subject to decline. This evolution creates serious goal conflicts for future EU spatial policy oriented towards a balanced polycentric territorial structure of Europe.

In the context of accelerating globalisation and of enterprises' relocation towards countries with low-wages and booming markets (Asia in particular), medium-sized towns are generally more affected than metropolitan areas, both in Eastern and Western Europe. It should not be concluded, however, that only regions with very large cities are prone to growth. In the present European society, the residential and tourist economy plays an ever increasing part and favours a number of rural regions, provided they are attractive and easily accessible. The increasing number of retirees is strengthening the residential economy of numerous regions in Europe.

European integration is also an important factor for the development of urban systems at intermediate scale. Networks and clusters of cities are emerging in various transnational

areas such as the Baltic Sea Region or the so-called Triangle[4] of Central and Eastern Europe. The new TEN-T as well as the EU support mainly through the INTERREG programs (though this support remains limited) also enhances the potential for empowering Transnational Urban Systems in the meso-regions of the EU periphery.

2.12.1.3 Local / regional level

A significant diversity of factors generates important, and sometimes contradictory dynamics in urban systems considered at the local / regional scale.

Despite general population ageing and decelerating population growth in Europe, large cities, especially the metropolitan areas, are still subject to population growth. This is not only a consequence of the changing structure of the European economy with a stronger emphasis on services and high-tech and R&D activities, but also of internal and international migrations. The population of large cities remains generally younger than the respective national averages and continues to grow, although numerous retirees move towards rural areas. Further suburbanisation and sprawl can be observed in and around numerous European metropolitan areas.

Mobility at regional scale is an important characteristic of modern society, comprising commuter flows related to home-work journeys, but also to education, culture and leisure activities. Mobility had generally increased and has become more diversified in nature and in time. Increasing motorisation generates larger flows of car traffic, in particular in the countries of Central and Eastern Europe where a clear catching up process is taking place. In western cities, the development and modernisation of public transport cannot completely compensate for the growing demand in mobility. Increasing car traffic and related emissions is also there an important issue. ICTs are playing an ever increasing part in the provision of public and private services (e-commerce, e-administration etc.) and in home-working. There is however so far no clear evidence that ICTs have positively contributed to curb down physical mobility.

The strong and sustained increase of energy price (oil and gas) is already having impacts on urban settlements at local / regional scale. Stronger use of public transport and increased car-sharing can be observed. The need to shorten commuting distances through different choices in residential location can also be perceived. Much stronger impacts can be expected in this field in the years to come, with a general evolution towards more compact cities or settlements and better integrated urban functions.

A growing issue in numerous European cities is that of the economic, socio-cultural and educational integration of population groups (in particular the young ones) originating from immigration. Although the origin of the problems is often of economic nature (very high

[4] The recent enlargement undoubtedly enhanced the development potential of the 'Triangle' in Central Europe which covers the transnational territory between Warsaw in the east; Poznan (and possibly Berlin) in the west; and Krakow, Saxony (Dresden), Prague, Bratislava, Vienna and Budapest in the south.

unemployment rates caused by lower educational level and bigger difficulties of integration into the labour market), the impacts are stretching over the socio-cultural spheres with the strengthening of ethnic or religious communities and trends towards radicalisation. The social divide in cities is growing; cities become more fragmented; various forms of segregation are progressing. This issue can be considered as a very serious one with strong impacts in the years to come.

2.12.2 Evolution of rural Europe

2.12.2.1 Diversification of rural areas

Rural areas in Europe are affected by different trends. Since the way they are affected varies according to their physical, socioeconomic and other characteristics we first describe different categories of rural areas. *Rural areas in urbanized regions* are situated in the periphery of important agglomerations, especially in the Pentagon and near large cities. Many of these areas profit from the presence of residential areas, industrial estates, and recreational amenities. They are affected by high socioeconomic dynamics in terms of population density and urbanisation. This reinforces the scattering of settlements and the pressure on land-use.

Many coastal areas, like the North Sea and the Mediterranean coasts, have a well developed tourist industry and can be characterized as *rural areas attractive for tourism.* The same is true for mountain areas like the Alps and the Pyrenees. The tourist industry contributes to a high economic viability and to the in-migration of many young people from the surrounding areas. In high seasons, however, nature, landscape and environment are put under pressure.

Rural areas with a variety of activities, e.g. in Devon in the UK and in the Po area in Italy, are highly dependent on rural activities but additional activities, like service for out-door recreation and manufacturing generate additional incomes. Socioeconomic viability is moderate. In some areas agriculture survives; in other areas the economic structure becomes more diversified. Landscape elements are developed to some extent in these areas.

Rural areas where agriculture dominates can be divided into two subcategories. Areas with a highly productive agriculture and in which the processing industry plays an important role, e.g. in Bretagne in France and in the UK, have a moderate or high socioeconomic viability. Intensified large-scale agriculture, however, puts the environment under high pressure. Areas in which agriculture is traditional and has a low productivity, e.g. in Galicia in Spain and in the CEECs, have a low socioeconomic viability. Environment is under low pressure.

Rural areas with low accessibility, e.g. mountain areas and peripheral areas in Northern Scandinavia and Eastern Poland, are characterised by large natural landscapes and small cultural landscapes dominated by marginalised agriculture. Out-migration of young people causes an aging of the population. In some areas this is further enhanced by the in-migration of retirees. Many areas loose the critical mass which is necessary for the maintenance of services.

Rural areas in urbanized regions are affected by the *changing role of agriculture and food-supply chains*. This trend is a result of the growing attention for the origins of food and the production methods applied. Animal diseases and food scandals put food quality, food security and animal welfare high on the agenda. Besides, the CAP reforms stimulated a shift from the agri-industrial towards the multi-functional model of food-supply chains.

Many rural areas attractive for tourism or with a variety of activities have turned to out-door recreation and tourism. This implies a trend *towards the consumption of different ruralities.* Urbanites visiting rural areas and regular residents can increasingly be regarded as consumers of different ruralities. This poses a challenge on the prevailing culture.

Rural areas with a variety of activities or with low agricultural productivity are subject to the trend *towards the post-productivist country-side*. These rural areas are increasingly commodified by the marketing of their characteristics. Changes related to this trend are e.g. growth of alternative farm activities and increasing investments in the quality of the environment.

Rural areas with natural, cultural and other assets, e.g. rural areas attractive for tourism or with low agricultural productivity, gain importance because they increasingly use their *localities as resources of identity formation*. Where the constructed identities fit local needs and extra-local opportunities self-identification is a key to the development of these rural areas.

2.12.2.2 Evolution of agricultural production

Agriculture experiences substantial *structural changes*. Cost-intensive technological progress leads to higher production, causing an increasing supply on the markets. The increased supply, together with the competition with producers from abroad causes a spill-over, a decrease in prices and consequently a decline of farmers' revenues. In this way a vicious circle is set in motion. Indicators for this structural change are the number of farms and farm size. In the EU-15 the number of farms dropped from 7.4 million in 1995 to 6.8 million in 2000. Small farms (0-5 ha) dominate with 3.9 million in 2000. Only 0.6 million farms are larger than 50 ha. In the CEECs the number of holdings is large: 9.2 million (30% more than in the EU-15). Cultivated land, however, amounts to 50 million ha (40% of that in the EU-15). In 2000, the average area of a farm in the EU-15 was 18.7 ha. The difference between the member countries is remarkable: the smallest average areas existed in Greece

(4.4 ha) and the largest in the UK (67.7 ha). In all CEECs the share of small holdings in the total number of farms is high: from 42% in Latvia to 97% in Bulgaria. Most of them are subsistence farms. Large farms (more than 50 ha) include mainly commercial companies and co-operatives.

Regarding agricultural production the following trends can be observed. The production of *major crops* continued growing. Community support to cereals, oilseeds and protein seeds as well as the fall of the number of cattle induced an increase in the crops for sale. The CAP reform of 1992 only modestly affected this major trend.

Permanent crops decreased. The main reason for this was the pulling up of vines intended for ordinary wine production. This resulted partly from Community support. Wine production concentrated on the name areas (quality wines). The orchard surfaces decreased in the northern member countries but remained constant in the southern member countries.

Between 1975 and 1995, *surfaces still in grass* decreased by 12% in the EU-9. The cattle and sheep rearing areas in plains were most affected. Only some cattle-rearing areas (e.g. Ireland, Limousin, Umbria) saw their surfaces still in grass increasing. The period was marked by the milk quotas (1984) and the decline of livestock-farming resulting from it.

2.12.2.3 Reforms of the CAP and the Structural Funds

The CAP, having its foundations in the *Treaty of Rome* (1957), was established to counter the fluctuations in the availability and prices of food and to raise the level of production. The most important measures were income support, price support, import tariffs, and export subsidies. The CAP was so successful that within 20 years Europe produced more than enough food for its own population. Exports were rising sharply and surpluses mounting.

It became increasingly clear, however, that the production growth was achieved at the expense of nature and the environment and the distortion of the international markets. Moreover, the CAP became too expensive to maintain. The pressure for reform was intensified by the GATT and WTO. More efforts were made to mitigate the negative side effects. The EC began a shift in expenditure from production support to income support and rural development.

The MacSharry reform (1992) was a milestone in this process. The reform decoupled agricultural payments from production levels and introduced the set-aside system. *Agenda 2000* (1999), another milestone, defined two pillars of the CAP. *Pillar 1* contains among other things commodity market support and direct payments; *Pillar 2* covers measures aimed at the agricultural sector and the wider economic development of rural areas. A switch of funding from Pillar 1 to Pillar 2 ('modulation') implied a further shift in favour of

rural development.

Although the CAP was primarily designed to improve agricultural productivity it has significant territorial impacts. The fall in intervention prices increased the strength of the market. As a result cereal production in the EU-12 declined from 170 million tonnes in 1992 to 165 million in 1995. Production with industrial purpose, e.g. colza, strongly increased and intensified. New crops for the international markets appeared, like flowers in the Bergamo Province.

Partly due to market forces and partly owing to the CAP, a dualisation of agricultural production has taken place. Concentration and an intensification of production occurred in the most fertile areas while more extensive agriculture and agricultural abandonment took place in the LFAs. In the new member countries, the existing dualisation is also a major problem.

Intensified arable and diary farming have caused serious damage to landscapes and the environment in open fields, polders and deltas. The scaling-up of production has also occurred most profoundly in these areas. In many British areas bocage landscapes changed into open fields. There are also many areas in which agriculture is marginalising, e.g. in mountain areas.

Pollution by agriculture has been reduced but not stopped. The intensification of production, particularly cereals, is still topical. The expansion of irrigation also contributes to it. And livestock-farming in or near the cereal areas further intensifies. Positive developments, however, can also be observed. Between 1992 and 2001 for instance 500,000 ha have been afforested.

In the 1980s Regional Policy began in earnest. SFs were used to stimulate among other things the development of rural areas with few alternatives to agriculture. In 1988 the budget was doubled and there was a shift from individual project support to programme support. LEADER was introduced to encourage integrated local development strategies.

The end of the 1990s marked the emergence of a new approach. Budgets were cut and concentrated in order to increase effectiveness and the priority objectives were reduced. Objectives relevant for rural areas and agriculture are 'Development and structural adjustment of areas most lagging behind' (*Objective 1*) and 'Economic and social conversion of areas facing structural difficulties' (*Objective 2*).

The SFs generate different effects on different levels. Rural and other areas outside the Pentagon (particularly in Greece, Portugal and Spain) receive substantially more assistance than areas inside. The bulk of the assistance, however, goes to urban areas although sparsely populated rural areas receive most spending per capita. While contributing to

territorial cohesion on the macro level it works against it on the meso level. On the micro level, e.g. in rural areas like Toscana, the SFs contributed to the stabilisation of settlement patterns and the strengthening of the regional and local levels of government.

2.13 Territorial cohesion and spatial integration at stake

2.13.1 Polarisation and dispersal

In the early 2000s, a number of trends push Europe towards territorial cohesion, while others are counteracting such processes.

The concentration of population and activities in the central parts of the European territory is the dominating factor of territorial imbalances. At EU-15 level, a high concentration of economic activity and population in the central area or Pentagon (which stretches between North Yorkshire in England, Franche-Comté in France, Hamburg in northern Germany and Milan in the north of Italy), which covers 18% of the EU15 land area while accounting for 41% of population, 48% of GDP and 75% of expenditure on R&D. New trends show however signs of a more balanced development, with the growth of a number of urban areas in peripheral parts of the EU, including[5]:

• an extension of the core towards the east with growth of cities such as Berlin, Munich and Vienna;
• capital cities in Scandinavia, Stockholm and Helsinki, in particular, have become strong economically especially in new technologies;
• a number of urban areas in peripheral parts of the EU, such as Dublin, Athens and Lisbon, have also experienced significant growth in GDP per head over the past decade;
• a number of urban regions located outside the core seem to have a population and economic potential strong enough to attract research activities and to link up over time with the main European, and even international, centres of decision making. These appear to be capable in the future of stimulating the growth of peripheral areas and of bringing about a better balance of economic development in the EU.

In applying the methodology developed in the Final Report of ESPON project 3.1, it is possible to measure the economic and demographic polarisation, based on multiscalar computation of economic and demographic potential with various span of gaussian smoothing. The following map is the synthesis of 4 criteria: Local demographic polarisation

[5] Third Cohesion Report, 2004, pp. 27-28.

(LDP), Medium demographic polarisation (MDP), Local economic polarisation (LDP), Medium economic polarisation (MEP). A synthetic index of polarisation is then calculated[6].

Drivers of spatial development: Polarisation and dispersal areas

(see Figure 1)

Polarisation areas

The combination of demographic and economic criteria provides a global picture of metropolitan areas of ESPON29 in 2000. These metropolitan areas are based on the multiscalar analysis of population density and GDP per capita at local and medium scale. What is important in terms of polarisation is the situation as compared to neighbouring territories. With a baseline scenario of metropolisation (concentration of population in most important urban areas) and economic competitiveness (concentration of invests and activities in most developed territories), the area represented in red on the map are the most likely to gain population and to increase their GDP/inh. as compared to the neighbouring ones. ***We assume here a model of negative spillover (backwash effects) with increasing spatial differentiation****.*
The fact to measure polarisation at medium and local scales (50-100-200 km) implies that it is possible to find growth poles in all parts of the European territory and generally at least one in each country. The only exceptions are the Czech republic, Slovenia or Estonia where the capitals are not sufficiently important to balance the attractiveness of neighbouring territories with higher density and/or higher GDP per capita. In many states, we observe several areas of potential growth like in Spain, Portugal, Greece, Portugal or Italy. In North-Western Europe, we have rather an axial pattern with a continuous set of growth poles along the 'Blue Banana', from Northern Italy to UK.

Dispersal areas

Dispersal areas represent the reverse situation of territories which are strongly polarised by neighbouring metropolitan areas, in economic or demographic terms. The weakness of these areas can be related either to relatively low density or relatively low GDP per capita as compared to neighbouring territories. As the map is expressed in absolute terms, it focuses on the peripheral areas with relatively high population density i.e. areas which are potentially able to be the origin of important flows of out-migration towards attractive areas (polarisation areas). ***Under the assumption of growing polarisation and negative spillover effects, these areas will be clearly the 'losers' of the future dynamics of the European territory. But on the other hand, we can also consider that these areas can be privileged destinations of investment flows from neighbouring metropolitan areas looking for low cost labour force or recreational activities.*** *These territories represent the majority of the whole ESPON area and can be found in all ESPON member states. They represent the majority of the area in many countries, especially France, Czech Republic, Slovakia, Slovenia, Poland, Bulgaria Hungary and Greece. They are less frequent in Nordic countries because the population density of northern peripheries in not sufficient to generate important push*

[6] See methodology in Appendix 2.

effects in absolute terms. The situation of the northern peripheries is in a sense worse than the one of the countries with high push factors as they cannot benefit from important redistribution of neighbouring regions.

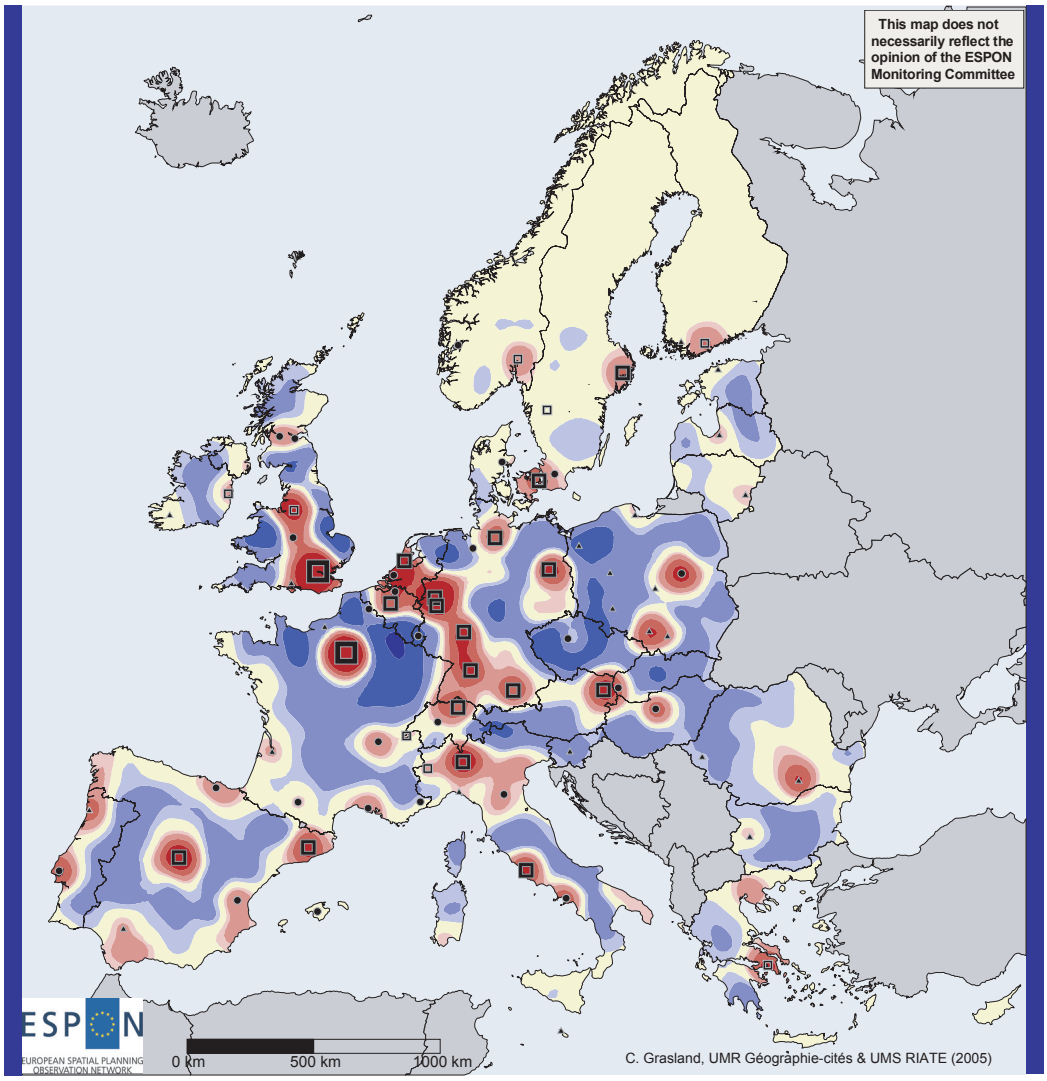


Figure 1 Polarisation and diffusion areas

Demographic factors with long-term significance are likely to favour various countries and regions and to disfavour others in terms of labour markets and of national/regional consumption of goods and services. In a Europe-wide perspective, countries and regions with the most constraining demographic evolution (strong population ageing and negative outmigration balance) are to be found in the eastern periphery (large parts of the new member countries with the exception of Poland, Cyprus and Malta) and in some parts of the southern, northern and western peripheries (large parts of northern Spain and of Portugal, western Scotland, large parts of Sweden and eastern Finland). In the more central parts of the wider Europe, this type of negative evolution can mainly be identified in large parts of the new German Länder (with the exception of Brandenburg) and in central France (northern parts of the Massif Central). Demography can be considered as a positive factor for the evolution of various countries and regions. These are largely concentrated in the central parts of the wider Europe, such as the regions of the 'Blue Banana' from the British Midlands to northern Italy (encompassing the Benelux countries, Alsace, northern Switzerland and southern Germany) as well as the regions of the French Atlantic coast, the Loire and Rhône regions, parts of Catalonia, but they also comprise a large number of peripheral regions, especially the metropolitan ones (metropolitan regions of Thessaloniki, Lisbon, Porto, Copenhague, Stockholm as well as wide areas of Ireland, southern Spain, southern Norway, southern Finland and western Poland).

By 2005, issues of economic dualisation and socio-cultural integration, also related to immigration, have already reached a significant level in a number of countries, even if violent manifestations (such as recently in France) were so far rather the exception. Socio-economic inequalities have fostered specific attitudes and mentalities (political radicalisation, 'communitarisation') in some circles of the European population which might lead to serious social conflicts. In territorial terms, the metropolitan regions are more affected than rural areas. The Pentagon is however not the only part of Europe where issues of socio-cultural integration arise. These problems also exist in the eastern periphery (minority groups like roms and gypsies, new immigrants from countries farther in the east) as well as in the southern periphery of Spain and Italy.

Accelerating globalisation favours the regions with the most advanced economies or with specific comparative advantages such as cheap labour force. In this respect, in Europe metropolitan areas are largely favoured, when compared with the more rural areas, but a number of east-European regions are witnessing significant foreign investments because of lower labour costs. The east/west divide is progressively being replaced by a metropolitan/non metropolitan divide and this trend is likely to become stronger over time, although a number of factors such as the part of the population with a high education level, the expenditures in R&D activities and the registration of patents still favour the western regions, especially those of the Pentagon and of Northern Europe.

With regard to accessibility and transport infrastructure endowment, Europe is characterised by a clear east-west divide in terms of motorway density by inhabitant. The regions of the Pentagon are clearly favoured, but also a large number of Spanish and Portuguese regions with low population density and having benefited from significant EU supports for the development of their transport infrastructure. A catching up process has started in Central and Eastern Europe and is favouring mainly the major corridors connecting metropolitan areas among themselves and with the EU-15. The picture is rather different when it comes to potential European multimodal accessibility. The divide is clearly between the Pentagon and the peripheries, irrespectively of their eastern, southern, western or northern location. A striking aspect of this differentiation is that large parts of the new member countries of Central and Eastern Europe, especially the parts adjacent to the EU-15, have a multimodal accessibility level much higher than that of a number of EU-15 peripheries, such as Greece, southern Italy, the southern and western parts of the Iberian Peninsula, Ireland, northern Scotland and the Nordic countries. The new member/accession countries and regions with very low European multimodal accessibility are in particular the Baltic States, Bulgaria, the eastern parts of Romania, Cyprus and Malta. The accelerated development of transport infrastructure in the new member countries will be of advantage to them, but it will not fundamentally change the pattern of multimodal European accessibility, which has more to do with the geographical position of regions (centre vs. periphery) than with the real endowment with transport infrastructure.

In terms of territorial cohesion, the emerging new energy paradigm is likely to have contrasted impacts. It certainly will be less detrimental for the regions, the economy of which is the least dependent upon transport functions and costs. These are the more central regions of the Pentagon. It will also be less harmful to the regions with a lower share of traditional, energy-consuming manufacturing activities. The regions which will benefit from it are those where renewable energy can be produced or exploited, such as fertile rural regions and forestry regions (biomass and biofuels), southern regions (solar energy), coastal and hilly regions (wind energy). Regions with mild climate will also be less disfavoured. The new member countries of Central and Eastern Europe are in a particular position with regard to the new energy paradigm. On the one hand, they are strongly developing their road and motorway networks under the pressure of growing motorisation, although they have extensive, but partly obsolete, railway networks. This evolution is likely to make them more vulnerable to strongly increasing oil and gas prices. On the other hand, the share of solid fuels in their total energy consumption is still much higher than in Western Europe, a fact which protects them from growing oil and gas prices. Recent transport policies, not only in the new member states, favour again road transport against more sustainable transport modes. It seems that this evolution, which is driven by a more liberal approach of the economy and by the need to boost economic development, has not yet integrated the new energy paradigm. In more general terms, the new energy paradigm will certainly be an obstacle to the development of mobility and it will favour substitution to physical mobility through telecommunications. It is also likely that the location patterns of

households will change and will favour areas well serviced by public transportation at the expense of locations distant from cities and only accessible by cars. More compact cities will result from this evolution.

As far as the potential geographical spread of climate change impacts is concerned, a first, tentative attempt to regionalize impacts in Europe is presented below. Two aspects are taken into account; the impacts themselves, and possible mitigation and adaptation measures:

- *Coastal plains and delta areas* are confronted with increasing risk levels of inundation. These are parts of the Baltic states, Denmark, Northern Germany, The Netherlands, Belgium, some deltas in the UK, France, Spain.
- *River valleys in Northern and Eastern Europe* will have to deal with increased flooding. Adaptation measures are infrastructure and movement out of river valleys.
- *Mountainous areas* are in two ways vulnerable. One is decreasing winter tourism as a result of declining snow cover. A second issue is the vulnerability of ecosystems, since species have no place to migrate to when ecosystems are shifting to higher altitudes as a result of global warming.
- *Southern European agricultural areas* will be affected by water shortages. Savings on water use will be a big issue, as well as the possibility to exploit water resources at large distances and at environmental costs.
- *Southern European cities* are confronted with water shortages and heat waves. The same effects as for agricultural areas hold true. These problems might affect quality of life in such a manner, that these cities loose attractiveness and people and businesses start to move out.
- *Southern European tourism areas (coasts)* could suffer decreasing number of visitors in summer due to risk of heat waves and water shortages. This might be outnumbered by increasing visitors in other seasons.
- *Northern European fringe north of current agricultural areas* might prepare for increasing possibilities of a change to agricultural production. Opportunities of income generating activities will have to be balanced against the cost of building infrastructure and giving up existing land use (forest plantations, nature)
- *Depopulated areas in southern Europe* are now facing problems of desertification. Natural processes would aggravate this problem. However, forestation programs could become beneficial if sink areas are being paid by climate change policies, leading to vast tracks of forested areas.
- *Depopulated areas in northern and Eastern Europe* can be attractive not only for forestation to create carbon sinks. If technological developments head for biofuel, these regions might convert themselves to one of the world's main producers.

Summing up, the territorial impacts of climate change are likely to be rather detrimental to territorial cohesion, although a number of rural or peripheral/disadvantaged regions could

draw some benefits in future, in particular in the northern half of the EU.

It is important to observe that close interactions exist between climate change and the energy sector. Such interactions are numerous and of various nature. While the general warming up is reducing energy demand for heating (spring, autumn and winter time), it also increases energy demand for air conditioning, in particular in southern regions. Increasing drought is detrimental to the production of energy crops and biomass in the southern European regions and related forest fires reduce the availability of wood for heating. Drought is also responsible for the reduction of hydro-power potential in southern regions and therefore for the increase of demand of other types of energy supply, including the traditional polluting ones. The ongoing changes in the present balance between climate and energy are therefore rather detrimental to territorial cohesion.

In the early 2000s, a number of new technologies are emerging in a variety of fields (biotechnologies, nanotechnologies, energy and transport technologies, ICT etc.). The territorial impacts of the generalisation and maturation of such technologies will very much depend upon the use which is made of them. It is rather difficult to anticipate if they will be or not be favourable to territorial cohesion. It seems however that a number of these technologies have a potential for benefiting to territorial cohesion if they are properly applied. These are in particular:

- biotechnologies and new technologies related to the exploitation of renewable energy sources which may benefit to a number of rural areas, including those located in the European peripheries;

- the further development of ICT which may enable the de-concentration of activities out of metropolitan areas and reduce passenger transport needs;

- the extension of the HST networks towards more peripheral regions (Eastern Europe, Iberian Peninsula).

The present evolution in the transport sector is rather contradictory as far as territorial cohesion is concerned. The renewed emphasis put in recent years in a number of member states on road transport (in opposition to the recommendations of the White Paper) makes possible the improvement of accessibility in peripheral regions, the (provisional) reduction of congestion in the more central ones and the catching up of the new member countries in terms of infrastructure endowment. In this respect, it can be rather beneficial to territorial cohesion, provided there are not more investments in motorways in the central regions than in the more peripheral ones. With respect to the changing energy paradigm, present policies favouring road and motorway transport should be considered as short-term ones, because the steady oil price increase will be detrimental to road transport in general and demand for other transport modes is likely to increase. In particular the regions most dependent upon

road transport, which are generally the most peripheral ones, are likely to be more affected than others by changing energy supply conditions. The objective of territorial cohesion calls for a reconsideration of transport policies integrating the new energy constraints as well as a higher degree of sustainability.

Environmental sustainability, as a component of territorial cohesion, is improving in a number of fields thanks to EU regulations and also to changes in the European economic structure, but new threats are also emerging. The Framework Water Directive in the EU is likely to significantly contribute to the conservation of water resources at the scale of river basins. Climate change is likely to further constrain the availability of water in the southern European regions, which is already a severe problem in various Mediterranean regions and also along the southern Atlantic coast. A potential risk exists of a revival of intensive agriculture related to the production of energy crops and of raw materials for industrial purpose. As far as natural areas are concerned, the implementation of the Natura 2000 programme is undoubtedly a progress, but a reduction of protection measures in semi-natural areas outside the Natura 2000 schemes can be observed (because of the lack of resources, which are mainly absorbed by the Natura 2000 sites). Natural areas in southern Europe are increasingly threatened by drought which regularly causes devastating forest fires. The abandonment of a number of rural areas (desertification) is damaging for cultural landscapes. Pressures on natural areas are also being observed on numerous coastal regions, resulting from the steady densification process.

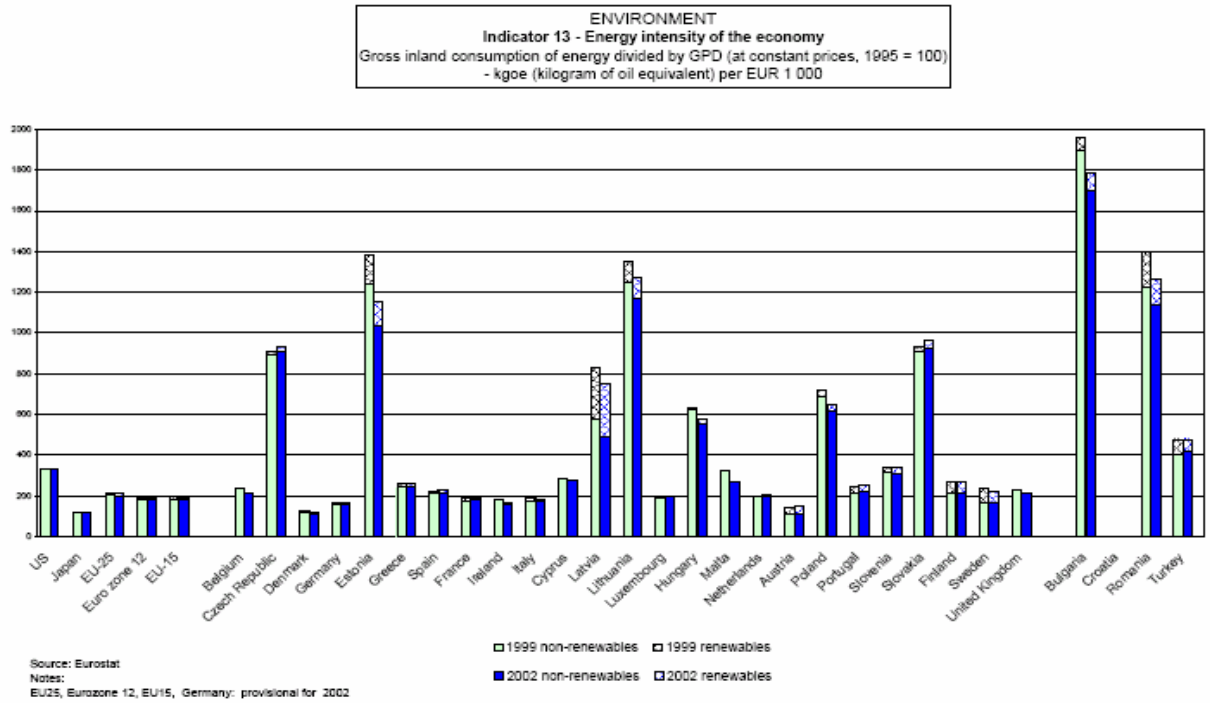
A number of changes in lifestyles are likely to have impacts on territorial cohesion at micro-scale. Mobility is for instance a factor of behaviour affected by contradictory trends. The past decades were characterised by significant trends of increasing short and long distance mobility. Increasing motorisation rates contributed to it. Changes in mobility are noticeable, under the influence of both ICT (tele-work, e-shopping, e-services) and, even more, of increasing energy price. With population ageing, the mobility patterns are also changing. Settlement systems will be affected by new mobility trends. Changes can also be observed in leisure patterns. New forms of tourism are developing, with shorter duration but with higher cultural or activity content. Most important changes in lifestyles have taken place in the new member states during the transition period and are still going on, the most significant features being travelling, changing consumption patterns and increasing motorisation.

Territorial integration is progressing throughout Europe. Economic, societal and technological factors contribute to it. The most striking manifestation has been the progressive integration between Eastern and Western Europe since the 1990s after several decades of Iron Curtain. Less impressive but also powerful is the territorial integration along national borders within the EU and also with Switzerland and Norway. Interactions of various types are strengthening (home-work relations, leisure, shopping, access to services and education etc.). Although a similar process is developing in the new member countries

of Central and Eastern Europe, cross-border permeability remains limited[7]. On average there is an international road border crossing on each 60 km of border in the Enlargement Area. But this density is highly differentiated. There are 3 crossing points per 100 km of border between EU-15 member states and new member states; 1.5 crossing points per 100 km of border among new member states; and 0.75 crossing points per 100 km of border between new member countries and accession/third countries. But there are extreme cases. On the borders between Greece and Bulgaria and between Romania and Ukraine, the density is only 0.4 crossing point per 100 km. While in the past, a relatively dense network of roads and railways connected the accession countries with neighbouring third countries, according to estimates only 40 percent of existing roads and 50 percent of existing railways crossing these borders are currently used as international border crossings. Some roads can be used only by citizens of the two neighbouring countries or regions; some are open only for a few hours daily; some are open only on holidays or during special events; and others are never used, for example when rails have been removed.

[7] ESPON in Progress. Preliminary results by autumn 2003.

Appendix 1: Energy intensity by country



Appendix 2: Methodology used for the calculation of polarisation and dispersal (elaborated by UMS RIATE)

Local demographic polarisation (LDP)

LDP is based on the computation of potential of population and potential of area with gaussian neighbourhoods span 50 and 100 km. We compute the amount of population which should move from internal ring (neighbourhood 50 km) to external ring (neighbourhood 100 km) in order to insure equal density.

P50 = potential of population in the neighbourhood 50 km
P100 = potential of population in the neighbourhood 100 km
S50 = area in the neighbourhood of 50 km
S100 = area in the neighbourhood of 100 km

Therefore

D50 = P50/A50 = density in the neighbourhood of 50 km
D100 = P100/S100 = density in the neighbourhood of 100 km

And

LDP = (D50-D100) * S50 (expressed in inhabitants)

Medium demographic polarisation (MDP)

The computation is the same but with increasing neighbourhoods. Internal ring is now based on neighbourhood of 100 km and external ring of neighbourhood of 200 km. Therefore

MDP = (D100-D200) * S100 (expressed in inhabitants)

Local economic polarisation (LDP)

The computation is the same but with population and GDP. We try here to evaluate the amount of people which should move from external to internal ring in order to insure equal distribution of GDP/inh.

P50 = potential of population in the neighbourhood 50 km
P100 = potential of population in the neighbourhood 100 km
G50 = GDP in euro in the neighbourhood of 50 km
G100 = GDP in euro in the neighbourhood of 100 km

Therefore

W50 = G50/P50 = GDP per capita in the neighbourhood of 50 km
W100 = G100/P100 = GDP per capita in the neighbourhood of 100 km

And

LEP = [(1/W50) – (1/W100)] * G50 (expressed in inhabitants)

Medium economic polarisation (MEP)

The computation is the same but with increasing neighbourhoods. Internal ring is now based on neighbourhood of 100 km and external ring of neighbourhood of 200 km. Therefore :

MEP = [(1/W100) – (1/W200)] * G100 (expressed in inhabitants)

Synthetic index of polarisation (SEP)

All indexes are expressed in amount of inhabitants (positive or negative) which could potentially move in order to insure equal repartition of population (LDP, MDP) or equal repartition of GDP (LEP, GEP) at different scales. The sign of the indexes has been corrected in order to insure coherency between demographic polarisation (attraction toward territories of high density) and economic polarisation (attraction toward territories of high GDP) but it is important to keep in mind that the results are expressed in absolute terms and not relative ones. A local peak of density or high GDP/inh will not produce an important potential in absolute terms, when an a widely populated area with only small differences of density and GDP/inh. with its neighbours will potentially attract much more peoples.

Due to the fact that results are expressed in absolute terms, the potential of polarisation are necessarily less important at local scale than at medium scale. But we can consider that local effects are more important in terms of impact. Therefore, we propose to build the synthetic index of polarisation as follow.

SEP = 2*LDP + 1*MDP + 2*LEP + 1*MEP

We give equal weight to demographic polarisation (areas with higher density than the neighbouring ones) and economic polarisation (areas with higher GDP per capita than the neighbouring ones) under the assumption that both factors are equally important and that compensations ore cumulative effects are possible.

3 Integrated roll-forward scenarios

3.1 Introduction: Three roll-forward scenarios

In order to explore the future evolutions of European regions and the overall spatial structure of the ESPON space, the team, in collaboration with the ESPON Monitoring Committee, decided to elaborate three roll-forward scenarios, one baseline and two prospective policy scenarios. The latter were defined using two 'axes' of policy making, not necessarily opposing each other, but implying different priorities (see figure 1): on one axis policy choices are lead by the desire for cohesion, on the other axis they are determined by the desire for competitiveness, including of Europe as a whole. The combination of the two priorities in a non-contradictory way was defined as the 'ideal' situation and thus defined the final image of the roll-back scenario which aims at exploring possible paths (and contradictions on these paths) towards this ideal.

For the three roll-forward scenarios, brainstorming within the team, several discussions with the Monitoring Committee and a regional validation exercise at the ESPON seminar in Manchester in November 2005 have led to the definition of a series of hypotheses, of which the most important are listed in table 1 allowing an easy comparison between the three scenarios.

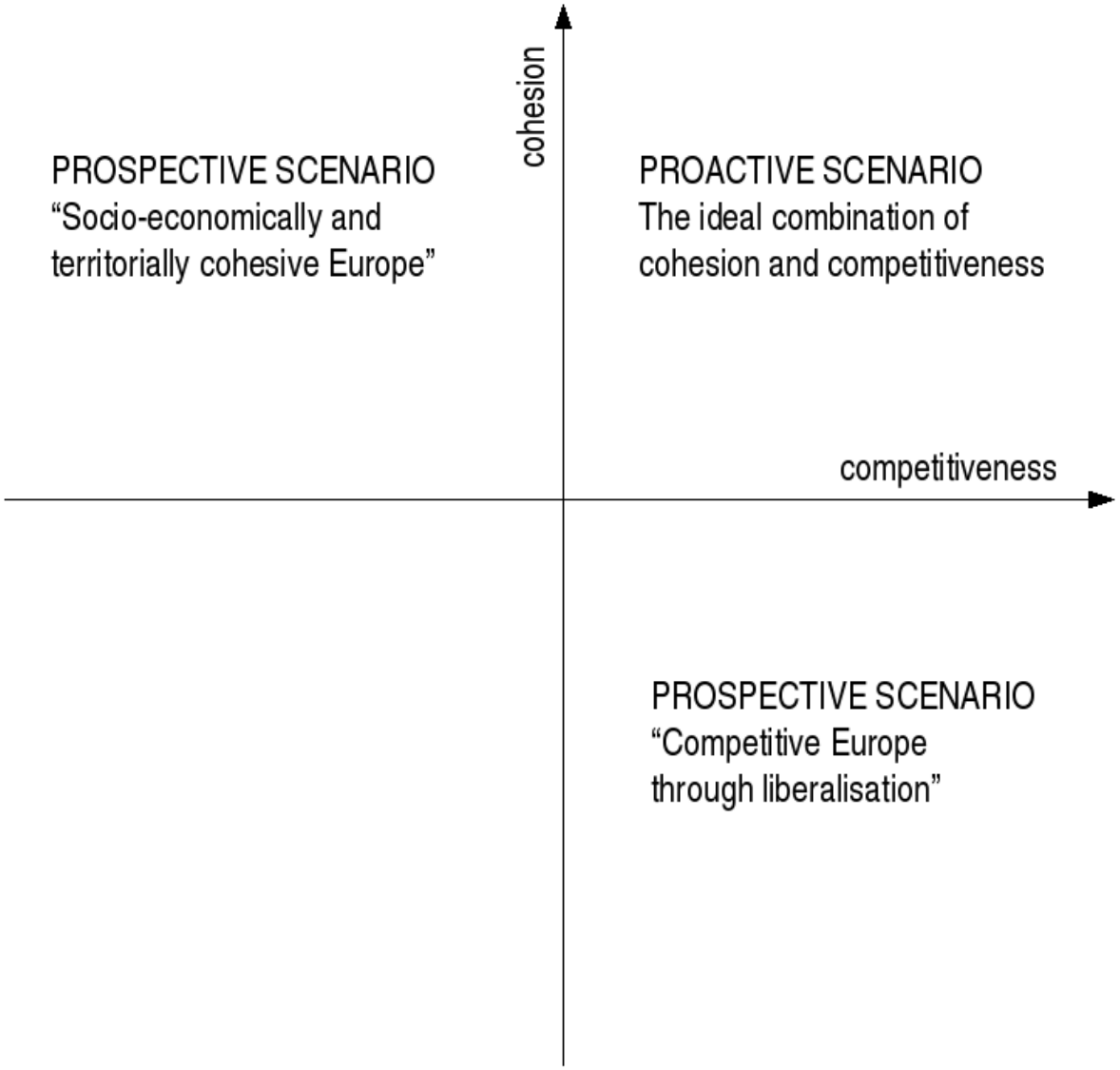


Figure 2 The axes defining the integrated prospective policy scenarios

Baseline scenario	Competitive Europe	Cohesive Europe
Demography - fertility down and mortality down => population ageing - total European population stable (+ enlargement) - increased, but globally controlled external migration - no change on constraints to internal migration	**Demography** - increase in selective (economic sectors & destination) external in-migration - abolishment of constraints to internal migration - increase in retirement age - encouraging fertility rate through fiscal incentives	**Demography** - restrictive external migration policies - more flexible retirement ages - encouraging fertility rates (=> encourage better balance of population structure) - more flexible arrangements for child care
Economy - slowly increasing total activity rate - slowly growing R&D expenditure, but constant technological gap to USA - decrease of public expenditure	**Economy** - sustained increase of activity rate - flexibilisation of labour markets - stronger reduction of total public expenditure than in baseline scenario - further privatisation and liberalization of public services	**Economy** - increasing activity rate, in particular in peripheral regions - maintaining the volume of EU budget - reinforcement and strong focus of structural funds on weakest regions - further harmonization of taxation and social security systems
Energy - steady increase of energy prices - European consumption stable/decreasing - increase of the use of renewables	**Energy** - steady increase of energy prices - European consumption increasing - realisation of TEN – E: investment in infrastructure according to market demand	**Energy** - steady increase of energy prices - realisation of TEN-E - promotion of decentralised energy production (in particular renewables)
Transport - constant increase of infrastructure endowment - constant congestion levels - application of the Kyoto Agreement	**Transport** - realisation of TEN-T: investment in infrastructure according to market demand - priority to links between metropolitan areas	**Transport** - development of TEN-T with priority to peripheral regions at different scales - support to transport services in rural and less developed regions
Rural development - further liberalisation of international trade - progressive reduction of CAP budget	**Rural development** - rapid and radical liberalisation of CAP (reduction of tariffs, of budget and of export subsidies) - reduction of support to rural development policy	**Rural development** - minor CAP reforms, but shift from pillar 1 to pillar 2. - priority to environmental and animal health criteria - active policy for diversification of rural areas, including SMEs, tourism, residential functions etc.

Socio-cultural sector - increasing polarisation between socio-cultural groups - growing socio-cultural (ethnic, religious, and social) tensions	**Socio-cultural sector** - reactive management of social problems in large cities - increase of surveillance and security systems	**Socio-cultural sector** - promotion of regional and European identities - proactive socio-cultural integration policies, in particular in cities - increased fiscal and/or social investment in quality of life issues
Governance - increasing cooperation between cross-border regions - increase in multi-level and cross-sectoral approaches, but limited to specific programmes (rural development)	**Governance** - abolishing barriers to cross-border cooperation - less public intervention - reinforcement of the Open Method of Coordination - increased role of private sector in decision making	**Governance** - active multi-level territorial governance, in particular in areas supported by structural funds - strong role of public actors in territorial governance - stronger role for the European Commission
Climate change - Moderate overall climate change until 2030 (+1°) - Increase of extreme local events - Constant emission levels - Few (too little) structural adaptation measures	**Climate change** – constant to increasing emission levels - mitigation measures based on flexible schemes & stimulation of alternative technologies. - adaptation measures only where cost efficient	**Climate change** - constant emission levels - strict mitigation measures (taxes, road pricing as far as non detrimental to peripheral regions) - wide range of adaptation measures (EU hazard funds, large investments)
Enlargement - by 2008 Bulgaria & Romania - by 2020 Western Balkans - by 2030 Turkey - continued combination of deepening and widening - modest impact of neighbourhood policy	**Enlargement** - Continuing enlargement to widen the market: - Romania, Bulgaria 2008 - Western Balkan 2015 - Turkey 2020, possibly Ukraine - Strengthening of the neighbourhood policy (Maghreb, Russia etc.)	**Enlargement** - deepening preferred to widening - break on further enlargement (except Bulgaria & Romania, which enter later than foreseen) - only lip service to neighbourhood policy

Table 1 Hypotheses for the baseline and the two prospective scenarios – global overview (unless otherwise stated, the hypotheses of the baseline scenario are also valid for the two other scenarios)

3.2 Integrated baseline (trend) scenario

3.2.1 Objectives and principles of the integrated baseline scenario

By nature, a baseline scenario is based on a continuation of trends and the principle that no major changes occur in the policies applied. It is however important to consider that in certain fields, like demography, the evolution over previous decades (structural evolution of the European population, with decreasing fertility rates and mortality rates, leading to population ageing) is also valid for the coming decades, while in other fields (such as that of energy price), the recent evolution seems more relevant for the future, than the past evolution over a longer period. In addition, a baseline scenario has also to consider a number of policy measures adopted recently (such as the Kyoto agreement), even if the impacts of such measures are not yet well known. In other words, a baseline scenario is not identical to the extrapolation into the future of long-range past evolutions.

3.2.2 Hypotheses of the integrated baseline scenario

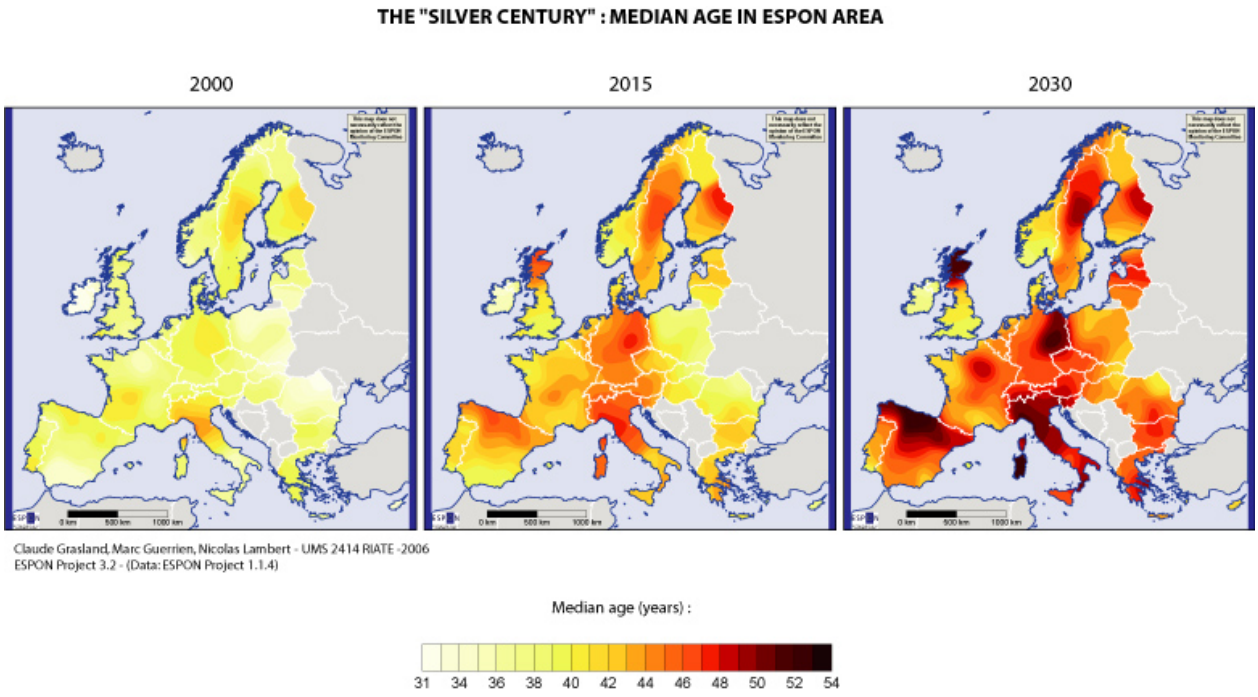
Demography	- Fertility down and mortality down => population ageing - Total European population stable (+ enlargement) - Increased, but globally controlled external migration - No change on constraints to internal migration
Economy	- Slowly increasing total activity rate - Slowly growing R&D expenditure, but constant technological gap to USA - Decrease in public expenditure
Energy	- Steady increase of energy prices - European consumption stable/decreasing - Increase in the use of renewables
Transport	- Continued growth of all traffic, but curbed by energy price with possible modal shift - Constant increase of infrastructure endowment - Constant congestion levels - Application of the Kyoto Agreement
Rural development	- Further liberalisation of international trade - Increased industrialisation of agricultural production - Further diversification of functions of rural areas - Strong dualisation of rural areas, though attenuated by the

	production of biofuels - Progressive reduction of the CAP budget
Socio-cultural sector	- Increasing polarisation between socio-cultural groups - Growing socio-cultural (ethnic, religious, and social) tensions - Heterogeneous policies related to integration
Governance	- Increasing cooperation between cross-border regions - Increase in multi-level and cross-sectoral approaches, but limited to specific programmes (rural development); - Maintenance of competition and incoherence between policies devoted to innovation and competitiveness and others devoted to cohesion
Climate change	- Moderate overall climate change until 2030 (+1°) - Increase in extreme local events - Constant emission levels - Few (too little) structural adaptation measures
Enlargement	- By 2008 Bulgaria & Romania - By 2020 Western Balkans(with Croatia acceding first, and relatively soon after 2008) - By 2030 Turkey - Continued combination of deepening and widening - Modest impact of neighbourhood policy

3.2.3 Scenario process

3.2.3.1 Demographic changes and related territorial impacts

From 2005 onwards, the demographic evolution in Europe shows a basic pattern of accelerated ageing. This pattern is however far from being homogeneous in all European countries and even more in all European regions.



The ageing process already observed in the early 2000s has been amplifying up to 2030, despite a revival of fertility rates in a number of countries. Already by 2015 wide areas in Europe (northern halt of Italy, northern Spain, Switzerland, Austria, Germany, central parts of Sweden and eastern Finland have reached an average population age above 44 years. In 2030, most of European regions, with a few exceptions (western and southern France, England, Ireland, southern Norway, southern Finland and a few regions along the eastern borders of the EU) are in a similar situation. A number of regions, however have then an average median age above 50 years (north-west Spain, northern Italy and Sardinia, Corsica, East-Germany, Scotland, central Sweden).

The ageing process has many impacts on European society. Larger and larger cohorts of people are retiring from professional life, precisely those born during the baby boom of the 1950s. This significantly influences the labour market. In a context of accelerating globalisation, a progressing knowledge economy and of related economic adjustment and restructuring, demand for highly skilled people is growing in Europe. The shortage of highly skilled people becomes therefore accentuated, despite the fact that the proportion of university graduates is higher in the new generations. Competition between the regions for attracting young skilled people is increasing, not only within individual European countries but also in the cross-border context and, more generally, at transnational level. Pressures are exerted on governments by large companies to facilitate the immigration of young skilled people, while trade unions are fighting in the opposite direction. The large number of retirees is however only a very partial solution to unemployment problems because of the overly high share of people without sufficient qualifications to successfully integrate into the labour market and due to the large number of illegally employed low-skilled people. A

positive impact of population ageing on the labour market is however the growing demand in the workforce in the sectors of health care and of social and cultural services for the elderly.

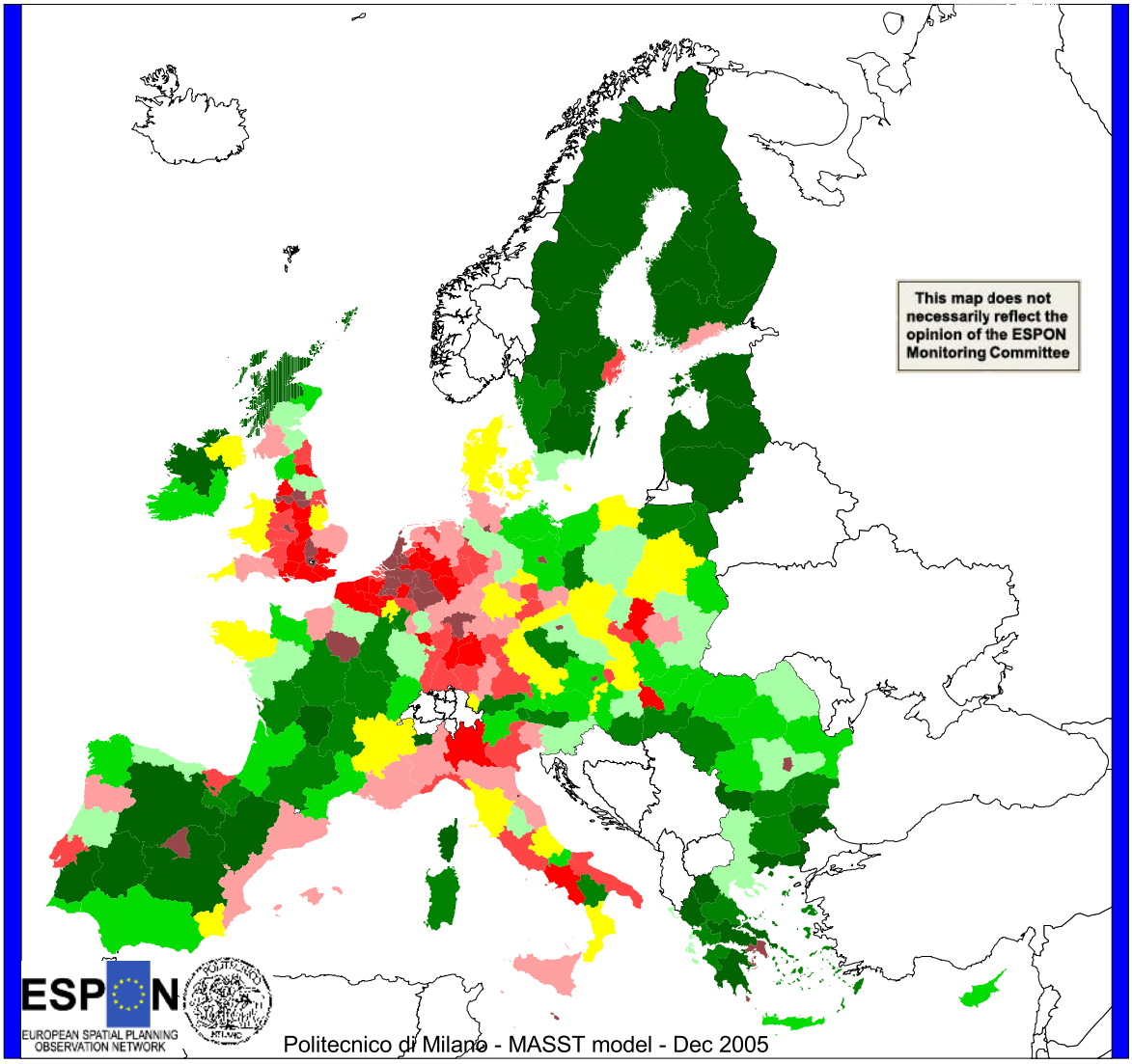


Figure 3 Population density 2015 – Baseline scenario

A closer examination of the demographic evolution at more regional and local scales reveals widely diverging situations. Population is generally growing in metropolitan areas, both in Western and Eastern Europe, under the combined effect of higher fertility rates and the attraction of migrants in relation to the development of advanced economic activities, with a number of exceptions, generally the old industrial regions. The knowledge economy favours metropolitan regions, both in Western and in Eastern Europe. Large cities also attract the major proportion of unskilled immigrants. By contrast, a quite significant number of remote rural regions in the eastern and western peripheries, but also in some central parts of Europe, are becoming more and more depopulated under the effects of advanced population ageing and the out-migration of younger age groups. This trend is particularly significant in the European peripheries. The progressive decline of public and private services in these areas accelerates the depopulation process. In between, one can find a large diversity of situations.

A quite large number of attractive rural or medium-density areas, especially in Western Europe are subject to population increase, as a result of the migration of retired people and free-lance workers from large cities, towards areas with a better environment. In this respect, coastal areas are particularly favoured, as well as the piedmonts of mountain regions. Movements of retired population mainly to sunnier, Mediterranean and Atlantic coastal areas can be observed, especially in France, Belgium and the UK. Daily commuters from the large cities also contribute to the densification of attractive rural areas surrounding the agglomerations. The regular influx of newcomers counterbalances natural population decline in a number of these attractive areas. Even in a context of general ageing, they can thus achieve demographic stabilisation in the long term. There are however also numerous areas with low or intermediate density where the stabilisation process cannot cope, after 2010/2015, with the natural decline of the population and where, accordingly, population is in long-term decline. In a number of these regions, the situation is not calamitous, but the number of empty houses and dwellings continues to multiple. In others, demographic decline is stronger and has detrimental impacts on the vitality and attractiveness of the whole region, because the quality of public and private services is declining and new investments are barely made, a process which accelerates the ageing of buildings and infrastructures. The number and size of derelict areas increases. This type of development can be observed in Central and Eastern Europe, outside of large cities, but also in a number of West-European intermediate regions.

Immigration from outside Europe is contained by public policies, but not really stopped. The process of illegal immigration continues, bringing into Europe mainly people with low education and skill levels who are facing tremendous difficulties in becoming integrated into society and the labour market because of their legal status. The European Mediterranean regions, especially Spain, Italy, Greece, France and Cyprus are subject to strong immigration pressure. Luxemburg is also observing increasing immigration, in particular from Portugal. In the countries of Central and Eastern Europe, immigration from countries

farther in the east (Asia, Caucasus, Middle East) intensifies. Legal immigration of skilled people is being organised by a number of countries where the shortage of skilled labour is stronger, such as Germany, the UK or France. Immigrants generally locate in large cities, not only because of better employment opportunities, but also because of the presence of ethnic and cultural communities which alleviate the constraints of integration. After 2010/2015, a larger number of immigrants also locate in intermediate and rural regions, because of better housing opportunities and of the possibility of self-sufficient economies. The development of ethnic communities progresses in these regions also.

The socio-economic integration of specific population groups (in many cases young generations of non-European origin) progressively becomes a serious issue in numerous European countries and generates socio-cultural manifestations of a generally negative nature. Youth unemployment is the main cause and it favours the development of ethnic/religious communities. Although the failure in socio-economic (and sometimes socio-cultural) integration is not strictly related to the share of population of foreign, non-European origin, it can however be observed in numerous European metropolitan areas that the importance of population groups of foreign origin is growing. A Europe-wide awareness of this issue develops after the riots in French suburbs in the fall of 2005. Measures are being taken at local level, but incoherently and with insufficient resources to really alleviate and solve the problems. Periodically, violent demonstrations and riots take place in the metropolitan areas. Reactions to this take various shapes, from political radicalism and increasing xenophobia up to the development of protective measures, including population moves towards the rural areas surrounding cities or the development of gated communities near large cities and in high-level tourist and retirement areas. The counterpart of this evolution is the development of derelict sites with multiple deprivation in cities and suburbs. Socio-economic dualisation and socio-spatial segregation is progressing in numerous European cities.

The EU enlargements to Bulgaria, Romania and Croatia do not significantly change the general trends observed in the rest of the EU. These three countries are also facing a trend of population ageing similar to that of most other European countries. Out-migration from these countries towards Western Europe is however stronger after 2010, because of diverging income levels and employment opportunities.

3.2.3.2 Economy, technology and evolution of urban Europe

Globalisation is an ongoing process stretching over the period until 2030, driven by declining transaction costs and a growing openness of the markets for capital, goods and services. As a result, the international division of labour undergoes further progress and the

competition among regions becomes stronger[8]. Specialisation benefits regions which show relative advantages in terms of factor endowment. For capital-intensive industries, the regions inside the Pentagon show locational advantages, whereas the regions outside the Pentagon – with few exceptions in the form of some metropolitan areas – show locational disadvantages. Under the influence of globalisation, adjustment and restructuring of the European economy is progressing, but Europe does not draw optimal advantages from the process because of insufficient competitiveness compared with other advanced economies at world scale. The relocation and closing down of certain types of businesses goes on and remains for a long time a source of concern, in particular because of the territorial imbalances generated.

Technology is progressing in a variety of fields. ICT use in production is rapidly changing the work organisation in the business sector. Not only intra-firm procedures are being re-organised with related productivity gains, but the re-organisation of inter-firm relationships with customers and suppliers is of even greater importance. Stocks are reduced. Production and logistics become more effectively connected. Just-in-time production which already experienced a widespread use in certain industries at the beginning of the 21st century (e. g. automotive industry) experiences growing diffusion. Just-in-time production influences the spatial distribution of producers in a twofold way. Firstly, in a number of cases, suppliers choose their locations adjacent to their customers. The formation of clusters, industrial districts, the growing importance of agglomeration effects might be a consequence of ICT use in production[9]. Secondly, in other cases, a greater frequency of long-vehicle traffic emerges to fulfil the requirements of just-in-time production. ICT solutions require the combination of modern hardware equipment with appropriate organisational solutions which is often very costly. Large firms are more able to fully reap the benefits from ICT than small firms which often suffer from limited managerial and financial capacities[10]. Since large firms often have a preference for locating in densely populated areas, whereas small firm often are located in areas outside the agglomerated areas, the benefits from ICT use in terms of growing competitiveness and productivity are not evenly distributed among the regions.

Concerning green biotechnology, the production and cultivation of plants for raw materials for industrial use is being located near to firms of industrial production in order to reduce transportation costs. Localisation economies are fostered. Even if GM-cultivation is still regulated on European or on the national level, the expansion of GM-food in addition to conventional and organic farming requires new systems of certification and strict product control. According to that coexistence, consumers have a free choice between both types.

· Rosenfeld, M. T. W.; Kronthaler, F.; Kawka, R. (2004): Nicht-demographische Einflussfaktoren der Regionalentwicklung in Deutschland, Expertise im Auftrag der Akademie für Raumforschung und Landesplanung, in: *Räumliche Konsequenzen des demographischen Wandels*, Teil 4, hrsg. von Martin T.W. Rosenfeld und Claus Schlömer, Hannover, pp. 37-81. (Arbeitsmaterial der Akademie für Raumforschung und Landesplanung, ARL, Nr. 312).

[9] European Commission. Directorate General. Joint Research Centre, IPTS 2003, p. 17

[10] The CIS3 survey delivers some indication for these size related differences (European Commission; Eurostat 2004, p. 42).

As gene-modified products and conventional products are externally not distinguishable, further progress has to be made to provide the identification of each product and its derivatives on the market. Efficient control and consumer protection mechanisms are being implemented, especially in highly developed and industrialised markets where high purchasing power and consumers preferring organic food without contamination are to be found. Thus, separated distribution channels are becoming necessary and result in new logistical challenges for agriculture and food industry. Distributing goods via different channels may cause a higher transport volume and frequency.

As another consequence, new business services (such as laboratories) may develop in order to control and certificate products. In order to guarantee spatial proximity to scientific and governmental policy makers, firms locate close to research institutes and federal or regional governmental institutions. Thus, urbanization economies on a small scale are being enhanced. This trend only emerges in regions and markets where research on GM-food is highly developed. Urbanization and localisation effects do not occur that way in less favoured regions within the EU.

For the red biotechnology field, according to a demand on human resource- and capital-intensive research and development, a further shortage of skilled employees in the field of natural and engineering sciences and on financial resources is expected. A growing discrepancy between an increasing demand on the labour market and lack of suitable human resources from academic institutes may negatively impact the expansion of the European biotechnology industry.

As SMEs often lack financial resources, it seems even more essential to build on cooperation between biotechnology firms, universities as well as research institutes (also supported by governmental institutions) for successful start-ups and further developments of small firms. Also, cooperation with larger firms (such as pharmaceutical firms) or suppliers of products, research materials and equipment is becoming more and more relevant. Therefore, spatial proximity is of high relevance. Also, consolidation processes are being observed because clinical phases are too cost intensive for SMEs due to high research and development costs. Competition among urban regions is growing. Concentration tendencies can be observed in those agglomerated (metropolitan) regions where a critical mass of venture capitalists, networks, research institutes and skilled employees from universities has already been achieved while other medium-sized urban regions are declining.

Research, development, and production in the field of red biotechnology in regions with public and university research infrastructure is developing further. Agglomeration economies have a positive impact. Employment effects, leading to regional economic growth, increase over time in such privileged regions, especially in highly industrialised regions, where a skilled labour force exists as an essential precondition.

Grey biotechnology finds new applications, in particular in the new member countries, especially in relation with water purification and supply. Similarly, nanotechnologies become more widely applied in the field of environment and health protection. With global warming, the conservation and quality of water resources gains in importance. High-speed analytical techniques for measuring water quality, nano-based filtration and purification techniques (carbon nano-tubes to trap bacteria) contribute to a less water-intensive production, which in turn reduces internal costs (economies of scale). In order to obtain data on the speed and levels of environmental pollution, self-calibrating, cheap air and water pollution sensors are used to detect various organic and inorganic chemical species. New types of catalysators extract harmful chemicals produced by combustion in cars, aircrafts and power stations. New measurements of physicochemical properties contribute both to hazard assessment and environmental modeling. A relevant impact of environment-related nanotechnology is that air pollution sensors can manage daily traffic generation and prevent traffic congestion. Waste reduction (especially of food) saves energy and resources (water) by producing less wasteful, and more recyclable, antibacterial 'smart' packaging. Packaging systems are able to monitor and identify contents by controlling the appearance/touch of food and provide data on energy to produce and transport (with signaling its location at any time/ logistics of food). Thus, quality of food can be assured and just-in-time logistic systems reinforced. New technologies applied in the energy sector ease mobility and decrease transport costs. The development of power cables, superconductors, quantum conductors of new nano-materials rewire electricity grid and enable long-distance, continental and even international electrical energy transport. The reduction of weight and volume also reduces transport costs. The reduction of production time reduces costs internally. Firms continue to equip their storage because smaller spaces for storages are needed due to the effect of miniaturisation.

Public policies in member countries and at EU-level remain rather substantial, partly because public resistance does not enable governments to transfer some public responsibilities in the private sphere. The main sectors considered by public policies are higher education, health care, pension systems, social support, social care and housing.

The global European policy tries to cope with the challenge of both widening and deepening the integration process. Bulgaria and Romania enter the EU by 2008 and later on Croatia (the entry negotiations started in autumn 2005). The adoption of the 'acquis communautaire' in the new member countries allows a reduction in transaction costs, with a positive impact on trade and on FDI. Europe as a whole benefits from the new enlargements. For capital mobility, the enlargement of May 2004 created favourable conditions, while labour mobility is still hampered by measures initially intended as interim arrangements. The continued restriction of labour mobility leads to growing re-location of firms towards the new member states. Losses of jobs with medium and low-skill requirements concern a number of EU-15 regions. Not only the job losses, but also restricted labour mobility creates unfavourable growth conditions in a number of regions in the western part of Europe. As the new member states (May 2004 and later) absorb large

parts of the EU-structural funds, in a medium-term perspective (after 2013) the funding for objective-1 regions in the EU-15 becomes very limited. The 'battle' for scarce EU funding, which had already emerged after 2000, leads to a situation where neither sufficient progress regarding Europe global competitiveness nor a sufficient degree of territorial cohesion can be reached until 2030.

Due to a continuation of European support, a number of regions along internal borders emerge as zones of cooperation. Cross-border cooperation progresses along all internal and external borders of the EU. However, the results are very different, depending primarily both on the economic, social and cultural situation *and* on the history of the respective borders. Within the European Union, barriers for cross-border mobility in the fields of infrastructure and institutions, which still existed at the beginning of the 21st century, have been, to a large extent, abolished in the meantime. But the lack of appropriate cross-border transport infrastructure is still affecting integration along specific borders, such as that between Romania and Bulgaria. Those internal border-regions where prospering development cores with a diversified business landscape existed at the beginning of the 21st century, emerge as 'integration zones', i.e. spaces of intensive inter-firm cooperation (e. g. the Saar-Lor-Lux-Region, the Upper Rhine Region, the Country-Triangle CZ-PL-D (Euroregion Neiße). However, in those border regions, where endowment with factors of economic growth is rather poor, the quality and intensity of inter-firm cross-border cooperation remains low, though inter-municipal cooperation is evolving relatively successfully (e.g. along large parts of the German-Polish-border). In economic terms, many of these economically weak border regions are still pure transport corridors, whereas economic cooperation takes primarily place between the agglomerations of the hinterland. The continuing European support for border regions contributes much to the positive changes along the internal borders. Beneficiaries are primarily the better-off border regions which have long since practised cooperation. However, policy measures are not capable of tackling hindrances for cross border cooperation which are primarily of an intangible, psychological character. Overcoming the 'barriers in the brains' takes decades, as the experiences along the German-Polish and German Czech border show. Contrary to the internal borders, the quality and intensity of cross-border cooperation along the external borders is still significantly lower, since strict border-control-procedures set limitations for cross-border mobility. Furthermore, deficits in terms of infrastructure (both border crossing infrastructure and accessibility of the hinterland) set limitations for the evolution of – desired – 'cooperation spaces'. Whereas many internal border regions tend to become spaces of cooperation, the majority of regions along external borders remain 'spaces of division'.

The most problematic regions remain the border areas between Poland and Belarus, Poland and the Ukraine, Hungary and the Ukraine, Slovakia and the Ukraine, and (after 2008) Romania and both Moldova and the Ukraine. In all of these areas, the existence of an ancient 'informal' and transient economy, plus the incongruence between ethnic, social, and

even familial patterns and national borders, makes a rigid implementation of the Schengen Border Control Regime politically problematic for the Member States involved. Their reticence over this issue however causes major concern in the former EU-15 countries where security concerns predominate.

Up to 2015, the pattern of regional economic development is one of continuing the catching up process in all new member countries, with more or less intensity[11]. The growing 'eastern periphery' from Cyprus over parts of Greece towards the Baltic States is separated from the growing 'blue banana' by a weakly growing belt stretching from the centre of Italy towards southern Sweden, over southern and eastern Austria, large parts of the Czech Republic and East-Germany. In terms of growth, the Pentagon is not homogeneous at all. Inside it, the 'blue banana' is expanding towards the east, covering broadly the whole of West Germany, while the western parts of the Pentagon, essentially in France, shows below-average growth rates, even in the Paris region, with the exceptions, however, of northern France and the Haute-Normandie area. In the western peripheries, a number of regions show above-EU average growth rates such as Central Scotland, Northern Finland and Central Sweden, Northern Ireland, Asturias, North Portugal and Andalusia.

[11] See map 3B from MASST model relative to EU25 GDP per person : difference 2015-2002. Baseline scenario.

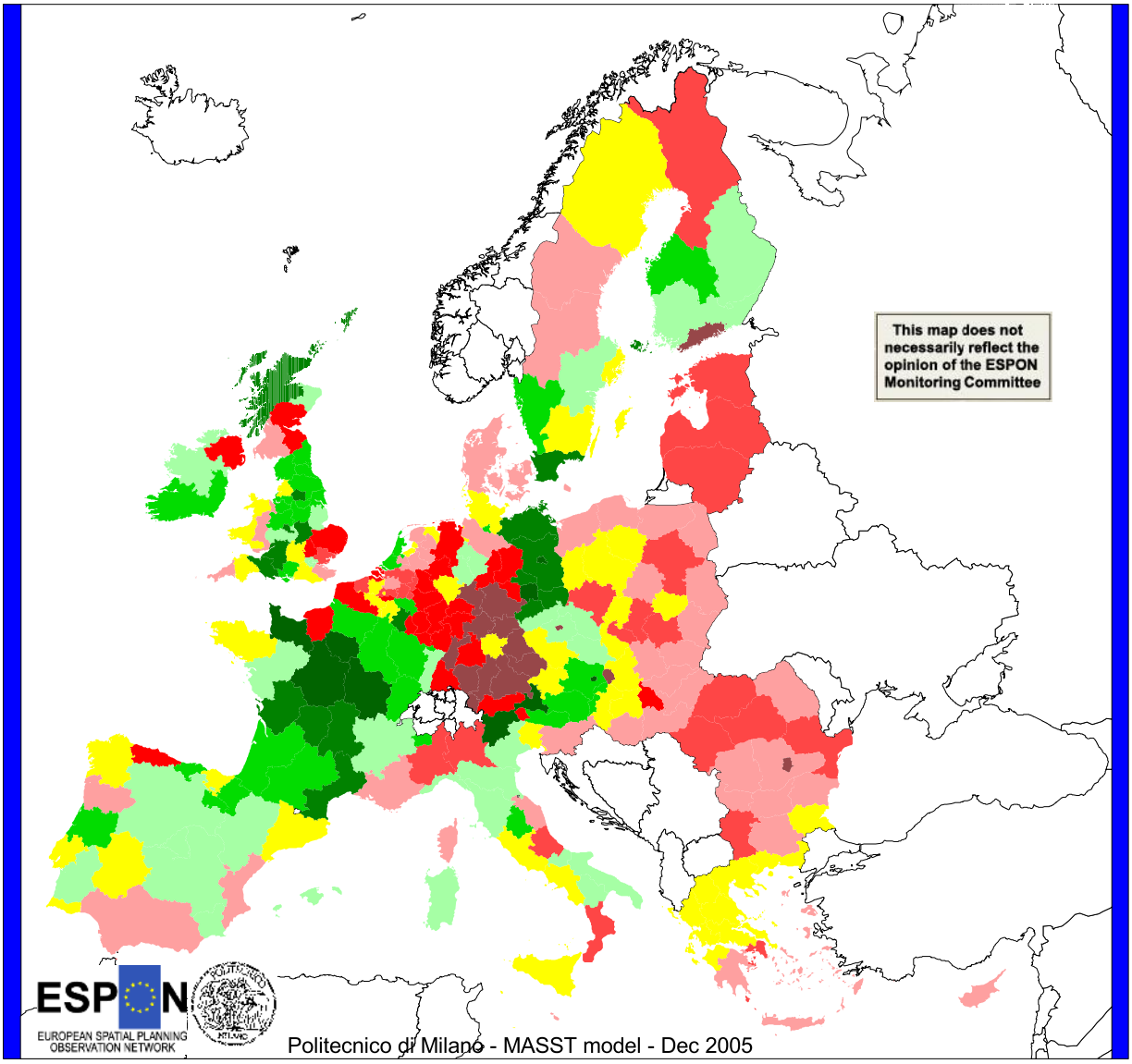


Figure 4 Relative to EU25 GDP per person – difference 2015-2002 – Baseline scenario

After 2015, the pattern of growth accentuates the contrast between metropolitan and non-metropolitan areas, both in Western and Eastern Europe. Stronger differentiation can also be observed among rural areas, with some being rather wealthy on the basis of residential

and tourist functions, especially related to the attraction of retired people, others being devoted to intensive agricultural production and others again being subject to depopulation and marginalisation.

Unemployment in the new member states, in Spain, Eastern Germany and Southern Italy remains substantially higher than in the core areas of the EU. In the new member states, Structural Funds resources are being spent mostly on infrastructure, transport and environmental improvements, which fails to raise employment substantially. FDI establishes highly mechanized and automated plants with relatively few workplaces, while – at least in some countries such as the Baltic States, Poland, Romania, and Bulgaria – agriculture sets free a large number of people. Another factor generating unemployment is the fact that these countries, in order to join the euro-zone, have to apply a strict austerity economic policy, and to achieve low inflation in a relatively short time which, according to the rule of the Philips curve, does not promote employment.

In the richer countries and regions of the EU, unemployment and labour shortage are simultaneously present. Unemployment, because priority is given to low inflation, balanced budget and exchange rate stability, also in the medium term, and this – perhaps to a lesser extent than in the new member states, but still significantly – limits growth and employment. As regards labour shortage, this will emerge, partly for demographic reasons – the post-war baby-boom generation is entering the retirement age – and partly because social care enables unemployed people to refuse low-wage and low-prestige jobs and immigration remains strictly limited and controlled.

In the new member countries, processes are not uniform, as depicted in the following graph which shows extrapolations by country of economic growth rates.

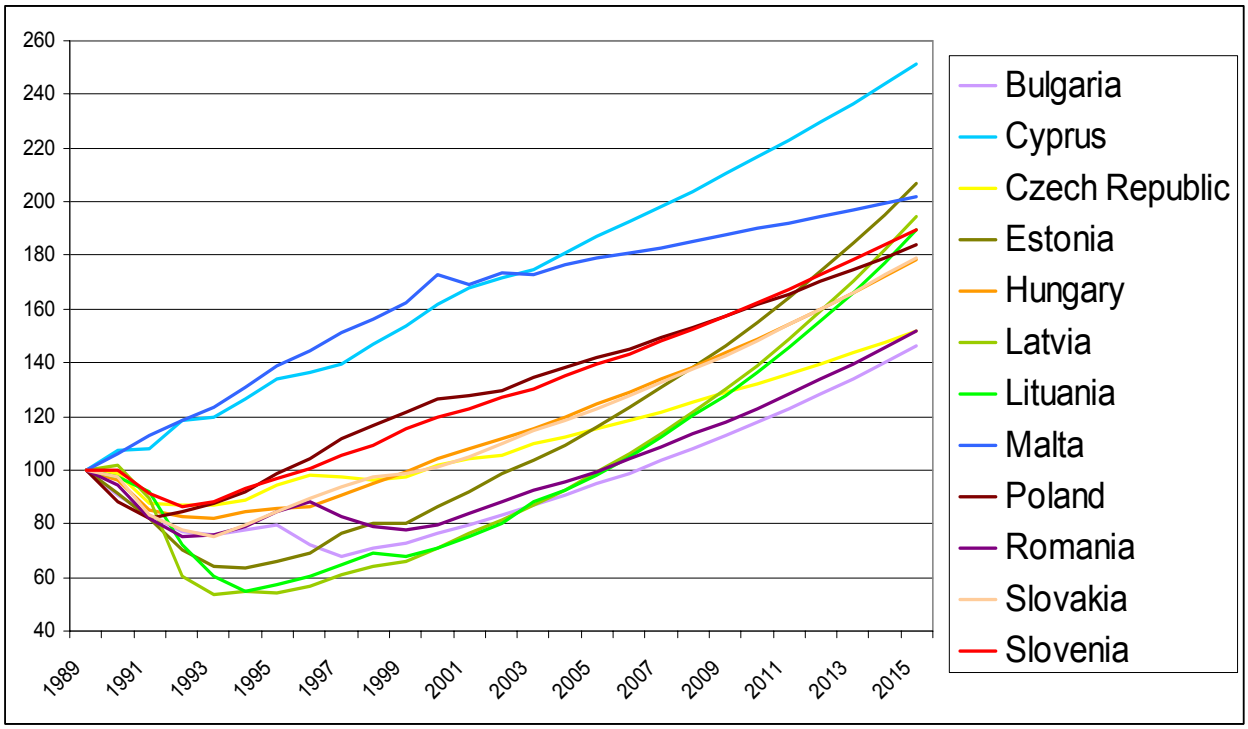


Figure 5 Extrapolations by country of economic growth rates

Results of restructuring of less developed regions are more clearly visible than in Western Europe, where it started decades earlier. An un-reformed CAP has stronger social impacts in countries where agricultural employment is significantly higher than average and where the size of farms is on average significantly lower (Lithuania, Poland, possibly Romania). The position of poorer countries depends, however, on the investment attractiveness of their major metropolitan areas (6 in Poland and one in each of the other New Member State) and on the quality of their institutional systems.

The interregional differentiation of the catching-up countries tends to grow, not due to the decline of their most backward regions but because of the fact that they are growing at slower rates than the metropolitan ones (but all are demonstrating positive growth). The national, regional and spatial policies – where applied in modern ways – allow for a wider diffusion of growth from the metropolitan cores to the less developed regions.

The processes of integration and reintegration of marginalised groups differ according to the quality of institutional systems and to the pace of development in individual countries. Also the unemployment rates differ accordingly. Further EU-enlargements influence positively economic growth in most developed EU states (as was the case in 2004) but with lower measurable effects.

The economic growth in CEE countries is, on average, faster than the EU-25 average. More 'labour cost sensitive businesses' tend to relocate from the Pentagon to CEE countries (in particular to their metropolitan and western regions). As already observed, some jobs are also lost in Europe (including CEE countries) to former CIS and Asian countries.

3.2.3.3 Evolution of rural Europe

Rural Europe is diversified and even more so after the EU enlargement of 2004 than it was before. After 2005, the diversification process takes place in a context where EU policies such as the Common Agricultural Policy and the Regional Policy still play an important part, but also where market forces (liberalisation of agricultural markets, accelerating globalisation) and demographic changes (population ageing in particular) are gaining in importance.

3.2.3.3.1 Evolution of agricultural systems under changing CAP/RDP and Structural Funds conditions and other exogenous factors

During the year 2005, the future of the CAP has been the subject of serious confrontations in the European Council. Although, it was decided that no fundamental reform would be undertaken in the short-term, the WTO negotiations of the Doha Round were concluded with the progressive abolishment of export subsidies. In a longer term perspective, CAP budgets are being reduced and resources progressively shifted from Pillar 1 to Pillar 2. The *macro-economic impacts* are considerable. The enormous transfers from consumers and taxpayers to agriculture – more than €120 billion in 1999 – are being reduced to approximately €60 billion. The reduction by 50% of import tariffs and the abolition of export subsidies enable the developing countries at last to generate approximately €10 billion more extra welfare per year. Countries that used to enjoy preferential access to protected Western markets continue to benefit but less than in the past[12] .

These reforms are stimulated on the one hand by the desire to reduce the large transfers from tax payers and consumers to agriculture and to make the agricultural sector more competitive on the world market, and on the other hand by the desire to maintain vitality in rural areas and to take care of the environment, animal health and animal welfare. The budget for Pillar 1 is being reduced from €37.5 billion in 2005 to €20 billion in 2030 (almost 50%). Pillar 1 resources are exclusively used for direct payments to farmers and market support has been abolished. The Pillar 2 budget, however, is subsequently increased from €7.5 billion in 2005 to €20 billion in 2030 (250%). Stimulating the competitiveness of agriculture remains the first priority. SF's remain concentrated on the improvement of the

[12] Massink & Meester, 2002

socio-economic viability of backward regions throughout the EU, with the emphasis on the new member countries.

In addition to the WTO negotiations, other exogenous factors become important for the development of agricultural systems, such as the increasing production of energy crops in a context of a changing energy paradigm as well as climate change and shifts in consumer behaviours. Investments in the *Trans European Network* improve mobility and thereby the competition between farmers inside and outside the EU. *Technological innovations*, lead to higher agricultural production and to reduced pollution and water-use for irrigation. Further EU enlargements (Romania and Bulgaria in 2008, Western Balkans at a later stage) also play a part as exogenous factors on the evolution of agricultural systems and of rural areas.

Intensification and scaling-up of agricultural production are stimulated by the further liberalisation of agricultural production and the progressive reduction of the CAP budget. This is limited to some extent by the criteria of environmental protection, animal health, and animal welfare. *Intensive cattle farming and horticulture* further increase in the Pentagon, in Northern Italy and in Southern Poland. This sector becomes successful on the world market. *Large-scale agriculture* moderately increases in rural areas with low land-prices in the CEECs. In North-West Europe large-scale arable and diary farming decrease, with the exception of areas producing energy crops. *Intensive cattle farming and horticulture* further increase in the Pentagon, in Northern Italy and in Southern Poland. This sector becomes successful on the world market. *Experience farming* increases in rural areas located in urbanized regions and in rural areas with small-scale landscapes in the Pentagon and in Eastern and Southern Europe. Consumers are willing to pay a higher share of their income for organic, regional and other quality products. The increase of rural development programmes and the growing demand for environmental quality stimulate agrarian *nature and landscape management*, particularly in small-scale landscapes. *Subsistence farming* in the peripheral regions of the CEECs is being significantly reduced.

Rural areas where agriculture dominates generally diversify, but not everywhere. In the fertile areas of France, Germany and Central Europe, agricultural production modernises further. In these areas food production competes with the production of energy crops. In Eastern and Southern Europe, numerous rural areas, stimulated by RDP and the SF's, also become economically more diversified. This applies for instance to areas attractive for tourism (Spain). It should however not be overlooked that only a part of the southern and eastern rural areas are diversifying, while others are declining. In an increasing number of rural areas characterised by unfavourable demographic situations (high level of population ageing), production conditions (low level of soil fertility, increasing drought) and landscapes, marginalisation and abandonment progress. This type of erosion is to be found both in Western and Eastern Europe.

3.2.3.3.2 Evolution of urban-rural relationships and partnerships

Urban and rural areas in urbanized regions become more interconnected. Urban sprawl is limited, to some extent. Rural communities benefit from the growth of shopping facilities, cultural amenities, and jobs in the service sector in urban areas. At the same time, urbanites benefit from the building of second homes, industrial estates and recreation facilities in rural areas. Many young people migrate from rural to urban areas because there is a growing demand among them for living in a heterogeneous, tolerant and creative environment. Adults and retirees, however, migrate from urban to suburban and rural areas since they prefer more stable, secure and natural living conditions. As a result, a number of attractive rural areas become slightly more urbanised themselves, while the less attractive are not subject to an intensification of urban-rural relations.

Rural areas in urbanized regions, particularly in the Pentagon and near other metropolitan areas in Europe, benefit from the growth of residential areas, cultural amenities etc. These areas become more viable in socio-economic terms and more densely populated. Some *rural areas attractive for tourism,* e.g. those near the Black Sea coast and in the Carpathian Mountains, are developed with the aid of RDP and SF's. Their socio-economic viability and population density increase significantly. R*ural areas with a variety of activities* develop further, particularly in urbanized regions and also in small-scale landscapes. Investments in tangible infrastructure (roads, ICT) and intangible infrastructure (institutional and entrepreneurial capacities), supported by RDP and SF's, make these areas more attractive for SME's and wealthy retirees. Several rural areas, although with low accessibility, are also successful in commodifying and marketing local resources to urbanites. These are particularly rural areas with a valuable but formerly neglected natural and cultural heritage in the CEECs. For these areas the increased and intensified RDP and SF programmes have made a difference.

Urban-rural partnerships further intensify in a number of regions. The promotion of public interests is concentrated on the strengthening of local competitiveness by investing in infrastructure, industrial estates, residential areas and landscape elements. Cooperation between urban and rural partners takes place on the local and regional level. This happens on a voluntary basis. The subsidiarity principle is loosely implemented. In most cases, the initiative is taken by public authorities, although local authorities often consider each other more as competitors than as partners. Urban-rural partnerships are relatively open: public authorities, the business sector and NGOs are involved. Cooperation is coherent because of the implementation of some kind of 'open method of coordination' but its effectiveness is limited because of the competition between local authorities and of the lack of binding policy-instruments. Remote rural areas subject to marginalisation and decline are generally not involved in urban-rural partnerships.

3.2.3.4 Transport

3.2.3.4.1 The transport context in Europe in a baseline perspective

The transport situation in the baseline scenario is conditioned by the general economic conditions of modest economic growth in Europe, compared with other industrialised countries and especially with a number of large emerging economies such as China, India or Brazil. Transport flows continue however to grow under the influence of progressing European integration and of accelerating globalisation. In addition, the nature and geographical distribution of flows is changing under the influence of structural evolutions in the economy (progressive move towards a more intangible economy with less heavy industry and more high-tech productions and high-level services) and of EU enlargements.

The sustainable character of increasing energy price (in particular of oil) is a major constraint in the transport sector, both for goods and people's transport. The new energy paradigm has also significant impacts on mobility and on technological development. From 2004 onwards, the behaviour of European citizens regarding mobility has been progressively changing with a new trend of car sharing, the search of residential locations closer to cities and other working areas, more intensive use of public transport, substitution of physical mobility through the use of ICT services.

Mobility is also influenced by the demographic evolution. Population ageing and the increasing number of retirees generate new forms of mobility, very different from the classical home-work relations. This does not mean that mobility significantly decreases (although higher energy prices work in this direction), but rather that that it is more linked to recreation, cultural activities, travelling, health care etc. The territorial differentiation of demographic structure (more younger generations in metropolitan areas and more retirees in rural areas) is accompanied by a corresponding territorial differentiation of mobility patterns.

Technological evolution plays an important part in the evolution of transport systems in Europe. The network of high-speed trains expands within the pentagon and also in the direction of more peripheral countries (Iberian Peninsula, countries of central and eastern Europe). A major factor in the boosting of technological evolution is the increase of oil prices. New engine technologies are being developed (hybrid cars, fuel cell engines) which become rapidly popular despite somewhat higher investment costs in the short term. In addition to lower energy consumption, the popularity of these new car generations is also justified by their lower environmental impact. Another sector of technological evolution in transportation is the generalisation of Intelligent Transport Systems, combining information flows and transport flows. Numerous applications are being developed and implemented in a

variety of fields such as better guidance of transport flows to optimise the use of infrastructure and to increase security, better management of urban traffic, increased tracing of goods transported, reduction of pollution generated by traffic, improvement of accessibility etc.

In line with the objective of sustainable development promoted at EU level throughout the 1990s and with the provisions of the White Paper and of the Kyoto Agreement, a number of measures are being implemented which contribute to alleviating the environmental footprint of transportation, such as road pricing (aiming at a better balance of transport modes), the development of less polluting engines, the promotion of public transport etc.

At EU level, the ERDF and the Cohesion Fund support significantly the development of transport infrastructure in the less developed countries and regions. Main beneficiaries are the new member countries where modernisation of infrastructure is a priority high in the agenda. Main trunk connections between metropolitan areas and between western and eastern Europe have highest priority, at the expense of more local connections. In central and eastern Europe, transport systems are evolving at the advantage of roads and motorways. This does not mean that the development and modernisation of transport infrastructure is neglected in the more central regions, especially in the pentagon. The high levels of traffic congestion in and around metropolitan regions as well as on major axes call for the increase of transport capacity and the elimination of bottlenecks. Various governments implement substantial programmes of infrastructure development. More and more public-private partnerships are developed to provide the necessary financial resources. The privatisation of networks is also progressing. Liberalisation is progressing in the railway sector, to reach finally passengers' transportation and urban public transport.

3.2.3.4.2 Simulations from the KTEN model

The infrastructure scenarios are based on both political aims and scientific criteria; policy aims determine maximum budget lines for road and rail, for 2015 and 2030, and the decision-making framework. No significant differences concerning ports and airports, and urban infrastructure, are considered in the scenarios.

In the baseline scenario, projects are selected on the basis of socioeconomic profitability, but a specific budget is allocated to regions with GDP below the EU average. Strong policies are applied to induce modal shift. It is assumed that rail technology and rail management will improve enough to carry this traffic increases.

Infrastructures are selected based on both CBA (Cost Benefit Analysis) and GDP gaps. Regions are classified into two groups, based on GDP (those above the average and those below). For each group, infrastructures are selected based on CBA ranks similar to the

competitive scenario (CBA thresholds will be smaller in the baseline scenario than in the competitive).

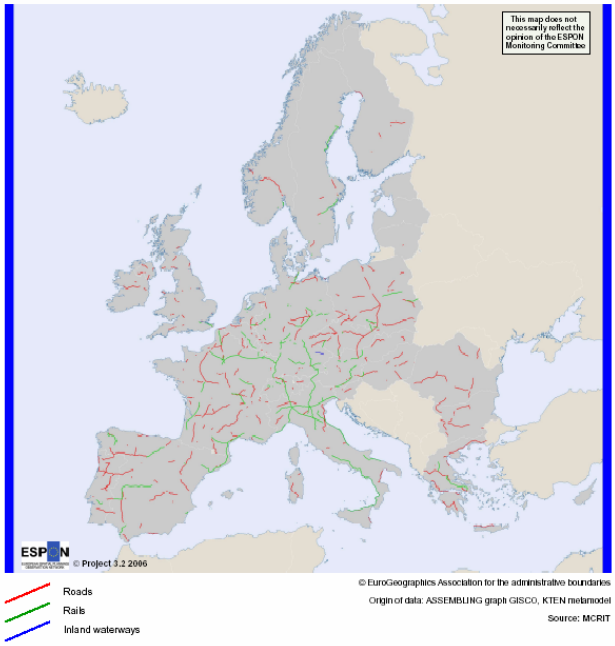
Method to define the infrastructure scenarios:

Evaluation of the current road and rail CBA.
Analysis of GDP evolution
From the list of projects for both group of regions, ranked according to CBA, select until the regional allocated budget to rail and road is reached.

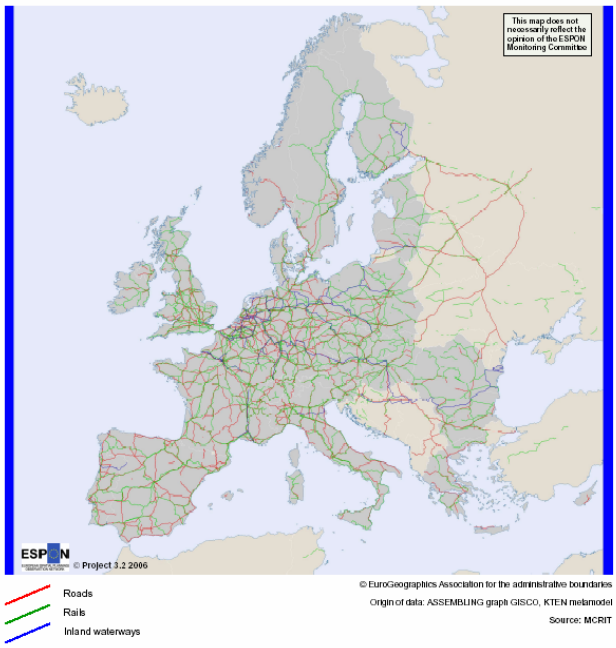
This scenario can be considered as the most sustainable, assuming an improvement in rail management.

Projects and networks

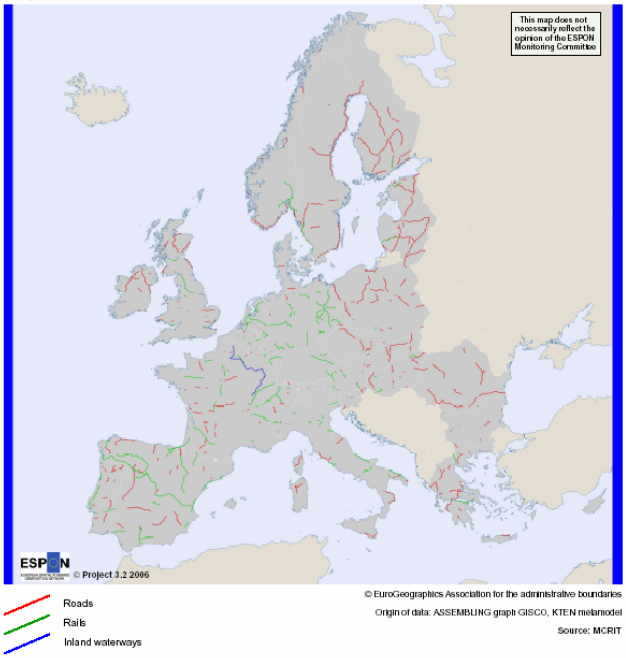
Projects 2015 baseline scenario



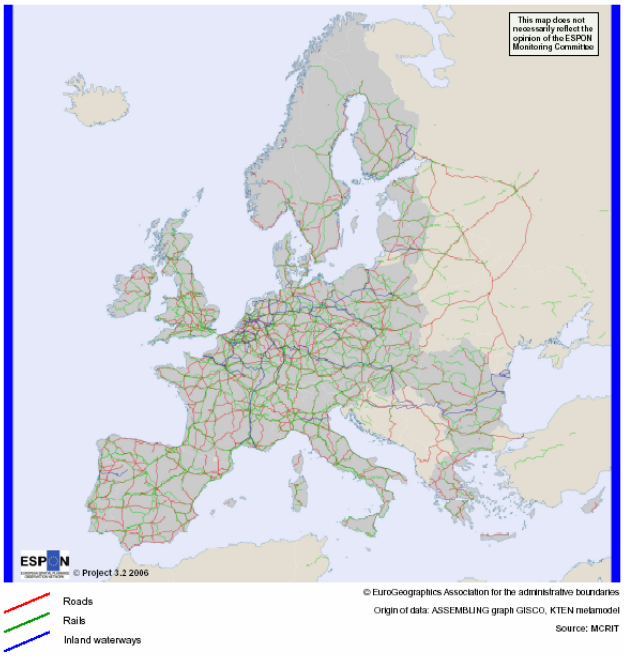
TEN network 2015 baseline scenario



Projects 2030 baseline scenario

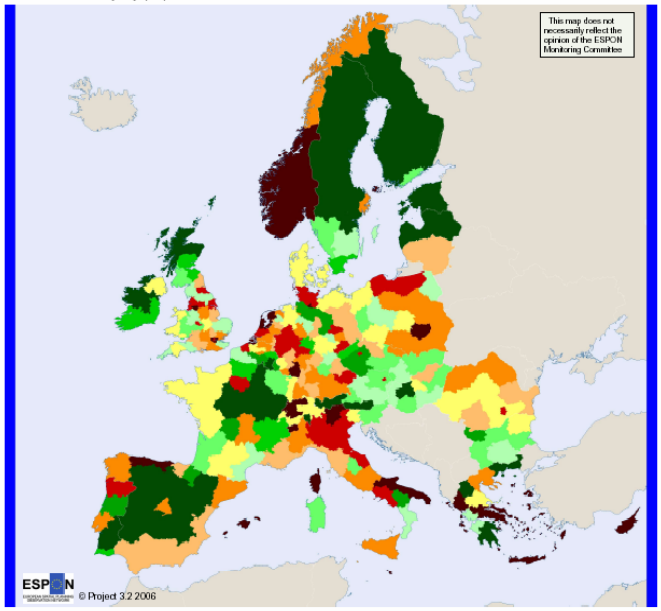


TEN network 2030 baseline scenario



Density of networks in relation to population

TEN rail density by population 2000

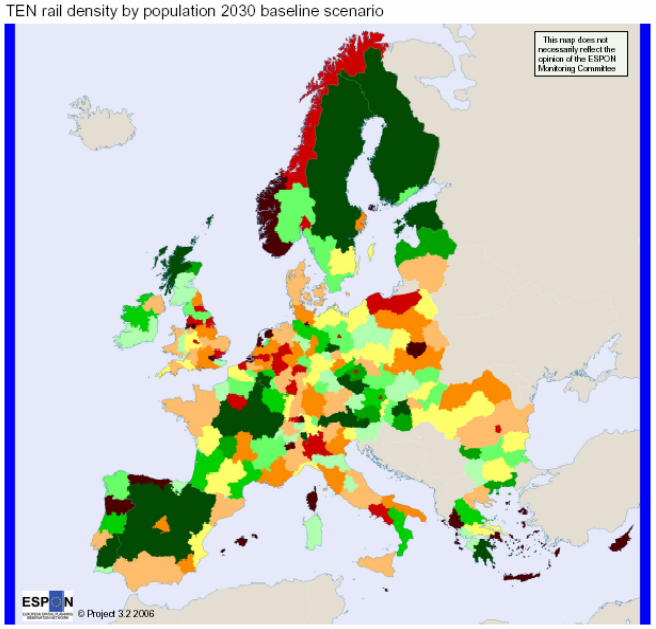


TEN rail density in km/inhabitant (ESPON Space=100)

up to 20
20 up to 40
40 up to 60
60 up to 80
80 up to 100
100 up to 120
120 up to 140
140 up to 160
160 up to 180
180 and more

Origin of data: ASSEMBLING graph GISCO, KTEN metamodel
Source: MCRIT

TEN rail density by population 2030 baseline scenario

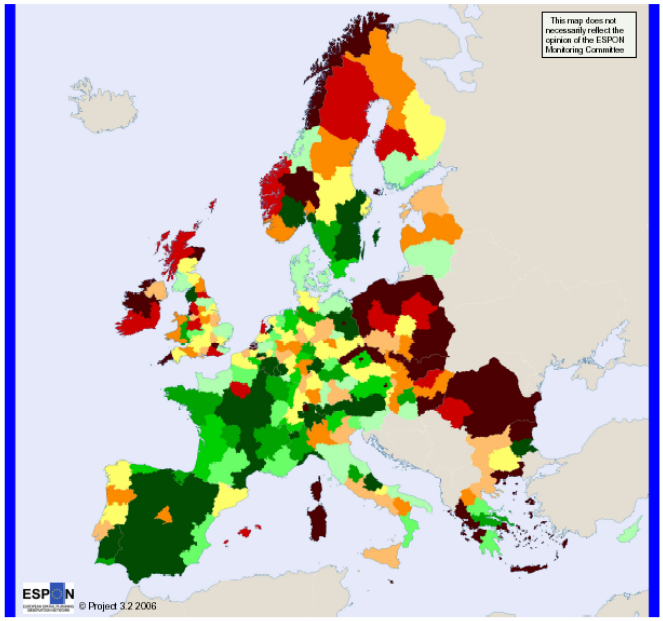


TEN rail density in km/inhabitant (ESPON Space=100)

up to 20
20 up to 40
40 up to 60
60 up to 80
80 up to 100
100 up to 120
120 up to 140
140 up to 160
160 up to 180
180 and more

Origin of data: ASSEMBLING graph GISCO, KTEN metamodel
Source: MCRIT

TEN road density by population 2000

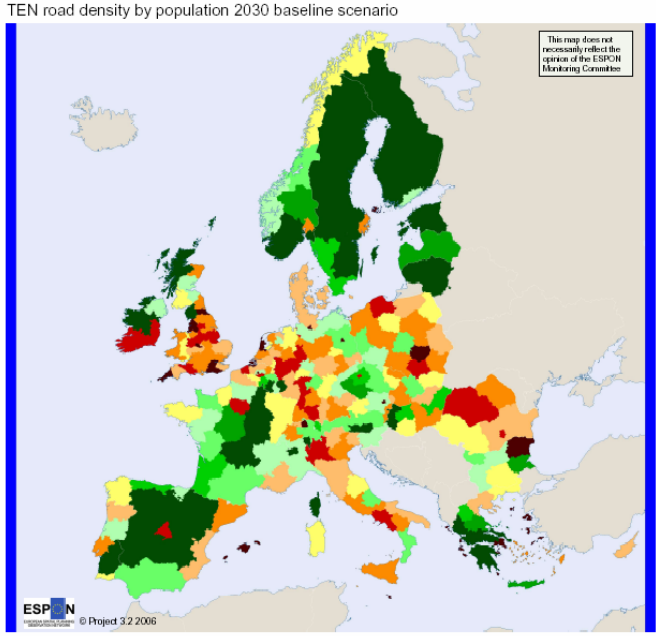


TEN road density in km/inhabitant (ESPON Space=100)

up to 20
20 up to 40
40 up to 60
60 up to 80
80 up to 100
100 up to 120
120 up to 140
140 up to 160
160 up to 180
180 and more

Origin of data: ASSEMBLING graph GISCO, KTEN metamodel
Source: MCRIT

TEN road density by population 2030 baseline scenario



TEN road density in km/inhabitant (ESPON Space=100)

up to 20
20 up to 40
40 up to 60
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80 up to 100
100 up to 120
120 up to 140
140 up to 160
160 up to 180
180 and more

Origin of data: ASSEMBLING graph GISCO, KTEN metamodel
Source: MCRIT

Traffic flows and accessibility

Maps on traffic flows and for regional accessibility for 2015 and 2030 are in preparation

3.2.3.5 Energy

3.2.3.5.1 Impacts of increasing energy prices on the evolution of energy consumption and changes of attitudes towards energy consumption

The trends existing before the third oil shock (starting in 2003) concerning energy consumption and related attitudes could not remain unchanged. Although the energy intensity of the West-European economies had significantly decreased after the first and the second oil shocks of the 1970s and that of the East-European economies had shown an even stronger decline after 1990, the global energy consumption continues to grow, driven by steadily increasing transport flows and the growing share of road and air transport and the growing number of air conditioning facilities in houses and offices etc. Even by 2005, and increasingly in the following years, a number of significant changes can be observed in various fields related to energy consumption. Energy-intensive industries (for instance those producing aluminium or steel) are relocated outside Europe because of prohibitively high electricity prices. Numerous industries in East and West invest in energy saving techniques and technologies. Households invest in house insulation and in complementary renewable energy sources. People contain their mobility, develop car-sharing and make more frequent use of public transport services, in particular in home-work relations.

The trend of a steady increase in energy consumption which prevailed before 2003 can be curbed down mainly under the influence of market forces, but also of subsidies (to public transport, to building insulation) in a number of countries.

In the context of this general trend, a number of regional differences can be observed throughout Europe. In general, the increase in energy consumption is stronger in regions where global economic growth is higher.

3.2.3.5.2 Impacts of the diversification of energy supply systems

Oil shocks and technological innovation have in the past been the most important drivers for diversifying energy supply systems, although in southern European countries oil dependence remains very high. In the field of technologies, the most important innovation of the post-war period has been the production of electricity out of nuclear energy. The decline of oil price during the 1980s and 1990s has been a constraint for the diversification

of energy supply systems. This largely explains why the share of renewable energy sources in total energy supply was so low in the early 2000s (6% out of which 2/3 from hydro-power). The third oil shock boosts the process of diversification of energy supply systems from 2004 onwards. Main beneficiaries of this diversification process are the renewable energy sources (solar, wind, biomass and biofuels, geothermal energy etc.), while no major innovation comes through as far as other primary energy sources are concerned. Nuclear fusion continues to be a potentiality for the very long-term, with the 'Iter' project being implemented as a unique pilot project in this field.

A significant revival of nuclear electricity production can be observed in numerous European countries thanks to new generations of nuclear power plants and to the pressure of certain lobbies (France, Italy, Slovakia and the UK). Experiments are also carried out in the field of coal gasification, but the cost of such processes remains an obstacle for a long time. The production of hydrogen as energy driver also looks promising, but the cost of primary energy (natural gas, electricity) needed to produce hydrogen is a significant handicap to the mass production of hydrogen.

The development of renewable energy sources is progressing rather significantly throughout Europe following Germany as the front runner country, which has already accumulated a substantial know-how and has increased its activities in this field after the government had taken the decision to progressively abandon nuclear energy. Not only the advanced economies of Northern Europe engage in the exploitation of renewable energy sources, but also various other peripheral countries and regions of southern Europe, such as Portugal or Greece.

In terms of territorial impacts, the diversification of energy supply systems has been significant mainly for rural areas. The production of biomass and biofuels gives a new impetus to agricultural activities and alleviates the constraints faced by the agricultural sector resulting from liberalisation and from the reduction of CAP support, in particular the subsidisation of exports. In fertile areas, the production of energy crops progressively becomes a competitor to the production of food products and this competition increases every time that oil and gas prices get higher.

Wind energy parks are being built in numerous coastal areas and hilly regions, sometimes damaging valuable landscapes. The use of solar energy is progressing throughout Europe and becomes more and more popular, in particular in southern regions. In a number of cases, the development of solar energy alleviates the problems of energy supply in southern tourist areas caused by increasing drought and its negative impact on hydro-power capacity.

The production of hydrogen develops mainly in the proximity of petro-chemical plants and of nuclear power plants. The use of hydrogen in the energy supply sector progresses

significantly after 2015 when oil prices have reached very high levels. A particular field of application is that of fuel cells-powered car engines. This contributes to significantly reducing air pollution caused by traffic in cities.

In addition to the diversification of energy sources, new technologies are developed on the basis of conventional fossil energy supply, such as hybrid cars with both conventional and electric engines. Hybrid heating systems of houses using solar energy and fuel or natural gas become rather widespread and also contribute to the reduction of air pollution in towns and cities.

3.2.3.5.3 Impacts of increasing energy prices on the economic development and the sectoral evolution of the economy

Increasing energy prices have a wide-reaching effect on the European economy. Through the increase of production costs, they reduce competitiveness, compared with countries with lower energy price or lower labour costs, and favour inflation. They also contribute to modifying the sectoral structure of the economy.

Increasing energy prices add their impacts to the factors causing low rates of economic growth in Europe, because of the high and increasing external energy dependency of Europe. Higher production costs make a number of activities less competitive in Europe, compared to countries with lower energy prices and/or with cheaper labour forces. This mainly concerns energy-intensive activities such as metal production (steel, aluminium), petro-chemical and other chemical industries. The continued movement of the European economy towards a service-based economy is accelerating. The increase of energy prices is also boosting inflation which is then counteracted by higher interest rates, thereby constraining economic growth.

While energy-intensive production sectors has progressively been abandoned, the immaterial economy has strongly progressed and Europe has become the world leader in technologies related to renewable energy and to new energy systems, favouring the technologically advanced regions of the Pentagon. Just as after the oil shocks of the 1970s, the European economic structure has made a 'quantum leap' in qualitative terms.

Increasing energy prices therefore affect more strongly the countries and regions with traditional industries, both in Western and Eastern Europe. In addition to this, the new member countries which are not yet part of Euroland are facing much higher interest rates, a factor which limits the volume of investments (in new production systems and in energy-saving technologies) and therefore the rate of economic growth.

At the European scale, peripheral regions whose economies are strongly dependent on transportation, are losing competitiveness because no major substitution possibilities to

road transportation are possible. Due to higher fuel prices, EU and national policies maintain road pricing at a modest level, with the exception of countries where the motorways have been totally privatised. In some countries, the level of pricing is variable, according to the regions: it is higher in central and urbanised regions and lower in more peripheral and rural regions. Taxes on fuels are however not reduced, because of their income effect on national budgets.

The share of transport costs in the final cost of products originating from peripheral regions increases and thus the final prices of these products. This explains their relative loss of competitiveness. Most affected regions are those of Ireland, Scotland, the Iberian Peninsula, Southern Italy, Greece, the northern periphery, as well as a number of peripheral regions of Central and Eastern Europe. Not only freight transport costs are affected by the increase of energy price, but also the costs of passenger transportation. Once again, peripheral regions are most negatively affected because of their higher dependency upon car and air transportation. The cost of inter-regional and transnational transport increases, including air transport. This trend works against polycentricity at the global European level. The gap between the welfare level of the Pentagon and that of regions outside it is widening. Location preferences are more and more given to regions from where the transport costs to markets and suppliers can be maintained at a reasonable level.

The availability of renewable energy resources (such as climatic factors in the case of solar energy or biomass) is not by itself a factor of economic or demographic distinction, but in combination with other factors (economic endowment, quality of life, accessibility etc.), it certainly is. Migration flows towards regions with attractive climatic conditions or the development of tourist activities in these regions are bringing with them wealth and jobs.

3.2.3.5.4 Impacts of the new energy paradigm on settlement systems

Regarding the impact of high energy prices on the regional and interregional dimension of the settlement structure, it can be observed that large and medium-sized towns are being preferred as residential locations to regionally dispersed settlements which are too dependent – as far as mobility is concerned – upon cars.

At the local scale (micro level), similar trends can also be observed. A clear move away from suburbanisation and towards more compact cities is taking place. Settlement systems are more and more coupled with public transportation. Urban and housing policies are favouring more energy-efficient types of settlements and buildings, making possible additional energy savings and increased use of renewables. Large recreation areas close to the cities and accessible through public transportation are developing. More retailing shops within and close to housing areas are being opened, making possible the purchase of a wide variety of goods without using cars. In places where geothermal resources are available, powerful district heating networks are implemented. Home working is developing strongly,

as well as other types of ICT applications such as the access to public and private services, e-shopping, educational and cultural programmes etc.

Settlement systems once again become more compact and also more energy-efficient. Not only are the building techniques improved, but also the distribution of urban functions, so as to diminish the need for mobility. Public transportation systems become the real backbone of settlement expansion and re-structuration policies. Densification of settlements in coastal regions, in particular Mediterranean ones, motivated by attractive climatic conditions, become a real problem, adding to the landscape damages caused by tourist development in the 1970s and 1980s and by the development of windmill parks.

The increase of road traffic flows remains more modest than the forecasts of the early 2000s, mainly because of the increase of transportation costs.

3.2.3.5.5 Impacts of the new energy paradigm on rural areas

The sharp increase in world energy prices (mainly oil) has several impacts on rural areas. Agricultural production is affected where energy intensive production methods are used, as for example hothouses (warmth and light), intensive cattle farming for meat & dairy production (barns), the use of farm machines, and further processing of agricultural raw materials. The primary sector also consumes energy for the transportation of fodder, animals, meat, and other agricultural products (e.g. flowers) through Europe. As a consequence of high-energy input production methods (for heating, treating and fertilizing), increasing energy prices lead to higher consumer prices for food produced in the EU, thus to less competitiveness compared to farm products from outside the EU where less energy is used in the production process. In sum, higher energy prices contribute to a crisis of agricultural holdings in the EU and lead to the abandonment of more small holdings and the concentration on few, but large, agricultural industry enterprises. This results in an increased shift of rural dwellers from the agricultural to the industrial and service sectors.

Higher transportation costs from and into the rural areas disadvantage agricultural production in the most remote areas, as farmers from these areas are less competitive than farmers in the surroundings of the urban areas. This results in the abandonment of agricultural productions first of all in the most peripheral locations. Former farmers and employees in agriculture orient themselves towards the job-offering services sectors in the agglomerations. As higher transportation costs also influences the behaviour of commuting, a large proportion of remote rural areas dwellers migrate to the cities. Population continues to decrease below the critical population mass for which public services can efficiently be offered, leaving older people and farmers alone. This leads to the vicious circle of lower quality of public services (education, health, transportation) as well as of private services

(supply, post, bank, pharmacies, movie theatres and so forth), less attractiveness, less quality of life and stronger migration fluxes towards urban areas.

As for the field of energy efficiency, renewable energy sources and their exploitation, numerous technological evolutions emerge. High potentials for further strong growth exist for the production of bio-fuels, wind energy, and solar energy. The production of energy crops progressively brings new sources of income to farmers, alleviating somewhat the problems of agriculture in peripheral rural regions. Set aside land is being reconverted into energy production. New large-scale hydropower projects, however, are more difficult to realise and their effectiveness in the long-run is unclear due to possible lack of water in barrages.

3.2.3.5.6 Environmental impacts of the new energy supply strategies

The progressive change in the energy paradigm brings with it both positive and negative implications for the quality of the environment. A decrease in oil consumption is a major factor for the improvement of air quality. The development of new engine technologies for cars and trucks (hybrid cars, fuel cells etc.) also significantly contribute to the reduction of traffic-related air pollution, in particular in cities. In addition to this, the use of solar energy for heating is acting in the same direction.

The development of biofuels has both positive and negative impacts on the environment. In the field of air pollution, the impact is clearly positive in terms of CO_2 emissions, as the CO_2 balance of biofuels is neutral (the combustion of biofuels produces broadly the same quantity of CO_2 as that which was absorbed by the plants during their growth process). In terms of soil and groundwater pollution, the situation is far less positive because the production of energy crops is causing a revival of intensive agriculture and the use of chemical fertilizers and pesticides and an increasing dissemination of genetically modified crops.

Wind energy facilities become rather widespread. They contribute to reducing the share of electric power produced by conventional or nuclear power plants, but they also cause damage to a number of valuable natural or semi-natural landscapes, although a number of countries adopt procedures to guide the location of wind energy facilities and protect valuable landscapes, in particular natural and cultural landscapes. In a number of countries (Greece, Spain), wind mills are harmful for tourist development.

The progressive change in the energy paradigm brings with it other threats to the environment. The use of coal and brown coal becomes attractive again when the prices of oil and gas reach very high levels. Not only imported coal is used, but also European coal, the extraction of which is characterised by a revival of interest. Due to the fact that the

gasification of coal does not progress rapidly, especially in the poorer European countries, the impact of coal use on air quality is rather negative.

Nuclear energy is further developed in numerous countries despite the protests of green parties and of anti-nuclear-minded citizens. Not only are old and obsolete nuclear power plants replaced by modern ones using new technologies, but the production capacity of electricity is being significantly expanded to compensate for the reduction of electricity produced in conventional power plants using oil and gas. Public-private partnerships are being set up to provide the financial resources necessary. The new generations of nuclear power plants generally reduce technological risks, but the issue of nuclear waste remains an important one, although experimental technologies are developed to strongly reduce the radiation potential of nuclear waste. Moreover, they do not provide a solution to Europe's energy problems in the short to medium term because of the lengthy commissioning process that has to be undertaken.

3.2.3.5.7 Impacts of climate change on the production of energy

Climate change has various impacts on the energy sector. First, it changes the pattern of energy consumption, mainly territorially. Global warming reduces the need for heating during spring and autumn in numerous European regions, but it increases the need for air conditioning, in particular in Southern Europe. Climate change has therefore no significant impact on global energy consumption, but the regional patterns are changing. In Southern European cities and tourist resorts, energy demand tends to increase.

The impact of climate change on energy production is also significant, mainly in Southern European regions. The development of solar energy facilities makes it possible to compensate partly for the increase of energy demand. Regions prone to drought have to face a double constraint: rainfalls are no longer sufficient to provide enough water to hydro-power plants and to enable the production of energy crops in agriculture. Drought favours forest fires and reduces the availability of wood and biomass to be used as energy sources.

3.2.3.6 Environment

3.2.3.6.1 Water resources and flooding

During the period of investigation up to 2030, water consumption is subject to contradictory developments.

Continuing economic growth (moderate in EU-15, higher in EU-10) leads to the increasing welfare of households. Domestic water consumption by households in Eastern Europe increases significantly, but this increase is compensated for by decreasing water

consumption in power plants and manufacturing industry. Also in Western Europe new cooling systems for power plants are being implemented, so that water consumption in this field is not significantly increasing, despite the fact that power generation capacity is growing.

Southern Europe faces higher water stress. Shortages of water force politicians and business to take decisions on water prices and investments in alternative ways to deliver water (desalination, water transfers from other basins). Irrigation techniques become slightly more efficient, due to water pricing and the increasing risks of low water availability, so that the increase of irrigated areas in Southern Europe does not lead to increased water consumption. However, the most water-consuming crops (e.g. corn) progressively disappear, which mostly impacts, economically, sparsely populated areas. In order to maintain the agricultural sector, water sources are differentiated between drinking water (expensive desalination) and agriculture (transfer of water from other river basins). Lack of water makes landscape management in semi-abandoned areas almost impossible.

The implementation of the Water Directive leads to a more balanced use of water. However, in extreme water demanding areas, the transfer of water from other river basins is still being implemented.

As far as water quality is concerned, pollution levels of European rivers generally decrease, particularly in traditionally polluted areas such as industrial zones and urban fields, although growing volumes of wastewater are generated as a result of continuing economic growth. However, some countries perform better than others, due to stronger focus on the chemical treatment of waste water. EU policies on waste water are being implemented as foreseen, with the expected delay. This means that increasing waste water volumes are dealt with by modern sewage systems driven by the EU waste water directive. In the EU-10, implementation is paid for to a great extent by structural funds.

In a number of areas with intensive agriculture, in particular where energy crops are produced, pollution levels remain stable or increase. Agricultural intensification takes place in the most productive areas and tends to raise nitrate diffusion levels. In Western Europe, the most affected areas are the Paris Basin, the Benelux regions, Northern Italy and Northern Germany. In the fertile areas of the EU-10, the use of fertilizers rapidly catches up with western levels. Ground water quality is deteriorating in most areas with intensive agriculture, leading to high costs for the production of drinking water, in spite of EU policies on diffusive nitrate pollution which oblige farmers to a more effective use of fertilizers in agriculture. However agricultural interests attenuate this evolution by successfully lobbying for a less restrictive implementation of the nitrate directive.

Although water quality further improves in numerous rivers, particularly those situated in densely populated areas and close to industries, pollution and deteriorating river and ground

water quality increases slightly in areas with intensive agriculture. The production of drinking water becomes increasingly expensive. Eutrophication remains a problem in numerous rural regions. However, some countries apply more severe measures than others, resulting in some 'ground-breaking countries' like Germany and Denmark.

Increasing rainfalls in Northern and Central Europe, but also in Southern Europe, where they may reach extreme intensity, cause more damaging river floods which are only partly attenuated by spatial adaptation measures like the reservation of water retention areas. Risks are increased by the fact that economic growth increases the size of built up areas, also in potentially threatened zones. The EU Water Directive fosters international cooperation on river basin levels. It stimulates measures to prevent river flooding; particularly the reservation of emergency flooding areas and retention areas, but much resistance has to be overcome to implement it. Resources dedicated tfor preventative measures are insufficient because they require significant investments often considered as non-productive. In spite of higher coastal flood hazard levels, vulnerability is decreasing thanks to investments in early warning systems and efficient evacuation plans.

3.2.3.6.2 Air pollution

Continued growth of road traffic, despite higher energy prices, driven by economic development and infrastructure investments, means more potential emissions. Technological advances and more severe legislations however enable the containment and even reduction, to a certain extent of air pollution. Environmental legislation fosters technologial developments and accelerates the implementation of certain existing technologies (carbon black filters). Other technologies (hybrid cars, fuel cells engines) lead to lower air pollution levels, in particular in urban areas. Air quality improves more rapidly in Western Europe than in Eastern Europe, mainly because new technologies are more rapidly adopted. The average emission levels of cars and trucks are lower. The move towards the service economy is stronger, leading to a reduction of air pollution by manufacturing industries. In Eastern Europe, the share of coal in total primary energy consumption is higher and the price increases of oil and gas tend to maintain coal consumption at a substantial, even a growing level. The implementation of the Kyoto Agreement has been more or less successful. Many greenhouse gas reductions are achieved within the EU-15, but a substantial proportion of emissions production takes place in other countries buying emission rights and implementing projects in developing countries, while the post-2004 EU Member States' emission levels do not decline quickly enough to see the now enlarged EU technically meet its target requirements.

The health situation has been improving in most European cities and territories. However, hot spots of high traffic volumes remain with high concentrations of small particulates. Ozone remains a problem, essentially in southern European countries. Regarding ecosystems, vulnerability to acidification is virtually disappearing. By 2010, only a few

forests in Germany and the Benelux are still suffering from acid deposition above critical load levels.

3.2.3.6.3 Natural areas

The evolution of natural areas and biodiversity is subject to contradictory developments. The Natura 2000 sites are sufficiently protected, but connectivity between different protected areas, as foreseen by the Directive, are not fully attained. Particularly in the Pentagon, linkages are thin and weak. In some southern European countries, where most part of the Natura 2000 areas are to be managed by traditional farming techniques, budgets are too low to manage all areas properly, and nature value falls. Urban sprawl and fragmentation of natural areas take place in and between growth regions, particularly in the Pentagon area and in the economically well performing metropolitan areas of Central and Southern Europe. Under the pressure of infrastructure, tourism and second homes, many coastal areas are further developed at the expense of valuable natural landscapes and wetlands. Pressure on accessible, attractive mountain areas rises.

Overall, the decline in biodiversity is only curbed, not stopped, due to a persistent lack of connectivity between protected areas, and a continuing pressure on natural areas and High Nature Value (HNV) farmland. Widespread energy crops production introduces monotonic landscapes potentially causing a further decline of biodiversity. Emigration from areas unprofitable for agriculture, takes place particularly in Southern Europe, and leads to the abandonment of low-intensity farming systems. This causes further encroachment of too limited a number of species, forest fires and further desertification. Shifting climate zones urge species to move northward or to higher altitudes. Some species cannot move rapidly enough; some have no space to move (mountain tops, lack of corridors etc.).

Many natural areas in the new Member States are changed into farmland. This is compensated for to some extent by nature development and forestation programmes. In the open fields in the polders and deltas where agriculture increasingly industrialises, many landscape elements are removed. Many small-scale landscapes are changed into open fields. The environment is affected by the increased use of chemicals and irrigation. This is only limited to a degree by agri-environmental measures. Efforts to concentrate intensive cattle farming and horticulture are not very successful. Increased emissions of ammonium are putting nature and landscape increasingly under pressure. RDP programmes stimulate the restoration of some small-scale landscapes like 'cultura promescua'. Afforestation programmes and extensive farming on abandoned farmland in mountainous areas reduce to some extent the risks of avalanches, landslips etc..

In *rural areas with a variety of activities,* the building of industrial estates attracts SMEs and also (young) adults; the building of residential areas attracts mainly retirees. The impact on nature and landscapes differs according to the circumstances. In *rural areas attractive for*

tourism the extended tourist infrastructure generates more welfare and in-migration, but at the same time nature and landscape are put under increasing pressure. This is mitigated only moderately by RDP measures. Many *rural areas with low accessibility* are unsuccessful in developing and marketing their natural resources. Consequently, they see their socio-economic viability and their service-level reduced.

EU policies on nature protection maintain their objectives, and budgets are slightly increased. Environmental measures in agriculture become gradually stricter. The introduction of environmental aspects to the CAP, force the agricultural sector to attenuate intensification processes. However, HVN farming is only supported where it is economically beneficial, for example in tourism and recreation areas. In areas prone to agricultural intensification, all developments made vis a vis High Nature Value agriculture decrease significantly.

3.2.3.6.4 Impacts of climate change

Climate change impacts are becoming evident, most notably the increased occurrence of natural hazards (floods, droughts and heat waves) and shifting climate zones. Floods cause much damage, more so in countries which had not invested in preventative measures. In addition, energy supply is threatened, both in southern areas dependent on hydro-electricity and in traditional power plants (which need the water for cooling) because of low river discharge. Drought leads to the abandonment of dry land agriculture in southern Europe. As a result, desertification increases and biodiversity declines. Inter-regional tensions for the appropriation of water resources are emerging. In Spain, for instance, tensions are developing between developed Mediterranean regions than need more water and other less developed regions than can provide more water. In northern regions, on the contrary, more favourable situations appear. In Finland, positive effects of climate change are observed in agriculture, forestry and in energy consumption.

Increased scientific evidence and knowledge about climate change enables better projections regarding the magnitude of climate change and its impacts. Public opinion shows increased interest in climate change impacts and possible measures on how to deal with them. Society (politicians, public, businesses etc.) however shows an ambiguous attitude towards costly adaptation measures, particularly at the international level. Climate change is therefore recognised as a major problem, but measures to adapt to its consequences are principally taken at national level. As a result, large differences develop between countries. Germany, for instance invests heavily in flood prevention, whereas Eastern Europe hardly does so, while Mediterranean countries focus on water availability in coastal areas and cities, combining water pricing and more diversion of water from high precipitation areas. EU policy is rather limited; ambiguity reigns between severe and costly adaptation measures and a focus on most cost-efficient measures.

3.3 Territorial image of Europe by 2030

According to a baseline perspective, the characteristics of the European territory in 2030 reflect a number of important changes, compared with the situation in 2005.

By 2030, the European population is, on average, much older than in 2005, with strong variations however, from region to region. The total population has declined, despite the existence of a new growth impetus in fertility rates evident in a number of countries after 2000. Areas with a particularly old population (average age above 50 years) are East-Germany, Northern Italy and Sardinia, Corsica, North-West Spain, Scotland, Northern Sweden and Central Greece. In the countries of Central and Eastern Europe, population ageing is counteracted by low life expectancy, despite very low fertility rates. In regions with very old population structures, a number of related impacts can be observed, such as the weakness of the labour market which reduces the propensity of enterprises to invest and to create jobs, the slowing down of internal demand, the reduction of services of general interest caused by progressive population decline etc.

The result of three decades of moderate economic growth and of insufficient competitiveness in Europe in a context of accelerating globalisation, is that a number of large European companies have been taken over by foreign multinationals from North America, Japan and emerging economies (Asia, Brazil). Strong restructuring and rationalisation has taken place in the related European branches. Europe leads in a few sectors, such as aeronautics, some new energy technologies and specific sectors of biotechnologies. Especially in the capital-intensive sectors of bio-technologies, energy and transport (railways in particular) a strong concentration of enterprises has taken place. A number of successful privatised ports were taken over by foreign companies, especially

from the Middle-East. A few large energy companies control the production and distribution of electricity, the sectors of renewables (in particular the production and transformation of energy crops, the wind energy parks), the development, renewal, operation and maintenance of nuclear power plants, the distribution of natural gas, the coal gasification plants, the production and distribution of hydrogen. Service industries and advanced tertiary activities are much more developed than they were in the early 2000s, as are household related services. By contrast, numerous industrial activities with low and medium technological level have disappeared from Europe, even from the countries of Central and Eastern Europe, for reasons of insufficient competitiveness. The same has happened to energy-intensive industrial activities, especially metal production, petrochemical and basic chemical activities. These trends, accompanied by asymmetric shocks, have led to strong territorial differentiation and specialisation.

Considering the long-range economic trajectories of regions, the European territory of 2030 shows that sustained growth processes are specific to a few categories of areas, in particular those characterised by high-level metropolitan or gateway functions, those attractive for specific population groups such as retirees, tourists etc., or those with new, significant economic activities such as in the field of new energy technologies and renewable energy supply (production of biofuels in particular). But the catching-up processes characterising less developed countries during the years following their accession to the EU is valid only for the short and medium term (generally not more than 15 years). After that, significant processes of territorial differentiation take place, based more or less on the same principles as those prevailing in the more central areas, with on the one hand, metropolitan regions continuing above-average development and, on the other hand, rural and intermediate regions lagging behind in their development pace if they don't have specific advantages of attractiveness. By 2030, these types of long-range economic trajectories appear to be valid not only for the new member countries of Central and Eastern Europe, but also for a quite number of regions in the EU-15, in particular the peripheral ones.

3.3.1 Urban Europe

In a world-wide perspective, European global cities have become more competitive, compared with the situation prevailing in the early 2000s, but their distance from the global cities of North America and Asia has remained quite unchanged. At a Europe-wide scale, the metropolitan areas of the Pentagon, together with a few others, have strengthened their leading position. The Pentagon, as defined in the late 1990s, has been expanding along major corridors with significant metropolitan areas, towards the British Midlands, the southern parts of the Nordic Countries, the Rhone Valley, the Danube Valley up to Budapest. The network of high-speed trains interconnects most of the metropolitan areas of the wider pentagon. A number of networks of cities have been emerging inside and outside the Pentagon, supported by efficient cooperation in RDT. The consolidation of these

networks has led to the development of wider areas, especially the Baltic Sea Region and the new 'Triangle' of Central and Eastern Europe, formed by Vienna, Warsaw and Budapest, including Prague, Dresden and Bratislava. The development of polycentricity takes place through the expansion of the Pentagon, rather than through the development of alternative global economic integration areas.

Remote peripheral regions, and even those with large cities, have generally not been successful in generating or maintaining sustained development processes, so that no global economic development area emerged outside the wider pentagon. As a result, large cities in the peripheries remained rather isolated in their development process and have not benefited from network and synergy effects.

At an intermediate scale, the level of polycentricity in the national urban systems of the countries of Central and Eastern Europe and of the southern peripheries has been reduced, compared with that of the early 2000s. This is a result of territorial differentiation in the long-range economic trajectories of regions. In the countries of Central and Eastern Europe, rural-urban migrations have been significant up to 2030, precisely because of the process of territorial differentiation. In Western Europe, both urban-rural migrations (retirees, self-employed etc.) and rural-urban migrations (young employed, students) have been co-existing during the three decades since the early 2000s, so that the demographic structure of large cities is generally much younger than that of numerous rural areas. A territorial division of generations has progressively taken place. In a significant number of regions with traditional industries, both in Eastern and Western Europe, the large, medium-sized and small towns have been declining in a context of accelerating globalisation and are facing, by 2030, serious difficulties in trying to recover and generate new activities. In the wider Europe, a number of regions attractive for residential and tourist functions, have however developed, some of them strongly, even in the absence of significant cities. ICTs have contributed to such processes.

Important differences with the urban systems of the early 2000s can be identified though at the local/regional level. A number of factors with cumulative impacts have contributed to reshaping urban settlements, the two major ones being increasing insecurity in cities and increasing energy prices. Insufficient economic, social, educational and cultural integration of ethnic minorities (mainly young people from immigrant families) has strengthened social and physical segregation in cities and favoured sporadic troubles and even riots. The social housing estates where these people live, as well as their surroundings, have been left by the population of European origin and by the 'better-offs' among the members of immigrants families, who moved to more 'secure' and quiet areas, either in other parts of the agglomerations or into smaller settlements of the surrounding rural areas. In numerous cities, as well as in tourist resorts, gated communities have emerged. Electronic security facilities are omnipresent in cities and in public transport. This type of evolution is stronger in the metropolitan areas of the Pentagon and of Mediterranean regions. As immigration has

also significantly increased in the countries of Central and Eastern Europe, the urban social and physical divide has been growing there also.

The impact of growing energy prices on settlements has been rather contrary to that of integration issues. High oil prices have favoured compact cities, with lower volumes of commuting movements, higher use of public transport systems and better integration of urban functions. Recreation and leisure facilities were developed at proximity of agglomerations. Densification and new urban developments took place in the surroundings of the stations of public transport networks. Home working has significantly progressed, so that numerous active people do not need daily commuting into the cities and prefer residential locations in surrounding rural areas, in particular those well connected by public transport.

The urban pattern at the local/regional level is one of increased social/physical segregation combined with compact approaches to new developments and redevelopment. It is however clear that this global pattern is largely differentiated according to types of regions. It takes different shapes in booming metropolitan areas and in declining industrial medium-sized cities.

The environmental quality of urban areas has progressed as far as air quality and noise levels are concerned, mainly through the wide adoption of new car engines (hybrid cars, fuel cells engines). Social tensions and physical segregation has however led to the widening of areas with a degraded environment and derelict character. The quality of the living environment in cities is more and more subject to a dual process with, on the one hand, areas of improving environment and gentrification and areas of a populous character with poor living environment.

3.3.2 Rural Europe

During the three decades following the year 2000, European rural areas were subject to strong dynamics. The diversification process already initiated in the 1990s in Western Europe continued and was also extended to Central and Eastern Europe. The new member countries benefited from CAP support, the CAP itself being subject to various reforms, including the implementation of WTO decisions. The strong development in the production of biomass and energy crops gave a new impetus to rural areas, including less fertile ones. Finally, the acceleration of climate change proved to be rather detrimental to rural areas in the southern half of Europe, while those in the northern half were beneficial.

By 2030, rural regions and landscapes in Europe are much more diversified than they were in the early 2000s, despite a strong trend to dualisation in the agricultural sector. Some have substantial population density in relation with their proximity to large towns and

metropolitan areas and to their attractiveness for residential and tourist functions. These are spread throughout East and West, in the surroundings of large cities, in coastal areas, in attractive valleys of mountain regions and in a number of Mediterranean regions with favourable climate. The degree of economic diversification of these rural areas is rather high. At the other extreme, a significant number of remote rural regions strongly affected by out-migration and population ageing, less attractive for residential and tourist functions, are more or less abandoned. Various types of intermediate situations can be observed, with some rural regions taking advantage of EU support (CAP and RDP) for the long-term stabilisation of their economic performance, while others with smaller production structures and declining industrial activities are engaging in a downward spiral. Numerous rural regions of Central and Eastern Europe, with the exception of those surroundinging large towns, have lost population after their accession to the EU, despite substantial support to agriculture.

Up to 2030, numerous changes have taken place in agricultural systems, both in Eastern and Western Europe. A dual system of agricultural economy has been consolidated, boosted by the further liberalisation of agricultural exchanges and by European integration:

- in large, fertile areas and/or close to the main consumption centres (agglomerations, tourist areas), large-scale, highly mechanised agriculture has developed, employing very few people. Large farms dominated already in the early 2000s in the UK, the Czech Republic, Slovakia, East-Germany, North-West Poland and in a few regions of France. After 2010, a rapid concentration took place in Hungary, Romania and Bulgaria. These large and cheap agricultural areas attracted numerous farmers from Western Europe (Netherlands, Germany, Austria, Denmark and Sweden) to buy or rent land and to set up large farms. Large farms have successfully resisted the pressure of global competition and produce the dominant share of agricultural products; a significant number of them develop export-oriented productions. In such areas, large energy companies have bought large agricultural estates to produce energy crops;

- in less fertile or less favourably located areas, especially those dominated by small farms, a more diversified evolution has taken place. The luckiest of these regions could change the profile of their activity (rural tourism, traditional handicrafts, organic farming) or strengthen some specificities ('terroir' products, regional brands). CAP subsidies (direct payments to farmers) as well as the production of energy crops at smaller scale, also contributed to stabilise the economic performance of such regions. In less favourable areas, numerous farms have been abandoned, being pushed out of agricultural production by competition. Many areas of this type are to be found in the European peripheries, but also in some more central regions.

The impacts of climate change have been detrimental to numerous rural regions in the southern half of Europe. Drought has severely reduced agricultural production and has even

led to the abandonment of agricultural activities in areas where irrigation was no longer possible and where alternative agricultural productions could not be successfully envisaged. Forest fires have generalised and destroyed irremediably traditional landscapes, adding to the drought problems, because of the reduction of the humidity retention capacity of the soil in mountain areas. Indirect negative impacts have taken place on rural and coastal tourism and on hydro-power production. As a counterpart, rural areas in the northern half of Europe have benefited from this evolution. Demand for specific agricultural productions has increased, as well as for rural tourism. New growth impetus benefited especially rural regions in the northern parts of Central and Eastern Europe (Poland, Baltic States, Czech Republic, Slovakia and East Germany).

The rural environment has been subject to contradictory evolutions. The generalisation of EU environmental legislation throughout the wider Europe has brought with it positive impacts on the protection of nature and surface water, while the intensification of agriculture in the most fertile areas and the acceleration of climate change were detrimental to ground water quality and resources, to traditional cultural landscapes and to soil protection.

3.4 Conclusions: territorial issues arising in 2030 from the baseline scenario

3.4.1 Europe-wide level

Significant regional economic disparities still exist in Europe by 2030, but less between East and West, as had been the case in the early 2000s, and more between metropolitan areas and remote rural regions with low attractiveness;

New global economic integration zones did not emerge; instead, the Pentagon has been widening along major corridors, encompassing a number of additional metropolitan areas. The wider pentagon is by far the most competitive part of the European territory;

Differences in global accessibility between the wider pentagon and peripheral areas remain significant by 2030 and are accentuated by the strong increase in the cost of transport (oil);

Outside the wider pentagon, the level of economic development is more modest (except in a few large metropolitan areas and some tourist regions); it is however much more modest in the East than in the West. The catching up process of weak and/or peripheral regions, which generally took place after EU accession proved not to have a long-lasting character. After a period of 10/15 years following accession, a differentiation process took place between

regions with large metropolitan areas and those with a more rural character. A significant amount of EU public resources allocated to weak regions (various types of infrastructures) has not generated significant amounts of private investments (weak leverage effect);

The pressure of illegal immigration is significant in most countries, but especially in those along the Mediterranean and eastern borders.

3.4.2 Intermediate level

The level of polycentricity has been diminishing in the new member countries of Central and Eastern Europe and, possibly, in a number of western, less developed regions. In the new member countries, the relative accessibility of areas along major corridors has increased. In more remote areas, it has been reduced;

City networks have consolidated in certain transnational areas (Baltic Sea Region; Triangle of the CEEC), but not in all transnational cooperation areas. In some of them, transnational integration is still weak and few economic and technological synergies have developed;

In a number of regions belonging to both East and West, the level of population ageing by 2030 is such that it generates a spiral of global decline and revival strategies are difficult to implement;

In a number of southern regions, the lack of prevention and adaptation measures related to climate change has produced long-lasting and substantial economic and environmental damages, especially in rural areas.

3.4.3 Local/regional level

The internal differentiation of cities has been strongly increasing, with urban areas becoming more and more attractive and others more and more repellent. Differences in real estate prices within cities are such that they accentuate the segregation process. Gated communities have been developing;

Problems of economic, social, educational/cultural integration of young population from immigrant groups have increased in various cities and have contributed to reducing their attractiveness and competitiveness;

Numerous retirees and self-employed have moved from cities towards attractive rural areas, where rents and real estate prices have strongly increased, generating housing problems for the local population;

A number of attractive coastal areas and mountain valleys are facing strong densification and urbanisation processes, generating pressure on traditional landscapes and on natural areas;

In fertile rural areas, the intensification of large-scale agriculture (export-oriented productions, energy crops) generates environmental problems (ground water pollution, soil erosion).

3.5 Integrated cohesive scenario

3.5.1 Objectives and principles of the integrated cohesive scenario

The scenario is a prospective, policy-oriented scenario in which the main priorities of public policies at EU level, in a context of growing globalisation, are focused on economic, social and territorial cohesion and not on global competitiveness. This does not mean that the improvement of competitiveness is excluded, but rather, that in case of incompatibility between cohesion and competitiveness (for instance if growing competitiveness is likely to increase territorial disparities), priority will be given to cohesion. It is however important to indicate that measures related to competitiveness in the context of structural policies are fully integrated in the scenario, even if they are likely to generate intra-regional disparities in less developed regions. It must be made clear that the scenario is a prospective policy scenario based on a strong cohesion policy and not a roll-back scenario minimizing regional disparities. Another major hypothesis is that the coming decades will be devoted to consolidating the enlarged EU in a balanced and sustainable way. Only Romania and Bulgaria will join the EU during the study period, while the neighbourhood policy will be focussed mainly on maintaining good relationships with immediate neighbour countries, quite independent of whether or not they are candidates to join the EU.

3.5.2 Hypotheses of the integrated cohesive scenario

Demography	- Restrictive external migration policies - More flexible retirement ages - Pro-natalist fertility policies (=> encourage better balance of population structure) including more flexible arrangements for child care - No change regarding constraints to internal migration
Economy	- Increase in the activity rate, in particular in peripheral regions - Maintainenance in the volume of EU budget - Reinforcement and strong focus of structural funds on weakest regions - Further harmonisation of taxation and social security systems, as - far as is non detrimental to the competitiveness of less developed - countries
Energy	- Steady increase of energy prices - Realisation of TEN-E - Promotion of decentralised energy production (in particular - renewables)

Transport	- Continued growth of all traffic, in particular in peripheral regions, but curbed by energy price - Development of TEN-T with priority given to peripheral regions at different scales - Support for transport services in rural and less developed regions - Application of the Kyoto Agreeement
Rural development	- Minor CAP reforms, but shift from Pillar 1 to Pillar 2. Priority to less developed rural regions in the field of direct payments to farmers (Pillar 1) - Priority to environmental and animal health criteria - Slow industrialisation and moderate diversification of agricultural production, promotion of quality products - Active policy for diversification of rural areas, including SMEs, - tourism, residential functions etc.
Socio-cultural sector	- Promotion of regional and European identities - Integration of marginal groups (ex: gypsies, etc) in peripheral areas - Proactive socio-cultural integration policies, in particular in cities - Increased fiscal and/or social investment in quality of life issues - (such as health, personal care, local environment, etc...)
Governance	- Active multi-level territorial governance, in particular in areas supported by structural funds - Strong role for public actors in territorial governance - Stronger role for the European Commission
Climate change	- Moderate overall climate change until 2030 (+1°) - Increase of extreme local events - Constant emission levels - Strict mitigation measures (taxes, road pricing as far as non detrimental to peripheral regions) - Wide range of adaptation measures (EU hazard funds, large investments)
Enlargement	- Deepening preferred to widening - Break on further enlargement (except Bulgaria & Romania, which enter later than foreseen) - Only lip service paid to neighbourhood policy

3.5.3 Scenario process

3.5.3.1 Demographic changes and related territorial impacts

Following the trends dominant at the turn of the century, the natural population development of most of Europe continues to decline in number, as well as in age composition until 2015. Over the next ten years recovery is evident, stimulated by strong,

but covert, pro-natalist policies. This recovery, though by no means 'pan-European', as typical with demographic trends, shows signs of convergence. Consequently, as a result partly of the new up-turn in birth-rates, but also strongly interventionist regional policies and strictly regulated and targeted migration strategies, there are, by 2030 indications of a more balanced population structure and of new life in many areas, even those which had previously been threatened by serious de-population.

However Europe's structural demographic difficulties have not been totally alleviated by these actions. Population ageing continues to affect certain parts of the continent, with Eastern and – most visibly – Southern Europe (whose life expectancy continues to exceed the rest of Europe) affected more than northern and western countries and regions. Falling total populations are also continuing to impact many eastern, and some southern areas of Europe. But there are significant national variations[13] to these general patterns: parts of France and Spain for instance experience a marked revival in their fertility rates, by the first decade of the millennium.

The convergence in population trends is seen mainly at the sub-regional level with a beginning of a levelling out of the extreme disparities between the demographic composition and tendencies of regions. By tackling the economic decline of regions which are net exporters of young people and by instigating a calculated policy of de-centralisation and polycentric development, supported by subsidisation of sustainable forms of transport and other services, there is a variable rise in the fertility rates of marginal areas (classified in ESPON project 1.1.4 as 3 and 5). Areas typified as 4 'touristic areas and suburbs, with positive demographic balance for all age classes, except young people' also experience a mild to moderate rise in the birth-rates. Furthermore with technological advances giving women the chance to delay child bearing there is a rise in child-bearing among older women in areas considered 'middle-aged and middle-class' such as greater Oslo and Vienna.

This birth rate up-turn and the continued improvements in life expectancy have major impacts on the labour market, which has in effect shrunk. Dependency levels, meanwhile at both ends of the age spectrum, are growing. Economic measures designed to mitigate the effects of this are enacted, designed to encourage integration and citizenship across the generational divide. The key concept underlying the strategy to plug the gaps in the labour market is flexibility. This helps to build consensus through the (appearance) of choice and has avoided the resentment that blanket income re-distribution between age and gender cohorts looked set to cause. Thus flexibility in child-care arrangements and pension ages are becoming the norm. Confronting institutional forms of ageism and removing compulsory retirement ages is part of this process and in some cases extends individuals working lives by up to 25 years. It is less popular among certain occupational groups though, particularly those involving physically demanding work. Flexibility is extended to other aspects of life

[13] As aspects of family policy have continued to be largely the preserve of national governments.

too, such as education, making family commitments more manageable. Allowances paid to grandparents and other older/retired relatives, instead of or as well as mothers are also becoming a widespread means of integrating the so-called third and fourth generations in community life and maintaining healthy life expectancy rates.

De-centralisation in welfare delivery means that some successful measures begin life as innovative one-off projects, most notably in countries such as Germany and the Czech Republic where ageing and declining fertility rates had caused particular concern at the end of the last century. Such initiatives have in effect re-created extended familial sources of support through surrogate residential arrangements. These programs, while inexpensive, help to consolidate community integration. More ambitious 'low-cost' projects which also allow mothers to re-integrate into the labour market earlier combine elderly and nursery care, in some instances with older adults, who are fit but otherwise isolated, being encouraged to 'mentor' pre-school children. Projects specialising in life-long learning, leisure and cultural are also becoming increasingly popular, opening up a wide variety of services and new forms of employment. Heavily subsidised through the tax system initially, many of these schemes are becoming self sustaining, profitable and 'exportable' to the rest of world as 'best practice' in welfare and community provision.

Importantly in spatial terms the location of many of these new projects is at some distance from the major conurbations, deliberately engineered by financial incentives from the EU, regional and national administrations to reduce pressures on built-up areas and regenerate areas of declining population. The 'democratisation' of remote forms of mass communication (ICT etc) also plays a part in re-establishing the viability of rural, semi-rural and some remote areas. This too is policy led.

European regional policy which was the focus of sustained debate earlier experiences something of a revival during the first quarter of the century. Disappointment with the effectiveness of 'cohesion policy' has led some to argue that it should be re-directed to focus on 'potentially strong' regions, which could produce a 'trickle down' effect benefiting weaker regions. However this market-oriented approach is abandoned as vast peripheral and de-industrialised areas of the continent are also abandoned en masse by their young and by any commercial enterprises which may have been able to offer retention of quality of life for any remaining inhabitants (mainly older persons). Consequently there is, by the second decade of the century, a return to the concept of 'remedial support' for weaker regions, this, both in spite of – and because of – the accession of new Central and East European members.[14] In demographic terms, the reversal to regionally redistributive economic policies, together with more interventionist immigration policies have positive demographic implications, in the sense of producing a more balanced distribution of population across the European territory.

[14] As the CEE accessions had from 2004 increased the degree of inequalities, but despite – as it was from the East that much of the push for 'new cohesion' was coming.

While MEGAs are continuing to thrive as centres for excellence, business hubs and residentially for transient populations – young, single and weekly commuters, smaller settlements become the dominant form of more permanent residence for settled populations. More accessible rural areas also enjoy a partial renaissance, buoyed up by substantial regional prime-pumping support maintaining service provision and transport. Even more remote rural areas experience a degree of renewed popularity, though less as permanent settlements than as seasonal retreats, as the increased subsidisation of transport[15] is helping to open them up to tourism so keeping alive small communities.

[15] Long distance trains – Japanese style – and water forms of transport have received subsidisation, while cheap air travel has been heavily taxed to curb the growth of long-distance tourism.

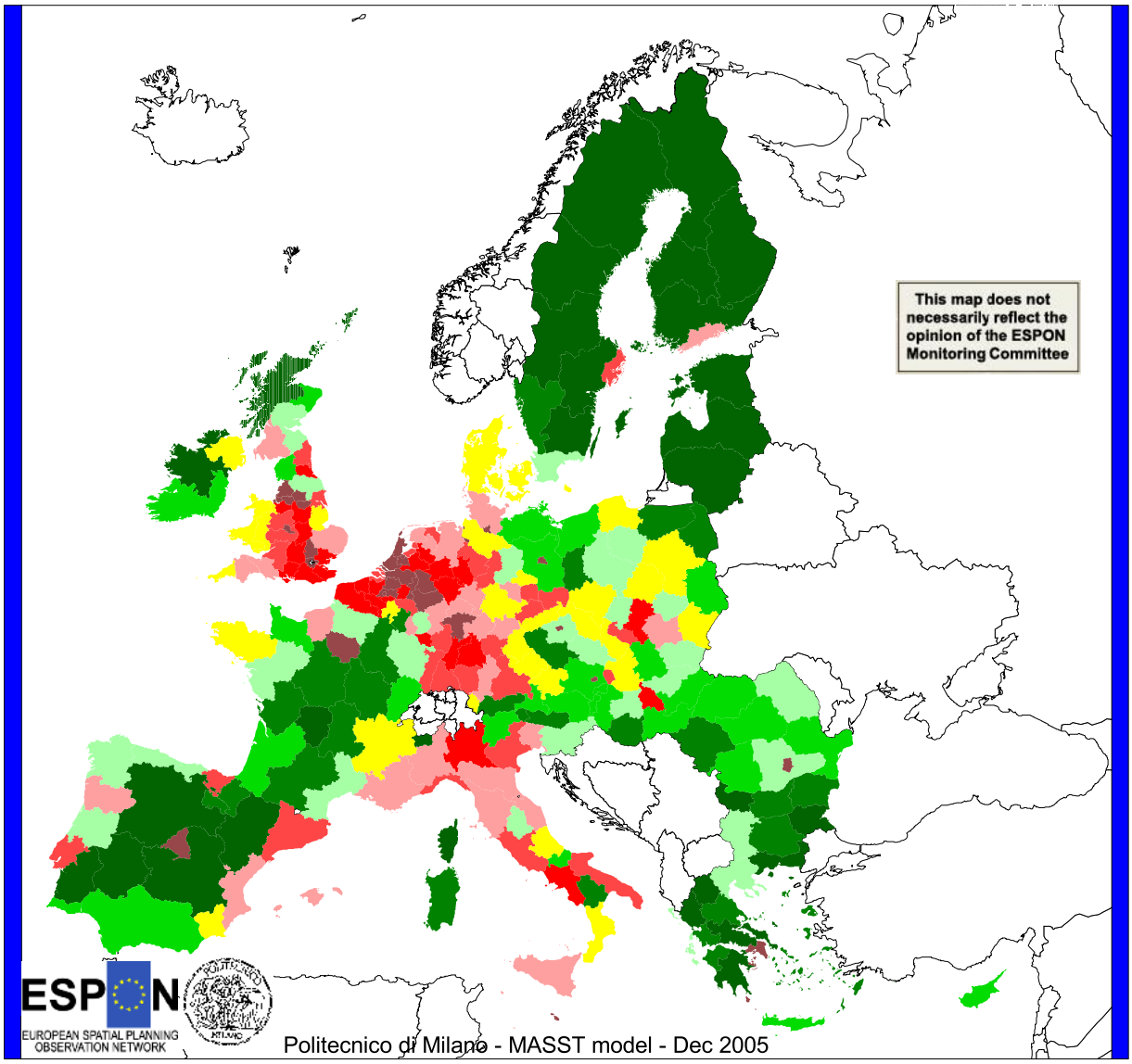


Figure 6 Population density 2015 – Cohesive scenario

Immigration, the demographic variable with the most dynamic potential, becomes an increasingly contested issue in the policy arena. But the EU does eventually agree a common treaty on external migration, heavily influenced by those countries who have become very concerned about the volume of immigration from outside Europe, most notably the UK. External migration thus becomes more restrictive. Specific controls are also being introduced with socio-cultural integration in mind, for instance bars on South East Asian migrants bringing relatives to Europe for arranged marriage. Early indications show that the integration of 2nd and 3rd generation immigrants from the Indian sub-continent, from the Middle East and from North Africa into the host communities is improving among young people; a slight rise in inter-racial marriage appears to be a positive side effect of this policy.

EU migration policy is also being manipulated to fulfil 'replacement' goals identified by the OECD; strictly controlled by 'donor' country, area and region of destination and occupational group along the lines of Australian migration policy developed in the 1980s. Illegal migration continues to supplement population, but the figures involved are declining substantially following the introduction of EU ID cards.[16]

Also controversial are measures to control internal intra-regional migration which has become an instrument of regional policy with, for example, generous re-location packages being offered to companies and individuals willing to move to remote regions.

The need to restore cohesion in Europe by re-building social and cultural integration is faced head-on by the 2010s with serious efforts to seek solutions to the challenge of religious and, racial diversity, which appeared to be the prime sources of conflict. The largely media-driven absorption with individual identity was tackled through shared cultural events and activities designed to cultivate shared regional and European identities. Citizenship and language classes become a residency requirements and restrictions on religious schools is complemented by interventions to circumvent the segregation of minority groups with, for instance quotas set for the children of ethnic and religious minorities and the facilitation of inter-cultural interaction from an early age through educational exchanges etc. While assimilation is not forced, such 'soft' measures encourage more peaceable co-existence and sew the seeds for long-term integration of disparate communities.

While the detail of policy provision to seek socio-cultural integration is generally devolved down to lower levels of regional and local administrations, there are exceptions. The situation of particular minorities who have experienced discrimination is of concern and protective measures from the EU and Council of Europe are enacted. The emergent nationalism in some areas which feed these problems also continues to be a source of

[16] The impact of migration policies will be largely dependent on international developments.

concern and the policy of a 'Europe of Regions' is being actively promoted to try to contain it, with special status/provision for minority groups who have no territorial base and are geographically disparate, such as Jewish and Romany groups.

A genuinely European Social Policy is also at last becoming something of a reality, with the harmonisation of tax systems and minimum levels of demographically relevant forms of income maintenance involving age and sex redistribution. This serves the dual purpose of both reducing 'benefit tourism' as a motivation for intra-European and inter-European migration – which until this time was only serving to intensify population growth in certain, already crowded areas, and overcoming some of the problems relating to the PSR (potential support ratio). The economic differences in life chances underlying socio-economic divisions are also being challenged with a reduction in some of the grosser forms of income differentials, politically possible following the growing fear of crime and disorder, and consensus around a 'third way' for economic development; not dependent on unrestricted economic growth. The continued popularity of Europe as a preferred destination, gives sustenance to policies geared to socio-cultural integration.

The incorporation of Bulgaria and Romania in the Union is complete by 2015. Tourism has subsequently opened up and the economies become more vibrant. Areas of Bulgaria and Romania are also developing as commercial conduits, developing new attractive areas for in-migration, but vast areas remain, in line with the rest of Central and Eastern Europe, which remain subject to a degree of demographic depression. The accession of Turkey seems to some to be a pragmatic move in that it would boost the numbers of young people in the European population; however considerations of cultural and religious opposition override this and lead to repeated delays in accession negotiations, even the possibility of cancellation. Constructive trans-national relationships between Turkey and the new EU members are being forged though and the EU continues to rely on the co-operation of the country in its external dealings with the Middle East.

3.5.3.2 Economy, technology and evolution of urban Europe

Maintaining and even strengthening EU cohesion policy is the result of both the EU enlargements of 2004 and subsequent ones embracing Romania and Bulgaria and of a reaction to the territorial imbalances generated by accelerating globalisation in the early 2000s. Preserving the vitality of less favoured regions appears as a fundamental long-term objective, because the economic and social costs of devitalised regions are, in the long-term, extremely high. On the other hand, this collective attitude does not ignore the requirements of competitiveness. The new cohesion policies include numerous measures aimed at increasing the competitiveness of less favoured regions and avoiding their marginalisation with regard to globalisation trends. As a renewed and strengthened cohesion policy is also more expensive, EU budgets have to be correspondingly increased and various resources diverted towards the cohesion policy. The CAP, transport and RDT policies are consequently being adapted to give priority support to less favoured regions. Further liberalisation of public services is not envisaged, because it would be harmful for less developed areas where the profitability of such services does not really exist. It is considered that the closing down of such services would be damaging for the demographic and economic evolution of the regions concerned.

The macro-economic context in which the renewed cohesion policy is launched is however not exceptionally encouraging. Globalisation is still accelerating and external competition from large emerging economies (China, India, Brazil) encompasses more and more high-tech products and not only products requiring cheap labour force. It also reaches the agricultural (following the WTO decisions of the Doha round) and the service sectors. Energy prices (in particular oil and gas) are steadily increasing, reducing the profitability of energy-intensive productions in Europe as well as the competitiveness of the most transport-dependent regions (mainly the peripheral ones). The gap existing between Europe and other advanced economies (USA, Japan) in terms of growth rates or of technological development remains significant and the Lisbon Strategy, despite its renewed boosting in early 2005, is not efficient enough to reverse the trends.

In the renewed cohesion policy, emphasis is put on efficiency-oriented support to the less developed regions. This support concentrates on preparing them to attract external investments and enhance the opportunities for development of their own firms; on developing prioritised transport links between these regions and the core nodes of their countries, and also strengthening the networks of business and research cooperation with the stronger regions. This support also concentrates on assisting the localities and companies which had already demonstrated ability for restructuring, development and competitiveness. Unconditional assistance to territories, channelled only because they are adversely influenced by history and the rules of 'competition-driven' economic development,

is of less importance and concerns mainly support to the improvement of the environment and of some basic facilities, such as water supply and treatment of sewage water, electricity supply, waste treatment etc.

The enlargement process slowed down after 2004. After the accession of 10 countries in May 2004, only Bulgaria and Romania become new members of the EU. The decision has been taken not to continue the enlargement process. Turkey and the Western Balkan's states only have the Status of 'neighbouring countries'. Instead of further enlargement, priority in European policy is given to further deepening of European integration. Cohesion policy at the European level is strongly related to the idea of maintaining the European 'social model'. Considerable spending for cohesion purposes is taking place. Furthermore, the deepening of European integration raises a great number of new regulations at EU level, e. g. in terms of environment and consumer protection, which lead to growing costs both for public budgets and for businesses.

Less developed regions receive substantial support from Structural Policies to boost their technological development. In terms of absorption capabilities, resources accrue mainly to large urban centres in the cohesion countries, where scientific and technological infrastructure is concentrated. The more remote rural regions, although eligible, are not in a position to absorb many of the resources earmarked for technological development.

In terms of ICT infrastructure development, progress is reached in the dispersal of broadband infrastructure into less densely populated regions. A supply-side improvement of broadband access in disadvantaged regions fosters the demand for internet services delivered in this way e.g. by the establishment of e-learning opportunities for citizens and employees in less densely populated areas and by offering e-government solutions. Also, policy actions and initiatives aimed at strengthening development poles in disadvantaged regions, contribute to improving and increasing the mobility and skills of the regional workforce. As an essential effect of education and training activities, the IT-competencies of the workforce, of children and students as well as of older people are improving. Thus, the digital divide becomes smaller and regional disparities decrease in European countries as a consequence of European policies. However, not all disadvantaged regions are experiencing an economic upswing. The approach consisting of concentrating policy support in locations within disadvantaged regions where a certain minimum of innovative capabilities, social capital, and sectoral concentration already exists, leads to a growing differentiation between the disadvantaged regions. The strongest among them experience an upswing, whereas the rest continues to lag behind. This is leading to growing economic disparities between and within countries.

As far as green biotechnology is concerned, gene-modified production indeed evolves but within different regulation frameworks, at a European as well as a national level. Following a separation desired by consumers, the coexistence of two farming types develop: cautionary

measures in order to avoid the contamination of GMO-free crops are being taken, and specific policies to ensure a certification and labelling due to coexistence are established. A further spatial separation of production emerges and requires new logistic systems for agriculture and food industry.

Some member states of the EU (such as France, Austria, Greece, or Germany) claimed a 'hedge clause' to the EU-guideline 2001/18/EG which prohibits the application or selling of specific seeds. Cohesive development implies that consumer protection also becomes stronger at European level. EU policy gives support to small farmers and small businesses in the food industry to fulfil the robust requirements of consumer protection. The EU agricultural policy also undertakes a paradigm shift away from overall subsidisation of agricultural production towards a more selective support for certain niche production, e. g. for organic farming, maintaining biological diversity etc. At EU level, strong regulations are being set in force, which are intended to avoid the contamination of certified GMO-free crops. Among European (organic and conventional) farmers, a European protectionism develops against world trade with gene-modified food and impede imports from less developed countries. Also spatial planning authorities take care for a relatively rigid separation of land-use for GM- and for conventional farming. Thus, GM farming develops rather modestly. Disturbance of conventional farming remains limited while organic and conventional farming have positive development opportunities. As a consequence, GM-farming tends to relocate into countries where no hedge clauses are implemented (inside the EU) or where cautionary measures are less developed (outside the EU). A cohesion-oriented European policy is to some extent successful in terms of supporting the catching up of the new member countries and in lowering the unemployment in the EU-15. Increasing income levels create a growing market for high quality food, both in the new member states (at least in their agglomerations) and in Western Europe.

Regarding red biotechnology, European or national policies intervene with regulations in research and development for gene-based technologies (such as of gene-tests, stem cell research, cloning etc.). Migration movements of scientists can be observed. Pioneer phases of new products are being conducted in Eastern as well as in Western Europe. Stronger cohesion policies in Europe result also in a more compensative financial support of peripheral regions in order to allocate growth measures more equally. European and national policies follow a strategy of encouraging researchers and SMEs in less favoured regions in order to let them participate in innovation processes.

In the field of grey biotechnology, peripheral regions benefit significantly from the support of Structural Funds for environmental engineering (water treatment etc.). An improved and self-sufficient water supply and return system in peripheral regions, is also beneficial for the financial resources of the centres which are less utilised. Financial equalisation transfers from the centres to the periphery are decreasing.

In terms of the economic territorial impacts of the cohesive approach, differences with the baseline scenario are not extremely large because the baseline scenario is also essentially based on cohesion policies. The cohesive approach[17] is arguably less favourable to the global economic growth of Europe, in particular because it diverts resources from the more developed regions (in the Pentagon) to less developed ones:

- in relation to the EU25-average (which is somewhat lower than in the baseline scenario), the catching up process of the weakest regions of Central and Eastern Europe shows a territorial pattern practically identical to that of the baseline scenario. Stronger growth rates (in relation to the EU25-average) can however be identified in North-West, West and North-East Poland and in Slovenia. Cyprus also shows a stronger growth rate;

- in the Pentagon, growth rates (in relation to the EU25-average) also have a territorial pattern very similar to the baseline scenario. A number of regions are however less favoured (north-east of the Netherlands, north of Niedersachsen, south-west of Baden Württemberg);

- the catching up process of the EU15 peripheral regions shows a territorial pattern practically identical to that of the baseline scenario. Surprisingly, a number of peripheral regions perform relatively less efficiently than in the baseline scenario (Galicia in Spain, Central Macedonia in Greece, North-West Ireland, Abruzzi in Italy, Schleswig-Holstein in Germany), although a few others improve their relative performance (Southern Finland outside the Helsinki metropolitan region, west of Cornwall, Eastern Wales);

- the weakly growing belt (growth rates below the EU25-average) between the Pentagon and the eastern catching-up regions has virtually the same extent and shape as in the baseline scenario. Differences are discernable only in the south-western part of the Czech Republic which performs relatively better and Central Austria and the Friuli Venezia Giulia which performs relatively less efficiently.

[17] See Map MASST 3D relative to EU25 GDP per person. Difference 2015-2002. Cohesive scenario.

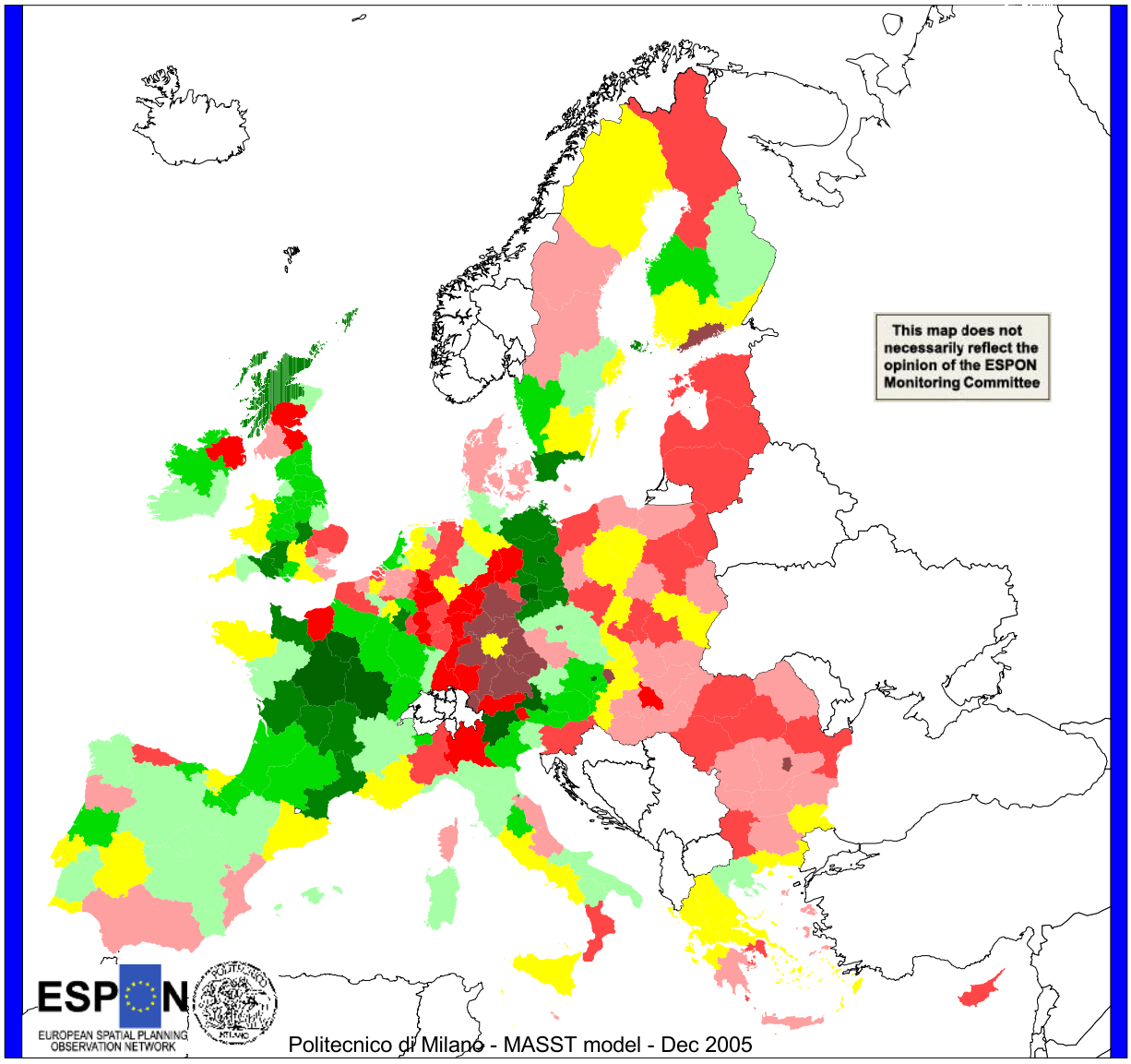


Figure 7 Relative to EU25 GDP per person – difference 2015-2002 – Cohesive scenario

Cross-border cooperation plays an important role both along the internal borders of the EU and along the external borders. EU cohesion policy, both in form of the mainstream funding (ERDF, ESF; EAGGF – guidance section) and in the form of border-specific support programmes (Interreg), contribute much to the enhancement of cross border cooperation. Compared with the handling of policy schemes practised at the beginning of the 21st century, a significant change in supporting cross-border cooperation is taking place. Regions which showed an already relatively high quality and intensity of both inter-firm and municipal cross-border cooperation at the beginning of the 21st century (e. g. the Saar-Lor-Lux-Region, the Upper Rhine Region), receive much less support from EU border-specific support schemes. The support is more focused on the weakest border regions, thus on those of the periphery. However, the results are ambiguous. Although since 2004 (enlargement) Interreg schemes are applicable on both sides of the border, the number of projects bearing a genuine cross-border character remains limited. A large share of projects are still isolated projects which have less to do with directly overcoming border specific barriers, than support for regional development either on the one side or on the other side of the border. This is primarily the case with many regions along the border between EU 15 and EU-10. The reasons for deficits regarding genuine cross-border projects do not only relate to the weak potential for cooperation (e.g. lack of businesses and low population density). The impact of different institutional arrangements on the two sides of the border (stronger decentralisation on the side of the EU-15 and – despite administrative reforms – still a central government influence on the side of the EU-10) is also responsible for this evolution. Therefore, the chances for developing border regions as spaces of intensive cooperation remain insufficiently used. However, some progress is reached in regions where a minimum of characteristics is present. In a number of cases, the potentialities of the border situation can be exploited with the support of Interreg. This is the case, for instance, within the country-triangle CZ-PL-D, where the Euroregion Neisse acts as an engine for developing cross-border cooperation based on a relatively diversified landscape of small and medium-sized businesses. Serious problems arise however along external EU borders, since regions bordering neighbouring countries which were denied EU membership, face barriers which hamper potential welfare development.

The impacts of the cohesive approach on European urban systems are rather diversified. Regarding the growth of metropolitan areas, the cohesive approach is less favourable to the Pentagon, because various EU resources, in particular from the R&D Framework programme and from other 'sectoral' policies (energy, transport) are diverted towards less developed regions. In the cohesion countries, however, metropolitan areas and other large agglomerations are strongly supported, both in terms of infrastructure and technological endowment. A characteristic of the cohesive approach is however that it also supports rather significantly the services of general interest in more backward and remote rural

regions. The impact of the vitality of small and medium-sized urban centres will therefore be far from negligible.

3.5.3.3 Evolution of rural Europe

Rural Europe is moderately diversified. The diversification process takes place in a context where EU policies like the Common Agricultural Policy and Regional Policy continue to play an important role. In a context of further globalisation, Europe continues to protect its agricultural markets to a large extent. Demographic changes, particularly population ageing, are gaining in importance.

Evolution of agricultural systems under changing CAP/RDP and Structural Funds conditions and other exogenous factors

After some serious discussions about the future of the CAP, the EU decides that some gradual reforms will be implemented. With respect to WTO negotiations, import tariffs and export subsidies are reduced. The CAP budget is broadly maintained while resources are shifted from Pillar 1 to Pillar 2. The *macro-economic impacts* are relatively modest. The enormous transfers from consumers and taxpayers to agriculture – more than €120 billion in 1999 – are reduced to approximately €90 billion. The reduction of import tariffs and export subsidies to 75% enable developing countries to generate approximately €5 billion extra welfare per year. Countries that used to enjoy preferential assess to protected Western markets continue to benefit.[18]

The reforms are stimulated by a growing awareness of the environment caused by some incidents like extreme droughts in Southern Europe. The enlargements of the EU in 2004 and 2008 put territorial cohesion high on the agenda because the EU includes more backward regions now. The budget for Pillar 1 is reduced from €37.5 billion in 2005 to €28 billion in 2030 (75%). Pillar 1 payments are shifted from market support to direct payments to farmers. The Pillar 2 budget, however, is substantially increased from €7.5 billion in 2005 to €23 billion in 2030 (300%). The SF's are concentrated on improving the socio-economic viability of marginalised rural areas in all member countries. Improving landscape and nature is also an important priority.

In addition to the growing awareness of the environment and the priority given to territorial cohesion after the enlargement of the EU, other exogenous factors become important for the evolution of agricultural production. *Consumers* become more and more aware of their power to steer production in the direction of organic farming and regional and other quality products through their spending behaviour. *Technological innovations* lead not only to higher agricultural production, but also to reduced pollution and reduced water-use for

[18] Massink & Meester, 2002.

irrigation. Rising *energy prices* stimulate the building of sustainable agro-production parks and lead to a growing demand for energy crops.

Intensification and scaling-up of agricultural production are moderated by the continued, albeit lowered, protection against the world market, regulation of the internal market and stronger regulation in the field of environment etc. *Large-scale agriculture* increases most in rural areas with low land-prices in Poland and the Baltic States; in North-West and Southern Europe large-scale arable and diary farming decreases. Many *intensive cattle farms and horticultural units* settle on agro-production parks, mainly in the Pentagon. Clustering reduces production costs and provides possibilities for recycling manure, waste etc. Regulations for animal welfare limit intensification. *Experience farming* breaks through in metropolitan areas and in rural areas with small-scale landscapes in Eastern and Southern Europe. The increased and intensified RDP programmes facilitate farmers' professionalism. The growing demand for cultural landscapes provides opportunities for agrarian *nature and landscape management*, particularly in small-scale landscapes. RDP programmes let *subsistence farming* in the peripheral regions of the CEECs almost completely disappear.

In numerous rural areas with significant agricultural activities, the economy diversifies. In the fertile areas of France, Germany, and Poland, agricultural production further modernises. In these areas, food production competes strongly with the production of energy crops. In Eastern and Southern Europe, rural areas, stimulated by RDP and the SF's, become economically more diversified. Both types of rural areas become more socio-economically viable. In Western as well as in Eastern Europe there are a decreasing number of rural areas experiencing marginalisation and abandonment. These are rural areas where the demographic situation (high level of population ageing), the production conditions (low level of soil fertility, increasing drought) and the attractiveness are very unfavourable. Despite all efforts the socio-economic viability of these areas lags behind.

Evolution of urban-rural relationships and partnerships

Urban and rural areas in urbanized regions become more interconnected only to a limited extent. Urban sprawl is limited both by increasing oil prices and by a moderate growth level in metropolitan areas. However in less developed rural areas benefiting from both Structural Funds, the diversification process of the rural economy strengthens urban-rural interactions

Rural areas attractive for tourism, particularly coastal and mountain areas and areas with small-scale landscapes in Central and Southern Europe, flourish. *Rural areas with a variety of activities* e.g. in Finland, Poland, and Spain develop further. Investments in infrastructure make these areas more attractive for SME's and wealthy retirees. This also causes an in-migration of people to these areas. *Rural areas in urbanized regions*, particularly those around the metropolitan areas, benefit from the modest growth of residential areas, cultural amenities etc. This causes a modest increase in socio-economic viability and population

density. Several *rural areas with low accessibility* are successful in commodifying and marketing local resources, particularly rural areas with a valuable, but formerly neglected natural or cultural heritage in the CEECs. Other rural areas are less successful because of a lack of institutional capacity. These areas experience a downward trend in viability and further out-migration.

Urban-rural partnerships moderately intensify. The promotion of public interests is concentrated on maintaining compact cities, limiting transport movements and conserving rural areas as open spaces. Since regional authorities are created or strengthened, cooperation between urban and rural partners takes place mainly at the regional level. In most cases, public partners take the initiative. Regional and local authorities consider each other as partners. Urban-rural partnerships are relatively open: public authorities and NGOs are actively involved; to a lesser extent this is also true for the business sector. Cooperation is relatively coherent because consensus-building plays an important role but its effectiveness is only limited because of autonomous trends in housing, transport etc. and of a lack of binding policy-instruments.

3.5.3.4 Transport

3.5.3.4.1 The transport context in Europe in a cohesive perspective

The general economic conditions in a cohesive perspective, with even more modest economic growth than in a baseline perspective, limit the growth of transport volume at European scale. Progressing European integration and accelerating globalisation are however factors which push transport flows to grow, but more modestly than in the other two scenarios. The move towards a more intangible and service-oriented economy is slower than in the other two scenarios, especially than in the competitive one. The changing nature of transport flows is correspondingly also slower. The territorial distribution of flows is significantly influenced by the EU enlargement of 2004 and of the following years (Romania, Bulgaria, Croatia), with east-west flows gaining in importance, but much less than in the competitive scenario.

As in the other two scenarios, the significant and sustained price increase of energy, especially of oil, is a major constraint for the transport sector. It has impacts on mobility and counteracts the cohesion objective, the economy of more peripheral and less developed regions being more transport-dependent than that of the pentagon regions. Technological innovations play also an important part in the cohesive scenario, in order to reduce energy consumption and to diversify energy supply sources. Although less innovations are generated than in the competitive scenario, because of more modest resources allocated to R&D, new car engines, especially hybrid cars using biofuels, are developed and widely used. The hydrogen technologies do not realise a real break through in the short and medium

term, because technologies likely to produce cheaply large quantities of hydrogen are not yet available.

Mobility is affected by higher transport costs. Weak economic growth and modest development of the purchase power incite European citizens to save financial resources and to reduce their transport expenditures, in particular on home-work relations. Car sharing is developing. Residential locations near public transport stations and within or at immediate proximity of cities are being preferred. More compact cities are developing with a better integration of functions. Dispersed settlement development is being restrained. The use of ICT as substitution to physical mobility is increasing in the field of e-services and home-working.

Technological development, in addition to new car engines, concentrates on the use of renewable energy sources. It concerns light technologies (solar, wind energy, production of biofuels etc.) and does not reach up to complex and heavy technologies such as those related to coal gasification or mass hydrogen production. Implications of technological development for transportation are more modest, although Intelligent Transport Systems are also significantly progressing.

A significant difference with the competitive scenario is that transport policies in the cohesive scenario are oriented towards cohesion and that market demand is not the primary criterion. Significant financial resources from the Regional and Cohesion Funds are allocated to the development of transport infrastructure in the cohesion countries and in the less developed regions. A main priority is the development of efficient transport infrastructure on major corridors in the new member countries as well as between the new member countries and the EU15. A difference with the baseline scenario is that, in addition to major corridors, support is also given to a number of strategic regional transport axes in the context of rural development plans, so as to connect as many medium-sized and small towns as possible to the trunk networks.

In the central regions of the pentagon, the more modest growth of traffic flows related to weaker economic development requires less expansion of major networks to eliminate bottlenecks. Although less resources from EU budgets (TENs) are available for central regions, national governments allocate their own resources with the aim to reach a more balanced modal shift. Public-private partnerships are also promoted, but less frequently than in the other two scenarios. A major objective is to provide sufficient transport capacity to the connections between the new member countries and the pentagon and to avoid that transit flows become an insuperable constraint.

3.5.3.4.2 Simulations from the KTEN model

The infrastructure scenarios are defined on the basis of both political aims and scientific criteria; policy aims determine maximum budget lines for road and rail, for 2015 and 2030, and the decision-making frame. No significant differences concerning ports and airports, and urban infrastructure, are considered in the scenarios.

In the cohesive scenario, projects are selected on the basis of reducing the infrastructure endowment gap between regions. Policy is based on more roads for regions with less road endowment, and a balanced investment on roads and rail in regions with higher levels of road transport endowment. This is the scenario that can have higher impacts on inducing economic growth in less developed regions.

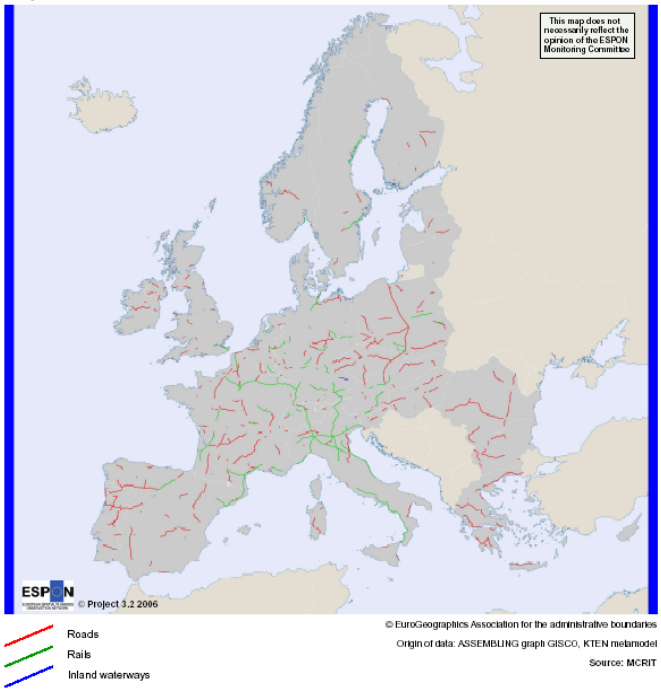
Infrastructures are built according to territorial criteria, based on assuring a minimum level of accessibility to cities and regions, without regarding the existing traffic or the economic development level. Since less developed regions use to have less resources available to build infrastructures, this policy requires transfers from most developed regions. Priorities are fixed based on reducing territorial gaps, starting by building those projects with higher expectations on traffic (those that may induce more mobility, relations and development opportunities).

Method to define the infrastructure scenarios:

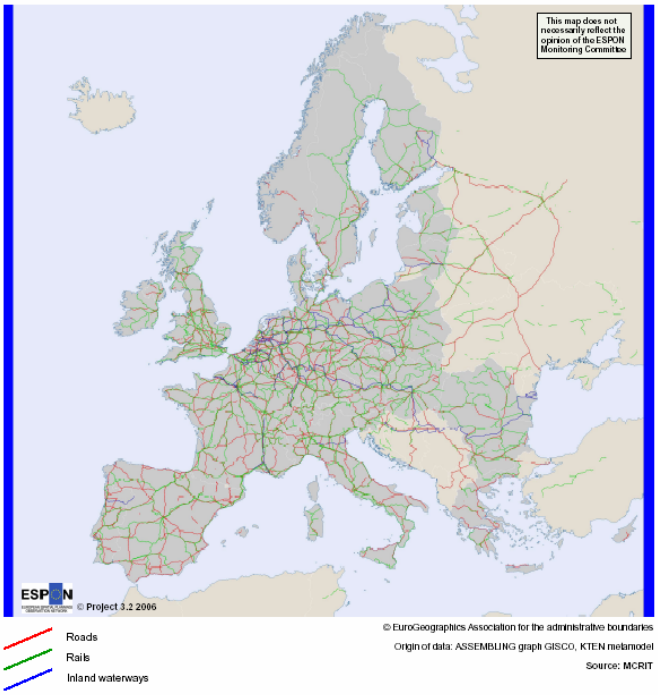
Evaluation of the current road and rail densities, and relative gaps.
Regional distribution of road and rail budgets based on gaps
From the regional list of projects, ranked according to CBA (Cost Benefit Analysis) proxy, select until the regional allocated budget is reached

Projects and networks

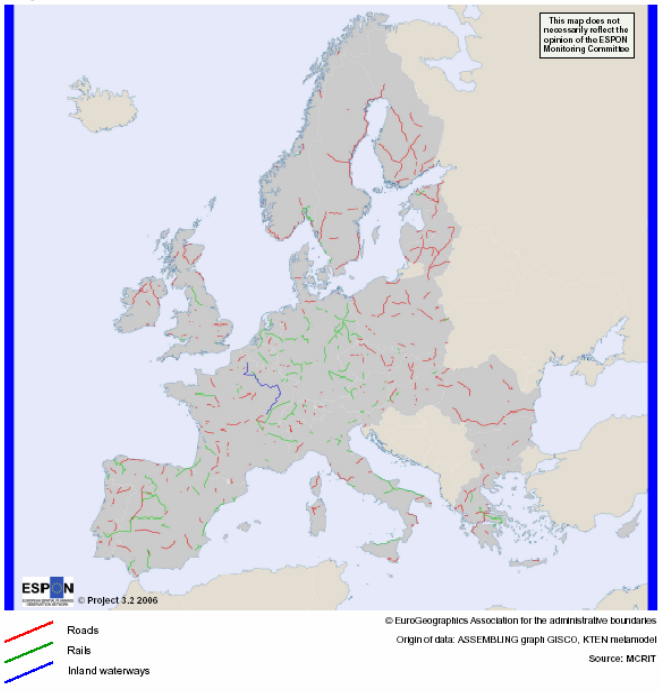
Projects 2015 cohesive scenario



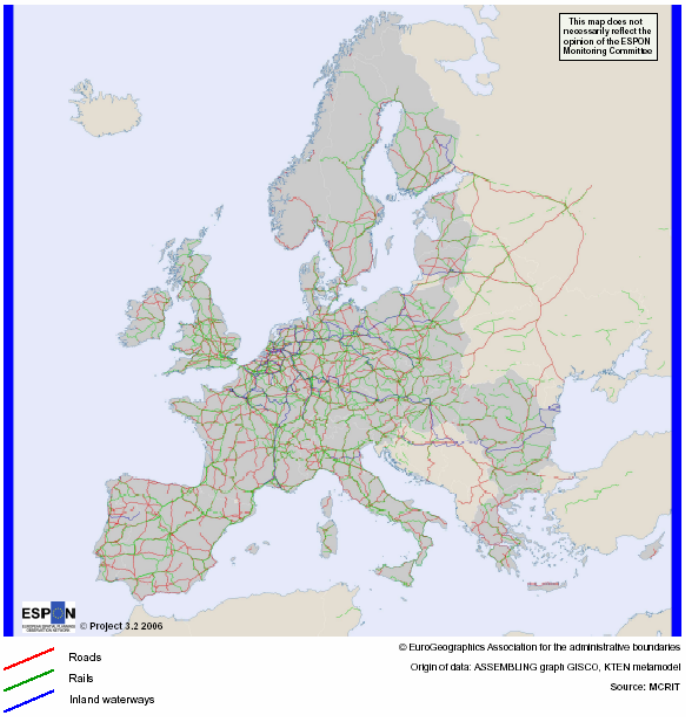
TEN network 2015 cohesive scenario



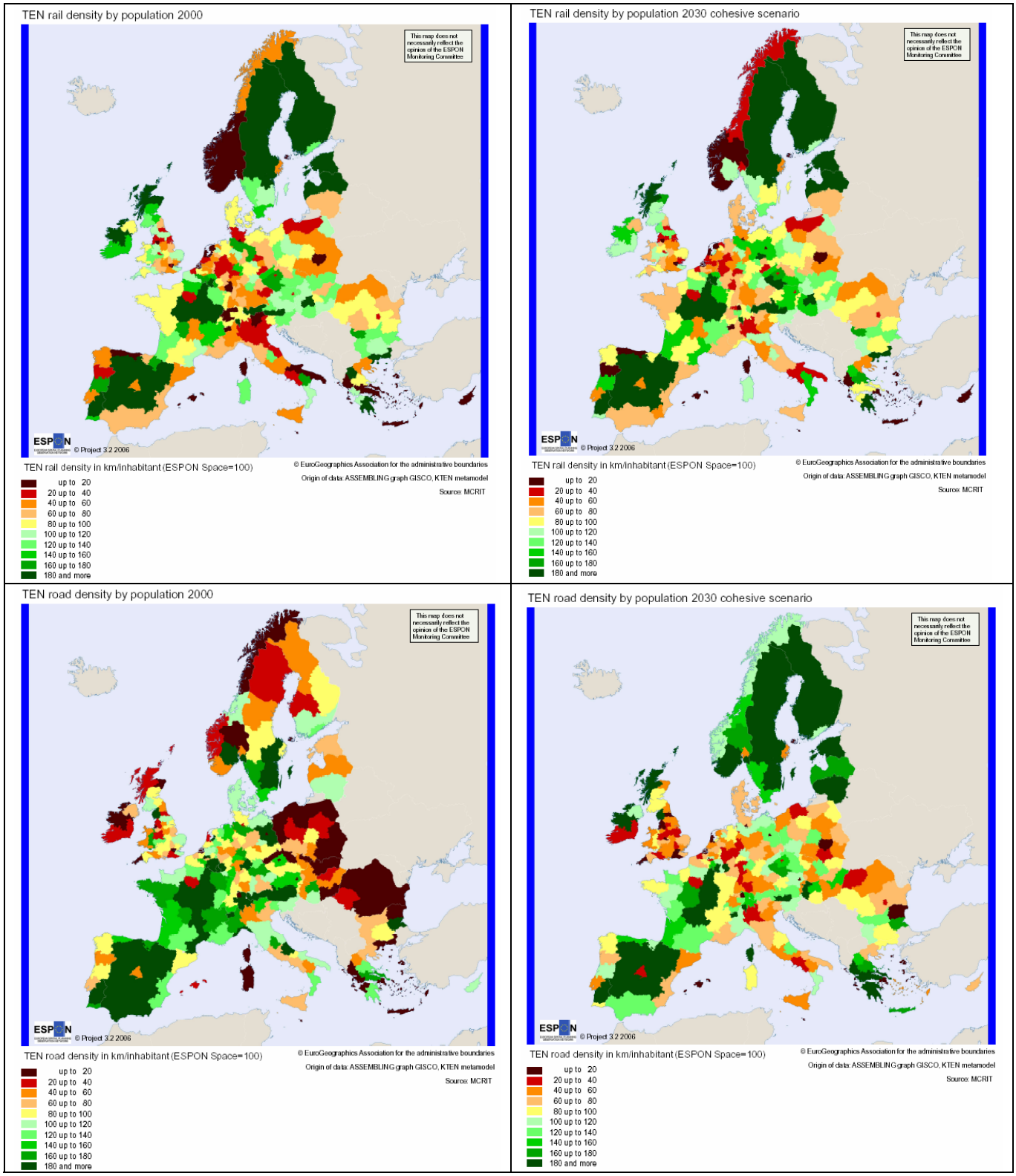
Projects 2030 cohesive scenario



TEN network 2030 cohesive scenario



Density of networks in relation to population



Traffic flows and accessibility

Maps on traffic flows in 2015 and 2030 and on regional accessibility are in preparation

3.5.3.5 Energy

3.5.3.5.1 Energy policies in the cohesive scenario

The external context of Europe in terms of energy dependency and evolution of oil and gas prices is identical to that of the baseline scenario. In the context of its external policy, the EU attempts to ensure a sufficient energy and gas supply through long-term contracts with oil and gas producing countries, however in a global environment where demand at the world scale is permanently increasing because of the high growth rates of emerging economies and where supply is progressively restrained by the 'plateauing' and exhaustion of resources. This means that energy prices in Europe are constantly and substantially increasing, especially after 2015.

After the 'third oil shock' of 2003-2005, most European countries adopt a number of measures to increase energy savings (in buildings and in transportation), to diversify energy supply sources, especially through the development of renewable energy sources, so as to limit the imports of oil and gas. Research in the energy sector is being boosted, mainly through EU energy and R&D policies.

Structural policies pay a great deal of attention to energy issues and allocate a significant amount of resources in eligible regions to measures of energy savings and of diversification of energy supply sources. The TEN-E are being further developed, but mainly to the benefit of less developed countries and regions (Central and Eastern Europe, European peripheries). The Rural Development Policy allocates also substantial resources to the production of energy in rural areas.

3.5.3.5.2 Impacts of increasing energy prices on the evolution of energy consumption and changes in attitudes towards energy consumption

Despite modest rates of economic growth, investments are made by enterprises to reduce the energy intensity of the economy. The energy intensity also decreases because of the progressive structural move of the European economy towards more intangible activities

and the relocation outside of Europe of highly energy consuming activities. Total energy consumption further increases, but at a very moderate rate.

The energy issue is also becoming a sensitive matter for individuals and households. Houses are being better insulated and the use of renewable energy sources is increasing thanks to numerous subsidy schemes at the regional and national levels. Car-sharing and the increased use of public transport also contribute to the reduction of oil and gas consumption.

Energy systems are being more modernised in less developed regions benefiting from structural support, than in richer regions with metropolitan areas. In this respect, the catching up process of the new member countries in the energy supply and energy transport sectors is significant. Obsolete energy systems are rapidly being replaced by more modern ones, including renewable energy sources.

3.5.3.5.3 Impacts of the diversification of energy supply systems

The impacts of the diversification process of energy supply systems are similar to those of the baseline scenario. The main beneficiaries of this diversification process are the renewable energy sources (solar, wind, biomass and biofuels, geothermal energy etc.). The diversification process is progressing rather significantly throughout Europe, especially in regions benefiting from structural and rural development policies. Decentralised systems of energy production/distribution are developing, encompassing rural areas together with their small and medium-sized towns. The external energy dependency of such regions is being reduced and energy production is at the same time a new source of income for farmers and rural areas in general, a factor which stabilises rural economies in a period of further liberalisation of agriculture with related stronger external competition.

Wind energy parks are being built in numerous coastal and hilly regions while the use of solar energy is progressing throughout Europe, especially in southern regions, contributing to an alleviation of the problems of energy supply of southern tourist areas caused by increasing drought and its negative impact on the hydro-power capacity.

As technological research is not sufficiently supported by EU policies, new break throughs in energy technologies are not taking place. The hydrogen technology and its applications progress only slowly, as the mass production of hydrogen remains very expensive. In order to match the energy needs of urban regions, a significant revival of nuclear energy production can be observed, generating tensions in the European society between those in favour and those against the proliferation of nuclear energy production. Hybrid cars,

equipped with a conventional and an electric engine become rather popular after 2010, a trend making possible substantial energy savings.

3.5.3.5.4 Impacts of increasing energy prices on the economic development and the sectoral evolution of the economy

Increasing energy prices add their impacts to the factors causing low rates of economic growth in Europe. In the cohesive scenario, the negative impact of higher energy prices is felt more strongly than in the baseline and especially the competitive scenario, because it can be compensated for less by other factors of growth. The move towards a more intangible economy is relatively slow. More investments are made in intermediate technology sectors, especially in less developed regions. In this respect, the European economy remains very sensitive to the globalisation process and is not in a strong position to gain substantial benefits from accelerating globalisation.

Europe is however more and more competitive in sectors related to renewable energy technologies. A number of regions, not necessarily in the Pentagon, take advantage of this evolution and develop significant amounts of exports towards other European regions and also towards non-European countries.

The impacts of higher energy prices on peripheral regions are less significant than in the case of the baseline scenario, because of a different transport policy favouring peripheral regions, not only through new motorway projects, but also through the strengthening of railway systems and through increased support to maritime routes. Transport costs between peripheral and central regions are however not decreasing, despite modernised infrastructure, because of significantly increasing energy prices. The competitiveness of air connections is particularly affected, because the cost of air transport depends more upon energy costs than on infrastructure.

3.5.3.5.5 Impacts of the new energy paradigm on settlement systems

In the cohesive scenario, a clear distinction has to be made between large and rich urban regions and less developed rural regions with a settlement system composed of small and medium-sized towns.

The large urban regions with significant metropolitan areas are rather handicapped by the new energy paradigm. They are more dependent upon traditional energy supply systems which are less and less competitive, because of a stronger dependence on oil and gas. As no significant technological breakthrough takes place likely to diversify the energy supply of urban and metropolitan regions, solutions are being sought in energy savings and in the

revival of traditional energy sources such as coal, which are detrimental for the environment. A consequence of energy savings is that compact cities with contained suburbanisation and stronger use of public transportation are being preferred to dispersed suburban systems. Settlements become more energy efficient and urban policies favour a better integration of urban functions generating less mobility. Home working is strongly developing as well as other types of applications such as the access to public and private services, e-shopping, educational and cultural programmes etc. The generalisation of hybrid cars after 2010 contributes significantly to reducing air pollution in cities.

3.5.3.5.6 Impacts of the new energy paradigm on rural areas

In the context of the cohesive scenario, the new energy paradigm favours rural areas more than urban regions. The strong promotion of renewable energy sources creates wealth in rural areas and counteracts the decline of a number of traditional weakly competitive agricultural activities. Solar and wind energy as well as the production of energy crops enable the creation of decentralised energy supply systems which also benefit small and medium-sized towns, making them less dependent upon external energy supplies. In the context of a liberalised energy policy, new regional energy production and supply companies emerge, competing against each other to the benefit of energy consumers.

Small and medium-sized towns are preferred to large cities because of lower mobility costs and the easier use of renewable energy sources (solar energy, biomass). In the countryside, numerous farms are becoming energy self-sufficient.

EU structural and rural development policies play a major part in making the new energy paradigm favourable for less developed rural regions, especially in the new member countries and in other peripheral regions. Significant subsidies are available for investments in alternative energy systems, using renewable energy sources, in energy saving technologies and equipment, for the production and transformation of energy crops etc.

3.5.3.5.7 Environmental impacts of the new energy supply strategies

The progressive change of energy paradigm brings with it both positive and negative aspects in relation to the quality of the environment. In urban regions and metropolitan areas, energy savings and the introduction of environmentally-friendly technologies (hybrid cars, fuel cell engines) contribute to improving the quality of the environment (air quality, noise level). On the other hand, revivals of traditional energy sources (coal, nuclear energy) endanger both environmental quality and security.

In rural regions, the higher level of energy self-sufficiency does not automatically mean that environmental quality is overall being improved. Wider use of solar energy and of biomass and biofuels certainly contributes to the improvement of environmental quality. But in the case of wind energy, both positive and negative impacts to the environment are being generated. Despite the adoption of new regulations, damages to natural and cultural landscapes cannot be excluded.

3.5.3.5.8 Impacts of climate change on the production of energy

In the cohesive scenario, the impacts of climate change on rural areas, especially in southern Europe, are by far less negative than in the other two scenarios, because of the implementation of prevention measures, largely supported by structural and rural development policies. The protection of forests and the development of energy crops cultivation contribute to the production of biomass while maintaining agricultural and forestry activities and preserving traditional landscapes.

3.5.3.6 Environment

3.5.3.6.1 Introduction

Unlike the competition scenario where the self-interest of individuals and firms is assumed to result in aggregate benefits for all, the cohesion scenario assumes that the maximum welfare for all is achieved when individuals and organisations act in the greater good of the larger community. In this, the environment is viewed as one of the main pillars of European solidarity. There is an increasing public concern about the environment in Europe, caused in part by some major natural hazards occurring in the 2005-2010 period. Therefore, not only must all Europeans have a basic right to jobs, education and decent housing — regardless of the region in which they may live — they also must have the right to clean air and water, protection from floods and a rich and vibrant natural landscape. In addition, in this scenario the public also demands that these qualities are preserved for future generations, implying that trends such as climate change are dealt with forcefully. In order to implement this, *environmental conditions will have to meet a certain minimum criterion in the whole European territory*. Pollution targets must be met everywhere in the EU, for example, and all areas of natural importance must maintain a certain minimum level of biodiversity. If member states fail to meet these standards, the sanctions they face will be severe. As a result, member states will do everything in their power to comply, rather than attempt to appeal or circumvent the legislation.

3.5.3.6.2 Water resources and flooding

In the cohesion scenario, economic growth figures are slightly lower than the baseline scenario, but the general welfare of Europeans and power generation still increase. This has consequences for the level and spatial distribution of water stress in Europe. Preventative measures in Southern Europe, such as heavy investments in efficient irrigation techniques and reasonable water pricing, transform the irrigated agriculture sector into a high-tech enterprise. Together with investments in desalination, and optimizing local water use, there is no need for additional transfers from other river basins. EU funds have an important role in facilitating these developments. By 2030, water stress has decreased by 20 percent, mainly due to a dramatic fall in water abstraction for power generation. Abstraction for agriculture has only risen slightly. Household consumption increases by 50% in the EU10. Southern Europe still faces water stress, but not nearly so dramatically as in the baseline scenario. This has been achieved by a combination of strict implementation of the Water Directive and the targeted use of funds to build and maintain a sustainable water management system.

The policy decisions taken in the cohesion scenario also have tangible results on the changing quality of water in Europe. As in the baseline scenario, growing volumes of wastewater as a result of continuing economic growth are a cause of concern. Another issue is agricultural intensification in the most productive areas (Paris Basin, Poland), which tend to increase nitrate diffusion levels. In fertile areas in the N10, use of fertilizers rapidly catches up with western levels. To counteract these two trends, EU wastewater policies are implemented swiftly, and standards are tightened and rigorously enforced. Countries are urged to complete sewage systems in small towns as well as big cities, and introduce tertiary (chemical) treatment of sewage water where possible. In the N10, implementation is to a great extent paid by structural funds. In rural areas, policies concentrate on halting nitrate diffusion; this requires more effective use to be made of fertilizers, and the blocking of agricultural expansion in areas with high nitrate levels. Farmers are urged to find new ways of fertilizing and to recycle the surplus of manure from their cattle farms. As a result of these efforts, pollution levels in European rivers decrease substantially, particularly in traditionally polluted areas like industrial zones and urban fields, but less so in areas of intensive agriculture. As a result, eutrophication remains a problem in most of Central and Western Europe, although not as much as in the baseline scenario.

With regard to the risk of flooding, the policies implemented in this scenario generally mitigate the effects of excessive water rather than the root causes (climate change). Measures are implemented from a public outcry following a number of river floods. It is increasingly acknowledged that these are not isolated incidents, but symptomatic of a structural change in climate. These changing rainfall patterns cause more floods in Central Europe, and produce short storms of extreme intensity in Southern Europe, which also

produce flooding. In this scenario, these conditions are attenuated by widespread spatial adaptation measures. The EU Water Directive fosters international cooperation at the river basin level, backed as it is by powerful legal sanctions in the event of non-compliance. Vigilance on the part of environmental NGOs operating at the EU and member state levels make it more difficult to escape full implementation of the directive. As a result, riverbeds are reshaped, emergency water retention areas designated, and restrictions imposed on building in areas that would cause unacceptable levels of runoff.

In 2030, although river discharge has increased in Northern and Central Europe, the actual damage of flooding is little more than in 2005, and much less than the baseline scenario. Most river landscapes have been transformed into wide semi-natural river plains. As a final note, the problem of rising sea levels is likely to increase hazard levels of sea floods only in the very long term (towards 2100) thanks to investments in early warning systems and efficient evacuation plans. In accordance with the philosophy behind the cohesion scenario, all European countries enjoy the same standard of flood risk protection.

3.5.3.6.3 Air pollution and greenhouse gas emission

In the cohesion scenario the point of departure is that all European citizens have a right to breathe clean air, regardless of their social position or locale. As the problem of hazardous air pollution for humans is linked to that of greenhouse gas emissions, many of the measures taken seek to tackle both issues. This is needed because there are several autonomous trends that threaten air quality. In the cohesion scenario, for example, road traffic is expected to rise sharply, particularly in the N10 as car ownership figures grow and as more peripheral areas become economically developed, producing more decentralized freight transport. In the Pentagon, however, car use will rise less than in the baseline scenario, reflecting the spatial diffusion of economic development at the macro level. In addition, fewer emissions are expected from industry as a result of more modest overall economic growth.

To ensure that clean air does not become a luxury in Europe, measures are drafted that go beyond the original air quality directives. In addition to the current targets for PM10 particulates, goals regarding PM2.5 particulates are introduced. In addition, EU policies actively address the necessity for spatial measures to deal with local air pollution problems, restricting new housing above or near motorways. Kyoto implementation is also taken very seriously by the EU, which translates itself into more rigorous source-based controls for industry and transport and the promotion (subsidization) of environmentally friendly practices. These measures are highly effective for two reasons: they force individuals and organisations to adapt their practices, and they have an overall dampening effect on GDP growth. Specifically, legislation encourages the development of new clean technologies and accelerates the implementation of existing ones, such as carbon black filters. Local

measures to reduce air pollution are most widespread in densely populated areas in the Pentagon, as peripheral regions are less polluted to begin with.

The year 2030 sees the disappearance of some air pollution problems (sulphur oxides) and a reduction of others (particulates, ozone, nitrate). Most of the EU territory complies with the strict air quality standards. Only a few hot spots of high traffic volumes retain high concentrations of small particulates. Less people, however, live in these areas than in the baseline scenario, due to the introduction of urban planning controls. As a result, the general health of Europeans has improved. For ecosystems, progress is no less profound: the vulnerability to acidification has disappeared completely and eutrophication caused by nitrogen oxide deposits is dramatically reduced.

3.5.3.6.4 Natural areas and conservation policies

In the cohesion scenario, solidarity between the citizens of Europe is extended to all living creatures inhabiting the European territory. Natural areas are seen as an unassailable component of European heritage, and the preservation of biodiversity a solemn duty. At this time, several major environmental calamities, like large forest fires in the south, and massive fish deaths as a result of eutrophication in Central Europe, succeed in solidifying public opinion regarding the urgent state of the natural environment. Public intervention is seen as unavoidable and desirable in this regard, as several market trends seriously endanger the status of natural areas in Europe following the 2004 enlargement. For example, the ongoing expansion of the mass tourist industry places areas of particular natural beauty under pressure, as do the increased interest in second homes in rural areas. At the same time, urbanization in peripheral regions, fuelled in part by structural fund support, increasingly fragments the habitats of flightless species. This is exacerbated by the intensification of agriculture in profitable areas and by the effects of climate change, which has forced the migration of species to cooler or wetter regions.

To remedy this situation, EU Policy on nature protection is expanded. Natura2000 zones are expanded and redrawn to ensure a fully connected network of habitats. Budgets are raised to make real protection and management of the sites feasible. In addition, EU agriculture policy introduces strict environmental measures in order to reduce the extent to which intensification damages biodiversity. Moreover, special zones are designated where low input farming has to be maintained, supported by structural funds. A new EU policy on coastal areas is introduced. New developments have to comply with very strict norms, comparable to Natura2000 sites.

The effects of these measures are clearly visible in comparison to the baseline scenario. By 2015, biodiversity decline has been checked, due to a combination of an efficiently protected network, and the maintenance of existing HNV farmland. Recreational areas

around cities are clearly distinguished from protected natural areas, and second housing is concentrated in these recreational areas. Finally, coastal tourism tends to stabilize, because most possibilities for development are already exploited.

3.5.3.6.5 Impacts of climate change (focus on adaptation)

As stated, the palpable effects of climate change — violent storms and floods, extinction of endangered species, heat waves and desertification — are decisive factors in swaying public opinion towards environmental protection. In addition to a renewed commitment to the Kyoto protocol, stricter EU legislation is enacted. Specific measures concentrate on: a) rural areas in Southern Europe (landscape management and alternative sources of income like energy production in a context of disappearing agriculture), b) flood protection by increasing waste retention capacity, c) extension of the Natura2000 network to assist the migration of species, d) hazard funds to pay for losses insurance companies cannot cover, e) disaster preparedness programs, f) alternative energy, less affected by climate change hazards. This framework policy is integrated into all relevant sectoral policies. Since climate change is a very long-term process, no changes can be observed with respect to the baseline scenario. On the other hand, these environmental measures have additional effects on the various issues described above, such as air and water quality and the sustenance of natural habitats.

Territorial image of Europe by 2015

In preparation

Territorial image of Europe by 2030

In preparation

Conclusions: territorial issues arising from the cohesive scenario

In preparation

3.6 Integrated competitive scenario

3.6.1 Objectives and principles of the integrated competitive scenario

The scenario is based on the assumption of a significant reshaping of EU policies originating in the poor results of the implementation of the Lisbon Strategy during the period 2000-2005. The low level of competitiveness of Europe compared with that of the USA and large emerging economies has called for an in-depth revision of public interventions, in particular at the EU level. The EU budget is being reduced and EU expenditures are being targeted towards R&D, education, ICT and strategic external accessibility, including in structural policies. The CAP is subject to rapid and radical liberalisation, with a significant reduction of support, of external tariffs and of export subsidies. The budget of structural policies is also being reduced, with a proportion of former EU interventions being re-nationalised and EU support being concentrated on the most competitive areas of less developed regions. As a counterpart, public services are further liberalised and privatised, labour markets are regulated in a more flexible way and the third pillar of EU policies (foreign policy, justice and security) is being strengthened. Widening of the market through further EU enlargements is part of the strategy of increased competitiveness. After Romania and Bulgaria joining the EU in 2008, the Western Balkans will join in 2015 and Turkey and Ukraine in 2020. The neighbourhood policy is being strengthened and the Maghreb countries are integrated into the European Economic Area.

3.6.2 Hypotheses of the integrated competitive scenario

Demography	- Increase in selective (economic sectors & destination) external in-migration - Abolition of constraints to internal migration - An increase in retirement ages - An encouragement of fertility rate through fiscal incentives
Economy	- Sustained increase of activity rates - Stronger reduction of total public expenditures than in the baseline scenario - Further privatisation and liberalisation of public services - Priority in public expenditures to R&D, education, ICT and strategic external accessibility (ICT and transport) - More and easily accessible venture capital - Flexibilisation of labour markets

Energy	- A steady increase of energy prices - European consumption increasing - Realisation of TEN – E: investment in infrastructure according to market demand - Priority given to alternative (non based on oil and gas), large-scale energy production for metropolitan areas
Transport	- Continued growth of all traffic, in particular in central regions - Realisation of TEN-T: investment in infrastructure according to market demand - Priority given to links between metropolitan areas - - Application of the Kyoto Agreement
Rural development	- Rapid and radical liberalisation of the CAP (reduction of tariffs, of budget and of export subsidies) - Reduction of support to rural development policy - Rapid industrialisation of agricultural production - Strong dualisation of rural areas, resulting from market forces
Socio-cultural sector	- Reactive management of social problems in large cities - Increase of surveillance and security systems
Governance	- Abolition of barriers to cross-border cooperation - Less public intervention - Reinforcement of the Open Method of Coordination - Increased role of the private sector in decision making - Strengthening of the third pillar (foreign policy, justice, security) of EU policies
Climate change	- Moderate overall climate change until 2030 (+1°) - Increase of extreme local events - Constant to increasing emission levels - Mitigation measures based on flexible schemes & stimulation of alternative technologies. - Adaptation measures only where cost efficient
Enlargement	- Continuing enlargement to widen the market: - Romania, Bulgaria 2008 - Western Balkan 2015 - Turkey 2020, possibly Ukraine - Strengthening of the neighbourhood policy (Maghreb, Russia etc.)

3.6.3 Scenario process

3.6.3.1 Demographic changes and related territorial impacts

Between 2005 and 2015 the ageing of the European population continues, but starts to stabilise from the 2020s, as a rigorous recruitment policy encouraging young skilled labour

from outside the continent and strong fiscal incentives to increase the total fertility rate begins to take effect.

The recovery is far from total though, and countries and regions which were suffering de-population at the turn of the century continue largely along the same trajectory. However new centres of growth, in population and in economic terms, are starting to emerge in Central and Eastern Europe and one of two other key areas on the Northern and Southern fringes of the EU territory. Part of Finland and Estonia, for example have become dynamic centres for new technologies, while coastal regions in the Western Balkans have started to thrive, initially as destinations for recreational and cultural tourism. The targeting of a somewhat diminished EU budget on the most competitive parts of less developed regions has assisted in this development of these 'new potential MEGAs'. It has also been encouraged by the abolition of constraints to internal migration within the EU.

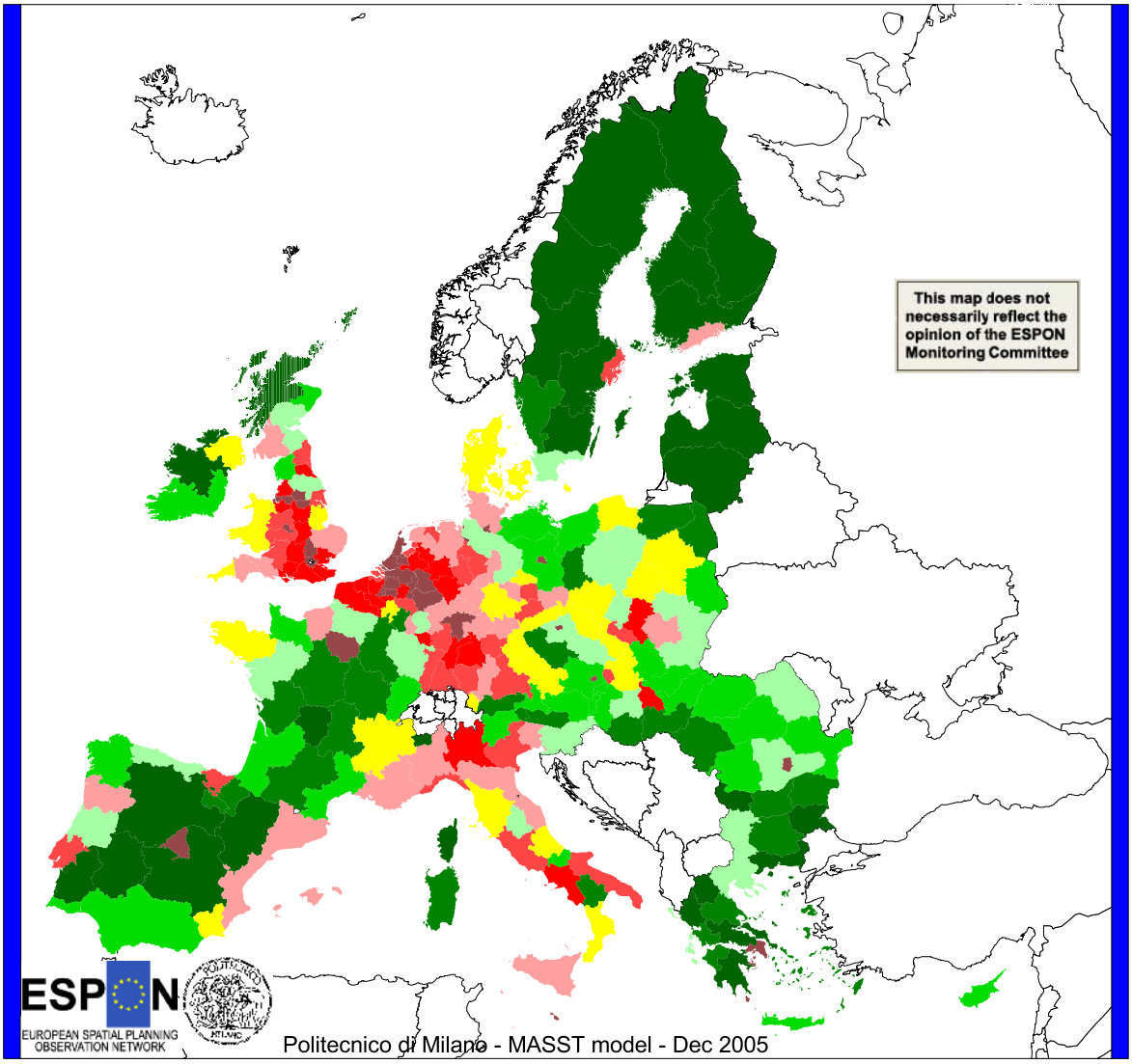


Figure 8 Population density 2015 – Competitive scenario

Maintaining a dynamic labour market is uppermost in the policy considerations of both national governments and the EU, although many key decision making powers are devolved to the private sector and large, including multi-national, business interests. Generous pension schemes are abandoned as life expectancy in many occupational groups continues to rise. This, together with the raising of retirement in most states to between 66 and 74

has helps to retain the contribution of older workers to the labour force. The incremental nature of these changes contains the resistance to them that was threatened by unions in previous years. Retention is not uniformly successful however and strategies for circumventing the system are developed, indeed many that can afford to continue to retire well before the statutory or company age.

To plug the gap caused by the expanding support ratio, a vigorous 'labour replacement' immigration policy is being co-ordinated across the EU, targeting young and/or highly skilled labour from across the world. The policy is strictly regulated and nationality is not an inevitable side effect of coming to work in Europe. The perception of 'cherry picking' workers to compensate for labour shortages in specific sectors leads to friction with some 'donor' countries who complain of losing their specialist labour. In some cases though, the income earned from Europe is being re-cycled into these countries effectively, arguably due to the clamp down on family re-unification as a legitimate reason for immigration. This has been instigated from the economic perspective of maintaining a limit on dependents; old, young or female in the host population.

There are also official attempts to clamp down on the volume of illegal immigration, although the service and public sectors continue to be sustained by the operation of this informal economy. The social impacts of this are divisive with unregistered migrants accepting negligible wages, and overcrowding and a low level of socio-cultural integration are the almost inevitable consequence. Social friction as it arises is met with strong restraint and there are perceptible increases in surveillance and security, which have become a major business in their own right.

In a spatial sense, the combined impact of continued illegal immigration, short-term skilled labour intake and a concentration of resources on MEGAs and potential MEGAs lead to an intensification of the demographic distribution of the population that was dominant at the end of the last century. In other words the demographic evolution of different types of areas is diverging more markedly; on the macro level monocentric in character, with areas classified as vibrant in population terms becoming more so and many de-populating areas continuing to be net exporters of people – especially young people. This trend is further supported by the policy of free movement of labour which has finally come to fruition and in effect removed all constraints to internal migration. The impact on rural areas of this trend in population distribution is also variable: accessible and attractive areas show some growth, others have declined rapidly. The latter are by the 2020s also falling into two main types; those that have effectively become derelict and those that have returned to their natural form. In these cases waste land is resuming a degree of wild life and landscaping is, where commercially viable and supported by environmental projects, being transformed into natural parks.

The rather 'pro tem' nature of the immigration strategy is of course reducing the possibility of continuing to rely on immigrant communities to boost birth-rates. Instead, aiming to bolster European fertility above replacement level, fiscal benefits are being increased substantially, but only for third and subsequent children. Some states are experimenting with different versions of this approach, by linking levels of support to years of service and, or by removing all payments for the first or second child. These overt and costly financial incentives lead to much controversy and some resentment from workers without dependent children whose own occupational welfare dividends are being eroded in relative terms.

Indeed most social security schemes are being cut back to 'American safety net' proportions and this, together with the de-regulation and privatisation of public services is increasing societal inequalities and reinforces the trend towards the 'ghettoisation' of poorer areas in almost all large conglomerations. The reduction in demand for manual unskilled and semi-skilled labour reinforces this with unemployment among such groups entrenching their marginalisation. Poverty persists too in isolated rural areas, but affecting as it does older people it does not receive the attention that urban poverty does. The visibility of the pockets of poverty, so close to affluent business centres produces a plethora of gated communities, surveillance technology and a strengthening of the criminal justice system to contain the potential nuisance represented by young pilferers, vagrants and other perceived threats to the public. In reaction, human rights groups and the legal profession are extending their activities and business interests, but community fears mean that populist measures to strengthen the '3rd pillar' prevail.

On a positive note the widening of the market through further EU enlargements is enhancing the global competitiveness of the EU and the opportunities available to many people marooned in what has been economically failing areas. By 2010 Romania and Bulgaria become full members, by 2015 the other 5 states which were once the former Yugoslavia join Slovenia and by 2020 Turkey and Ukraine. Negotiations are also beginning for Belarus and other former CIS nation states. Furthermore the neighbourhood policy is being strengthened and the Maghreb countries are well integrated into the European Economic Area. Significantly this evolution reduces the east-west migratory drive and helps to re-balance the demographic composition of the continent.

While on the global stage demographic and social policies appear to maintain the total population and the competitive position of Europe, there are costs with regard to the objectives of socio-cultural integration. While there is integration in the 'market place' there is increasing 'apartheid in residential arrangements', as people work alongside each other, but return to their ethnically and religiously segregated neighbourhoods at night, protected by the ever strengthening arm of the law.

Spatially, a sprawling monocentric development continues to be the norm, with the exception of some countries with a specific policy of de-centralisation, such as The

Netherlands, or large countries with well established 2nd and 3rd cities with strong external links, such as Poland. The sustainability of this general trend continues to be a source of concern for some as levels of commuting have continued apace, but new developments in ICT are containing this to a certain extent feeding the pre-existent trend of home-working and other remote forms of collaboration. As regards total population development, it is Southern and Eastern parts of the European territory which are expanding most noticeably between 2015 and 2030 with economic interaction between North African states and the Mediterranean and Turkey and Bulgaria being primarily responsible. This has at least the advantage of augmenting the population of two of the three quarters of the continent whose demographic decline has been the cause of most concern to European economists.

3.6.3.2 Economy, technology and evolution of urban Europe

Enabling Europe to draw maximum benefits from the globalisation process has become the leitmotiv of European policies. The drawbacks of the European economy in the early 2000s and the inability, up to 2005, to fulfil efficiently the objectives of the Lisbon Strategy have led governments to significantly change their approach to economic development. A majority, if not a consensus, is progressively being reached in the European Council to concentrate efforts as well as European and national resources on the objective of increasing global competitiveness. Total public expenditures are being reduced with the aim of bringing down both the level of public debts and of taxes. Public services are further liberalised and privatised. Higher flexibility is introduced into the regulations governing the labour markets of the various countries. Measures are taken to increase the volume of available venture capital as well as its accessibility, in particular for small and medium-sized enterprises.

European policies are significantly being reshaped. Adaptations are made to the CAP and to Structural Policies during the period up to 2013 and fundamental reforms are carried out afterwards. Resources are then diverted from the CAP and Structural Funds (which are partly re-nationalised) towards R&D, technological development, ICT, education and training, improvement of the external accessibility of Europe and of the transport links with neighbouring countries.

The enlargement process in Europe has been continuing since 2005. First, Bulgaria, Romania, and Croatia become EU members. Furthermore, EFTA/EEA-states enter the EU. Later, Turkey becomes a full member of the EU following the accession of the Western Balkan's countries. Widening is given priority compared with deepening. Europe's industry benefits from this enlarged single market which significantly improves Europe's global competitiveness. EU policies are primarily focused on setting an efficient framework which enhances the free movement of production factors (persons/labour force, capital, services).

Technological development is the cornerstone of the new policies, the objective being to reduce the gap between Europe and other advanced economies (in particular the USA and Japan) and to maintain sufficient distance in technological development from emerging economies such as China, India, Brazil and smaller ones. Europe is ready to give up large segments of its economic structure with inadequate productivity, provided growth can be achieved in high-tech segments of manufacturing industries and services with strong knowledge and capital intensity.

In the field of green biotechnologies, measures are not so strict as to suppress the economic profitability of the new genetically modified crops. At European level, consumer

protection is being reduced and decentralized responsibilities are transferred to national authorities. Already by 2005, there were signs of rather liberal developments within the EU Commission, in particular when approving the import for food and feed use of biotech maize (Bt11 and NK603), signalling an end of appeals. Also 17 maize varieties with insect resistance conferred by MON 810 were approved, making it the first biotech crop to be approved for planting in all 25 EU countries. The use of MON 810 maize, in conjunction with practical and equitable co-existence policies, opens up new opportunities for EU member countries to benefit from the commercialisation of biotech maize, which Spain has successfully deployed since 1998. Continued growth in the global surface of biotech crops can be observed, with up to 150 million hectares and up to 15 million farmers growing biotech crops in up to 30 countries19 by 2030.

The development of gene-modified crops is however generating various types of imbalances.

The first is between large and small enterprises (both agricultural holdings and food-producing companies). EU support is not available for small and medium enterprises (SMEs) and only large agricultural and food companies are able to meet the requirements of consumer protection (to the extent that a well functioning regulation on the respective national levels exists). Lacking economies of scale, SMEs cannot easily survive. Regions where large farms and large food companies are located benefit economically, while regions consisting mainly of small businesses (both in the agricultural and in the food sector) are disadvantaged.

Second, disparities between East and West are increasing because of growing dependency of the agricultural sector from producers of GM seeds which are typically located in Western Europe. Monopoly rates of return for these companies arise.

Risks for health are also subject to territorial differences. As no EU-wide regulation is being set up to avoid the contamination of certified GMO-free crops, new EU member states allow gene-farming and substantial risks to land fertility are tolerated. While prospering countries in Western Europe can afford a sound degree of consumer protection, the countries in Eastern Europe do not, to the same extent, and accept risks to health. In the absence of a strong spatial planning policy (not compatible with the liberal economic approach), the consequence is a progressive elimination of organic farms and of conventional agricultural production by GM farming. Cut-throat competition between farmers contributes to the fact that GM food becomes cost-saving and more profitable, while organic food becomes more expensive and polarization arises. The gap between a minority of consumers with preferences regarding high quality food (as organic food) and the majority of consumers who cannot afford high quality food becomes rapidly wider. If cost-savings in cultivating

[19] See ISAAA 2004.

GM-food are realised, products find a growing market in economically weak regions as with low income level, with certain risks for health.

In the field of red biotechnology, peripheral regions are neglected to the advantage of more developed regions, enabling support to excellent research at top universities in order to strengthen them for an international competition and avoid migration processes know as the 'brain drain'. At the level of consumption and lifestyles, reforms in the healthcare systems in Europe weaken or eliminate the reimbursement of specific products (e.g. such as tissue-engineering-products). The guarantee of a primary health care and further interventions such as cost cutting measures in the social systems strengthen the productivity of wealthier regions. Disparities between wealthier and poorer regions, respectively between highly industrialised and less industrialised countries in Europe, are being reinforced.

The competitive scenario generates globally somewhat stronger economic growth at the EU-25 level, so that the EU25 average is higher than in the case of the baseline scenario. The territorial patterns of regional economic development in Europe up to 2015[20] are however broadly similar to those identified in the baseline scenario, but with a number of differences, mainly in the intensity of the evolution process:

- the catching up process in the weakest regions of Central and Eastern Europe (mainly those along the eastern borders of the EU) is still significant (above EU25 average), but less strong in a number of areas (Northern Romania, Eastern Hungary and Slovakia, the Warsaw region in Poland and Lithuania). In Cyprus, growth remains below EU25-average, as opposed to the baseline scenario;

- in the Pentagon, growth rates are generally stronger than in the baseline scenario (West-Germany, Dutch Randstad, regions of Alsace, Nord-Pas de Calais and Haute-Normandie in France, western parts of South-East England, Northern Italy);

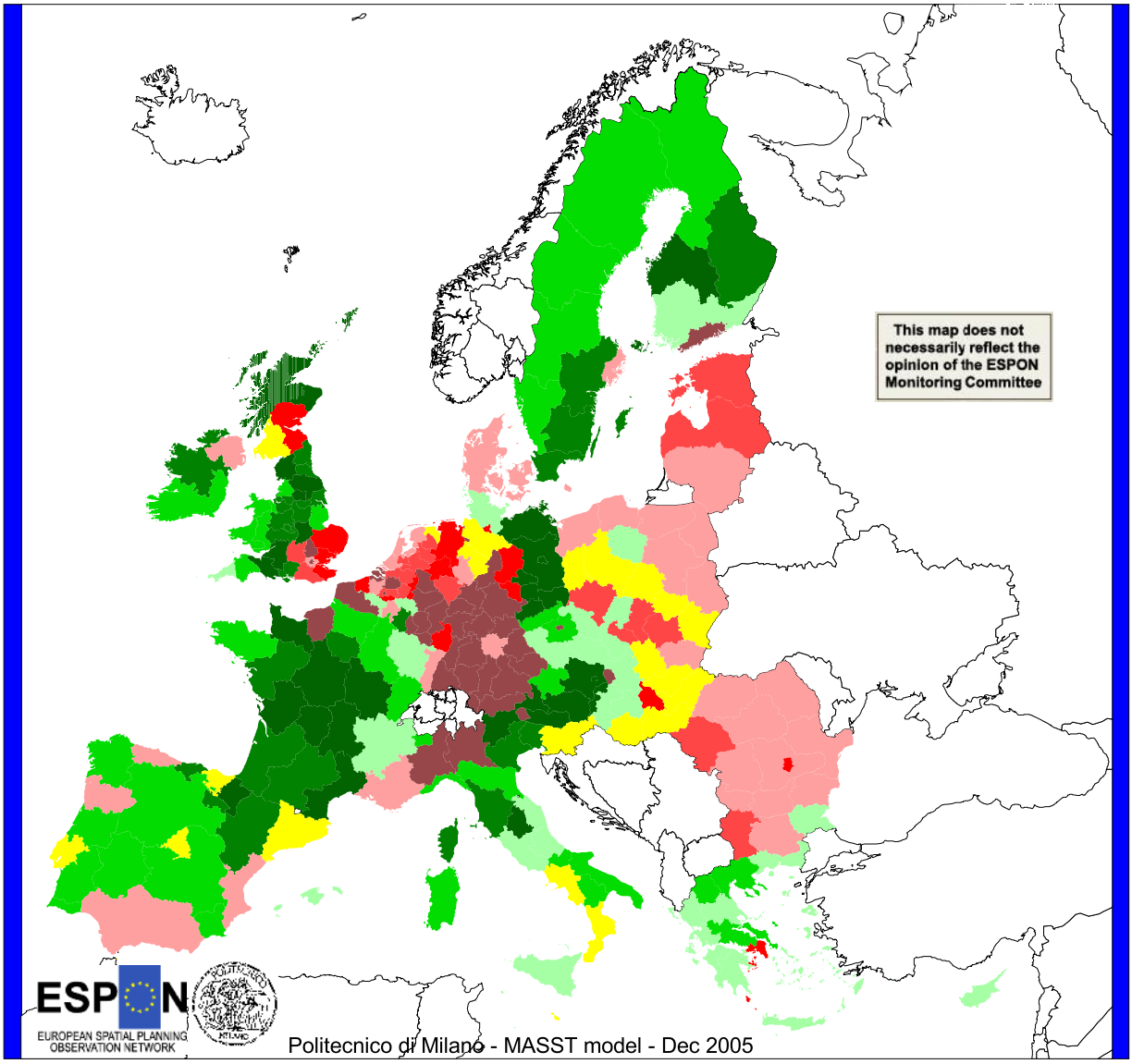
- the catching up process in the peripheral regions of EU-15 is less strong than in the baseline scenario (central Spanish regions, Southern Portugal, West Ireland, parts of Scotland, most regions of Sweden and Finland except the metropolitan regions, Southern Italy, most regions of Greece). A number of these regions which had above EU25-average growth rates under the baseline scenario, have below average growth rates under the competitive scenario (Algarve, Sicily, northern Sweden and Finland, most Greek rural regions and Crete, Corsica);

- the weakly growing belt (growth rates below EU25-average) between the Pentagon and the eastern catching-up regions has a much wider size than in the baseline scenario. It

[20] See Map MASST 3C relative to EU25 GDP per person: difference 2015-2002. Competitive scenario.

stretches from Southern Italy to Northern Sweden and comprises larger areas in Austria, Czech Republic, Slovakia and Southern Poland). The negative growth difference with the EU25-average is stronger in a number of these regions (North-Eastern Italy, Eastern Austria, parts of the Czech Republic, Southern Sweden).

The pattern of regional economic growth between 2002 and 2015 is therefore more divergent than in the baseline scenario, with areas improving more substantially their position in relation to the EU-25 average and others loosing significantly. The number of regions with intermediate positions is much smaller than in the case of the baseline scenario. The main winners of the competitive process are undoubtedly the regions of the Pentagon (with the exception of most of the French part). In the Benelux, Germany and in South-East England, the growth pattern is more compact and stronger. In the new member countries, the catching up process is lower than in the baseline scenario. The main losers of the competitive scenario are a large number of regions of the EU-15 periphery, as well as various regions situated between the Pentagon and the catching-up regions of Eastern Europe.



3C: relative to EU25 gdp per person - difference 2015 -2002 - competitive scenario

- less than -15
- -15 - -10
- -10 - -5
- -5 - -2
- -2 - 0
- 0 - 2
- 2 - 5
- 5 - 10
- more than 10

Figure 9 Relative to EU25 GDP per person – difference 2015-2002 – Competitive scenario

This evolution results an increase in disparities in terms of economic development and employment opportunities, both within the member states and the EU as a whole. With significantly weaker cohesion-oriented structural support, with reduced CAP and under pressures of globalisation, the less developed regions undergo turbulent restructuring with reduced employment in agriculture and in rural areas. Unemployment (both open and hidden) is growing. This results in faster depopulation of those areas and in lower investments in strategic infrastructure, human resource development and entrepreneurship. Polarisation of the European territory increases significantly. Cities and agglomerations, in particular in certain CEE countries, have problems with the absorption of workforces made redundant in the less developed rural regions. It may also result in growing cross-border migrations of labour force. As a result, both the Pentagon and other metropolitan areas are gaining in terms of workforce availability at the expense of more peripheral regions.

A primarily efficiency-oriented policy does not explicitly recognize equity objectives. De facto this efficiency-oriented policy enhances tendencies of spatial concentration in Europe. Among the most benefiting regions are those which already showed a good endowment with knowledge society-related resources at the starting point, i.e. at the beginning of the 21st century. The ultimate use of scientific excellence as the criteria for public support from R&D investments, de facto, means that the strongest are supported to become stronger. Beneficiaries are the best performing research institutes, universities and firms, which are mostly located in the European Pentagon and in a number of agglomerated spaces in the countries at the European periphery. The absence of a strong regional policy component, especially of a cluster policy which tries to strengthen clusters in disadvantaged regions, leads to the situation in which a number of highly agglomerated spaces are quasi 'naturally' privileged as locations for an intensive cooperation in the fields of new key technologies. There, the high density of R&D activities and business activities allows at best a strong trust-based cooperation between research institutions and companies, and between companies across different sectors.

At the same time, the influx of relatively less educated populations have added to housing problems and result in increased disparities within cities and agglomerations, in a growth in social tensions and pressures for more social spending within EU and national budgets. Peripheral areas, in particular in Central and Eastern Europe, deprived from measures which were made available to similar areas in the 'Cohesion Countries' in the 1990s, have much more difficulties in solving their socio-economic development problems. By 2030 it turns out that benefits from the improved global competitiveness of the EU (through the faster development of mainly the Pentagon) lead to increased tensions in the first decades of the 21st century. The incidence of riots in France in 2005 (followed by unrest in other locations) showed that internal social cohesion may have significant influence on society and on economy if not addressed in time.

Border regions in Europe can no longer rely on European assistance schemes which, until 2013, provided specific support for overcoming specific border hindrances. In addition, the overall absence of a strong cohesion policy leads to a situation where the majority of the economically weak border regions remain in a status of backwardness, particularly in terms of low employment opportunities, correspondingly high unemployment rates. For many of the economically weak border regions, primarily for those between the EU-15 and the EU-10, the cut of EU support both for cross-border cooperation and more generally for regional development came too early. High unemployment rates on both sides of the border enhance out-migration. As a consequence, the potential for start-ups in consumer-related services and even for cross-border activity of consumer-related businesses remain very limited. Furthermore, high unemployment leads to tensions regarding the cross-border mobility of the workforce. European policy spends large sums for the reconstruction and modernisation of Trans-European road and rail networks. However, the border regions themselves gain only small benefit from this. They remain more or less transport corridors, whereas the agglomerations in the hinterland are capable of reinforcing their position as centres of cross-border economic cooperation. Thus, whereas in general terms trade and foreign direct investments between the EU member states show an increase, the border regions in the narrow sense were and still are 'jumped over'. However, not all of the European border regions show signs of backwardness and a low level of cross-border cooperation. A more positive picture emerges in a number of regions along the internal borders which possess sufficient 'natural' locational advantages in terms of population and business density and existing polycentricity (as it is the case, e.g. in parts of the German-Dutch border region as well as in the Upper Rhine Region and the Saar-Lor-Lux-Region and, to some extent, at the Slovak-Austrian Border near Bratislava and Vienna). Among these regions which are capable of gaining benefits from their border location, one finds primarily regions with long-lasting cross-border contacts and cultural and mental commonalities.

The European urban systems change under the influence of both demographic and economic factors. Liberalisation of migration within Europe combined with a more liberal approach to immigration from outside Europe clearly strengthen demographic growth in and around metropolitan regions, in particular those which have clear locational advantages in terms of advanced economic activities. Large agglomerations in the Pentagon are favoured in terms of demographic development, together with a number of other metropolitan areas situated along the corridors originating from the Pentagon, in particular in Central and Eastern Europe and in the southern parts of the Nordic countries. Metropolitan areas in the remote peripheries are far less favoured.

In economic terms, large transfers of funds are made via policies like the Framework Programmes (R&D), away from cohesion and agriculture policies. In addition market forces favour areas with high endowment in advanced services and technologies. Significant investments are made in those regions that are capable of sustaining top universities, major financial institutions, research facilities and the like. This leads to development pressures in

and around urban areas for further expansion. Urbanisation will however not occur evenly over the territory, but is increasingly concentrated in the Pentagon, and specifically in the largest settlements therein. Major urban agglomerations like Paris, London, Randstad and Rhine-Ruhr extend their influence into the surrounding regions at the expense of smaller centres, because these do not have the critical mass needed to support top economic facilities. The same trend takes place even more strongly in metropolitan regions outside the Pentagon.

Urban development is concentrated in the European core area, but not necessarily within the administrative borders of the big cities, but rather in the Potential Urban Strategic Horizon (PUSH) areas[21]. These are the surrounding areas of urban centres within reach of 45 minutes by car from the centre. It is most probable that new high-tech jobs are located not only in the core cities but also in the surrounding areas where the most important resources and production factors, the professional and highly skilled labour forces, are easily available[22]. In the new member states and other peripheral areas the future development trend of the urban system is less clear. There, where the main investment motivations and location factors continue to be cheap labour, transnational enterprises look for more and more peripheral and smaller places where this type of labour force is still available. This results in a highly decentralised, but unstructured pattern. In cases where enterprises increasingly utilise the higher educated and skilled labour force of these countries, the result is of the same type of urban structure as in the more developed countries, yet at a more modest level. Agglomerations and cities most negatively affected by the competitive growth process are those with old industries and low productivity activities which are not competitive any more in a globalised world.

[21] As defined in ESPON project 1.1.1.
[22] Raspe *et al.*, 2004.

3.6.3.3 Evolution of rural Europe

Rural Europe experiences a process of intensified dualisation, even more so after the subsequent EU enlargements. After 2005, the dualisation process takes place in a context where budgets for the Common Agricultural Policy and Regional Policy are rapidly and radically reduced and where market forces (liberalisation of agricultural markets, accelerating globalisation) and demographic changes (population ageing) are gaining significantly in importance.

3.6.3.3.1 Evolution of agricultural systems under changing CAP/RDP and Structural Funds conditions and other exogenous factors

In little more than 10 years the European agricultural system is being transformed from a highly protected and heavily subsidized sector into an open and economically competitive one. After some radical reforms, import tariffs and export subsidies are almost completely abolished. The CAP budget – Pillar 1 as well as Pillar 2 – is radically reduced. The *macro-economic impacts* are huge. The enormous transfers from consumers and taxpayers to agriculture – more than €120 billion in 1999 – are almost completely stopped.[23] The reduction of import tariffs and export subsidies to 5% enables the developing countries to generate more than €20 billion extra welfare per year. Countries that used to enjoy preferential access to protected Western markets, however, suffer from the opening up of the borders.

The reforms are stimulated by the desire to reduce the large transfers from tax payers and consumers to agriculture and to make the agricultural sector strongly competitive on the world market. The budget for Pillar 1 is reduced from €37.5 billion in 2005 to €4 billion in 2020. Pillar 1 resources are exclusively used for direct payments to farmers; market support is abolished. The budget for Pillar 2 is reduced from €7.5 billion in 2005 to €1.5 billion in 2020. Stimulation of the wider rural economy becomes the first priority. SF's are concentrated on the most competitive rural areas of the less developed regions, first in the new member countries and only later in the candidate countries.

In addition to the WTO negotiations, other exogenous factors become important for the evolution of agricultural systems, such as the incidental but very expensive and drastic measures to combat animal diseases. Investments in the *Trans European Network* improve the mobility and thereby the competition between farmers inside and outside the EU. Technological innovations lead to higher agricultural production. Further EU enlargements

[23] Kol, 2002.

(Romania and Bulgaria in 2008, Western Balkans in 2015, Turkey in 2020) also play a part as exogenous factors on the evolution of agricultural systems and of rural areas.

Intensification and scaling-up of agricultural production receive a strong impulse from the radical liberalisation of the agricultural markets and the substantial reduction of the CAP budget. This is further stimulated by the low priority which is given to environmental protection and animal welfare (removing barriers to competitiveness). *Intensive cattle farming and horticulture* further increase in the urbanized regions of Northwest Europe. Scaling-up and clustering of farms and greenhouses reduce production costs. This sector becomes very successful on the world market. *Large-scale arable and dairy farming* decreases in North-West and Southern Europe, but it increases significantly in areas with low land prices in the CEECs and Western Turkey. *Subsistence farming* increases in the peripheral areas of the CEECS and in Southern Europe and Eastern Turkey. Because of the changes in consumer preferences and the reduction of RDP subsidies, *experience farming* and *nature and landscape management* only survive on a small scale in urbanized regions, or rural areas with small-scale landscapes.

Rural areas where agriculture dominates experience an intensified dualisation. In the fertile areas of France, Germany and Central Europe, agricultural production further industrialises rapidly. In these areas food production competes to some extent with the production of energy crops. In many other rural areas surrounding large cities in Eastern and Southern Europe economic activities become more diversified, due to the hightened economic dynamics. At the same time, however, an increasing number of rural areas in Western and Eastern Europe are confronted with further marginalisation and abandonment. This is particularly the case in rural areas with an unfavourable demographic situation (high level of population ageing), unfavourable production conditions (low level of soil fertility, increasing drought) or low attractiveness.

3.6.3.3.2 Evolution of urban-rural relationships and partnerships

Urban and rural areas become more and more interconnected and blurred by urban sprawl. This happens particularly in urbanized regions. On the one hand, rural areas benefit from the further growth of shopping facilities, cultural amenities, jobs in the service sector,and so on in urban and semi-urban areas. On the other hand, urbanites benefit from the building of second homes, industrial estates, recreation facilities etc. in rural and semi-rural areas. Many people move out of urban areas because they prefer the more stable, secure and natural living conditions in rural areas but they continue to do their work and shopping and spend their leisure time in urban areas.

Rural areas in urbanized regions, particularly in the Pentagon and around the metropolitan areas in the CEECs and in Southern Europe, benefit from the growth of residential functions

and cultural amenities as well as from intensive cattle farming and horticulture. The socio-economic viability of these areas increases significantly. *Rural areas with a variety of activities* around the metropolitan areas also develop further. Many of these areas are successful in selling luxury homes for retired people, building invented traditions (e.g. 'shopping castles') or attract innovative and footloose SME's. In *rural areas attractive for tourism* mass-tourism becomes a booming business, particularly in the Mediterranean, Adriatic and Black sea coast, because local resources are marketed successfully. Many *rural areas with low accessibility,* however, experience a downward trend. Regional actors in the North of the Nordic countries, in non-coastal southern regions and in the East of the CEECs are not successful in commodifying their local resources.

Urban-rural partnerships intensify selectively in a number of regions. The promotion of public interests is concentrated on the further improvement of the physical infrastructure (roads, ICT networks) and on the marketing of the locality in order to strengthen local competitiveness. Since the subsidiarity principle is put to the extreme, cooperation between urban and rural partners takes place most of all at the local level, and to a lesser extent at the regional level. In many cases private partners take the initiative. Urban-rural partnerships are selectively open: public authorities and the business sector are actively involved, but NGOs and citizens are often excluded. Many local authorities consider each other more as competitors than as partners for the settlement of enterprises and people. As a result, cooperation in many cases is relatively incoherent and ineffective.

3.6.3.4 Transport

3.6.3.4.1 The transport context in Europe in a competitive perspective

In the competitive scenario, the transport situation is conditioned by higher rates of economic growth than in the two other scenarios. Transport is also meant to contribute to the global European competitiveness and transport policies are shaped accordingly. The growth of transport flows is stronger than in the two other scenarios, because economic growth generates over-proportional growth of transport flows. This trend is somewhat smoothed by the more rapid move of the European economy towards intangible sectors, especially in central regions. Not only is the nature of transport flows changing, but also their spatial distribution in relation to further significant EU enlargements. In the wider integrated Europe of the 2030s, long-distance transport flows are much more significant than they were in the early 2000s in a more limited European space and more and more countries are affected by transit flows.

As in the other two scenarios, the sustainable character of increasing energy price (in particular of oil) remains a major constraint in the transport sector. Because good transport

conditions are necessary to ensure and strengthen competitiveness, significant EU resources are injected into research and technological development in order to counteract the progressing oil depletion and the related price increase of fuel. New generations of car engines are developed. After hybrid cars using mainly biofuels, the hydrogen technology is significantly boosted to enable wider use of electric cars powered by fuel cell engines. This evolution makes possible to ensure long-distance exchanges within the enlarged EU and to avoid the segmentation of the internal market because of too high transport costs.

The use of ICT in transportation is becoming generalised. A large variety of applications in the sphere of Intelligent Transport Systems are developed and implemented to increase transport efficiency and reliability, to increase transport security, to optimise the use of infrastructure, to satisfy mobility needs etc. Transport flows are systematically accompanied by information flows, both for the transport of goods and persons.

A high level of mobility is necessary to maintain robust economic growth. A more intangible economy, largely based on advanced services, is strongly dependent upon people's mobility despite the progress of ICTs. The further development of high-speed train networks and the availability of substitution fuels make possible to ensure the necessary level of long-distance mobility. At more regional and local scale, however, European citizens adapt their behaviour to increasing transport costs and organise their mobility, as far as possible, on a more rational way (car sharing, public transport, change of residential location). The further expansion of metropolitan areas brings however with it new waves of suburbanisation, a trend which limits the reduction of mobility. While younger generations and immigrants concentrate in and around metropolitan areas, retirees move towards attractive rural areas, small and medium-sized towns and develop new patterns of mobility more related to recreation, cultural activities, health care, leisure travelling etc.

Transport policies are clearly market-oriented and depart from previous transport policies more related to sustainable development and to cohesion. The road and motorway sector is largely favoured in the new policies. As growth concentrates in and around the metropolitan areas of the pentagon and of a limited number of other privileged regions, transport infrastructure and services are particularly promoted between such metropolitan areas. The development of public-private partnerships becomes generalised in order to provide the necessary financial resources. Not only transport services are fully privatised, but also significant amounts of infrastructure networks (motorways, railways). The territorial divide in accessibility between highly accessible regions with metropolitan areas and more land-locked and remote rural regions is significantly strengthening.

The weakness of structural and cohesion policies in the competitive scenario creates serious difficulties for modernising the transport infrastructure of the new EU member countries and for ensuring efficient connections between the EU15 and the other member countries, mainly of central, south-eastern and eastern Europe. There where transport demand is

significant, public-private partnerships are being set up to modernise main transport corridors. Pricing levels are however substantial on such corridors and are not compatible with the purchase power of local populations. In less strategic corridors and regions, transport infrastructure remains largely obsolete, so that the spatial accessibility divide is even stronger than in western Europe. Traffic congestion has a long-lasting character and a significant and negative environmental footprint.

3.6.3.4.2 Simulations from the KTEN model

The infrastructure scenarios are defined on the basis of both political aims and scientific criteria; policy aims determine maximum budget lines for road and rail, for 2015 and 2030, and the decision-making framework. No significant differences concerning ports and airports, and urban infrastructure, are considered in the scenarios.

In the competitive scenario, projects are selected on the basis of socioeconomic profitability only. There is no preference for rail and no strong policies in favour of modal shift; it is assumed in the scenario that the improvement of road vehicle efficiency, road traffic management systems, will produce more efficient use of roads and much less environmental impacts. Road pricing is applied to all roads and rail services tend to be adapted to demand and have market prices with no subsidies. This is the most efficient scenario from a transport-economics point of view (the one with the lowest marginal costs in both roads and rail).

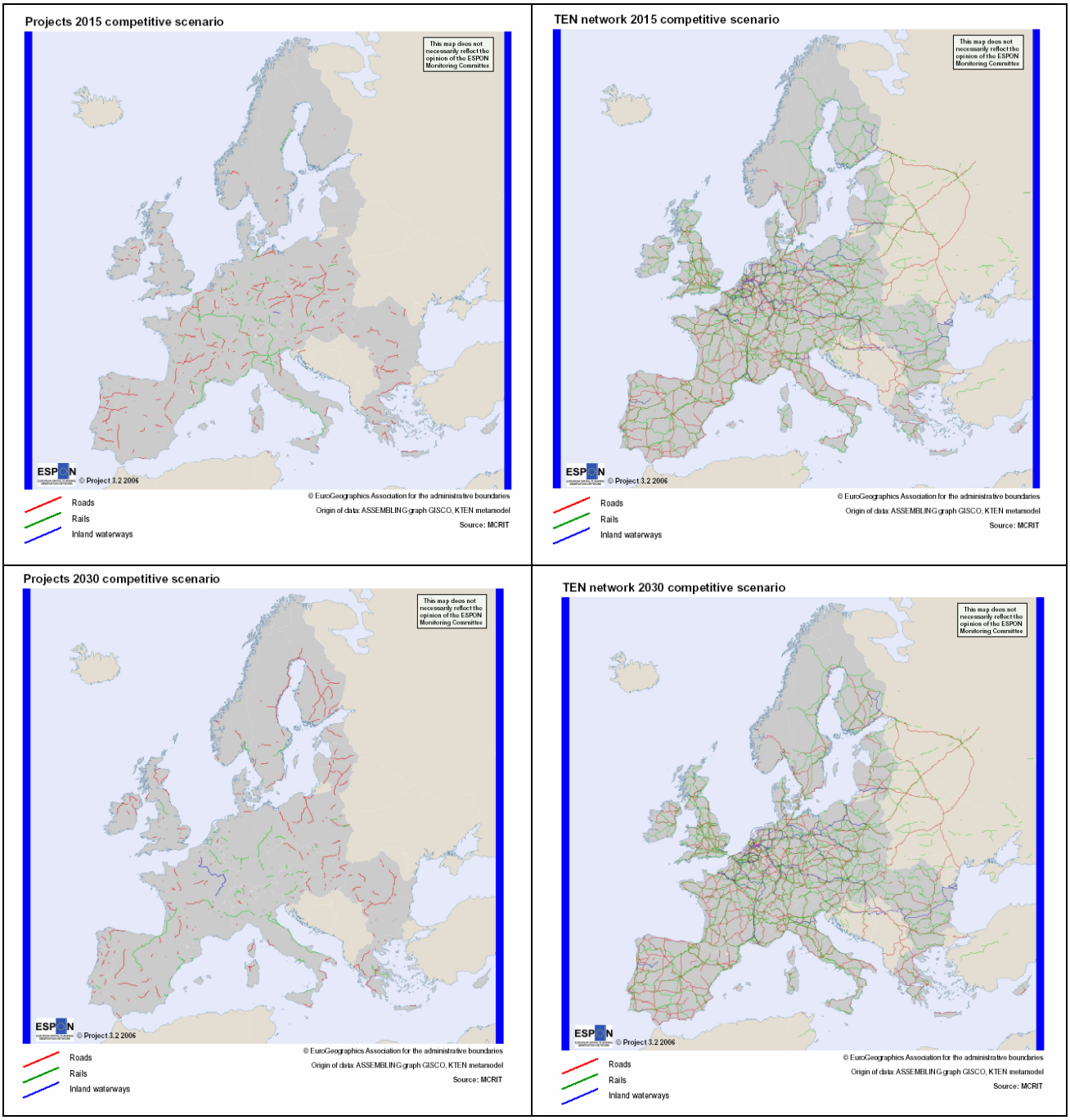
Infrastructures are built according to their socioeconomic profitability, based on a Cost-Benefit Analysis (CBA) appraisal that includes both environmental externalities and indirect territorial impacts. The RAILPAG defined by the European Investment Bank, for instance, proposes an updated methodology to evaluate rail infrastructure projects; according to CBA, the selection criteria could be not to build projects with CBA below a given threshold (measuring CBA in vehicle flow increase per invested €, and fixing priorities based on a CBA ranking). A proxy of this CBA is the marginal cost of the foreseen increase in passenger and freight traffic, and the savings of the existing traffic thanks to the time and cost reductions produced for the new infrastructure project. The total budget to be allocated could be separated into a "road budget" and "rail budget". The relative budget for roads or rail is then a political decision based on policy aims more global than the transport policy. The total investment in infrastructure will be less than the total possible, since projects with low profitability will not be built.

Method to define the infrastructure scenarios:

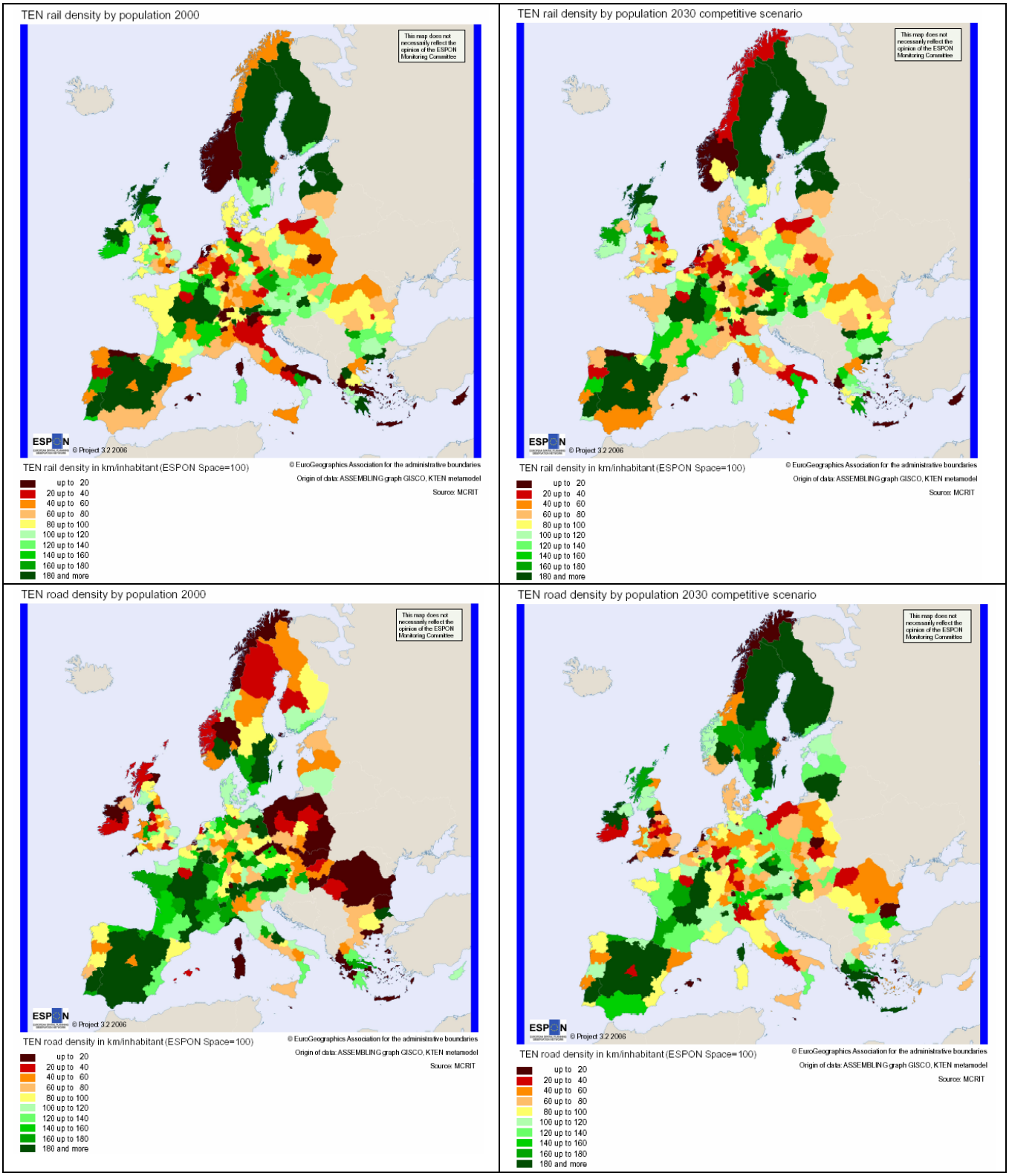
Evaluation of the current road and rail CBA proxy

From the European list of projects, ranked according to CBA proxy, select until the total budget allocated is reached

Projects and networks



Density of networks in relation to population



Traffic flows and accessibility

Maps on traffic flows in 2015 and 2030 and on regional accessibility are in preparation

3.6.3.5 Energy

3.6.3.5.1 Energy policies under the competitive scenario

The competitive scenario aims at strengthening global European competitiveness and in particular that of metropolitan areas. It allocates significant amounts of EU resources to R&D and to technological development at the expense of structural and rural development policies. The context of the competitive scenario is similar to that of the other two scenarios: energy prices are regularly and significantly increasing because of growing energy demand at the world scale and the progressive depletion of oil and gas resources.

In terms of energy policies, the competitive scenario concentrates also on the diversification of sources of energy supply, but not only on the promotion of renewable energy sources. It also allocates significant resources to the development of technologies which are likely to facilitate the provision of energy to metropolitan areas, such as coal gasification, hydrogen technologies, new generations of nuclear power plants and new types of car engines. The TEN-E are developed to provide as a priority energy to metropolitan areas. Because of weak structural policies, EU credits for technological development and energy transport infrastructure will be allocated more to developed regions, than to backward ones.

3.6.3.5.2 Impacts of increasing energy prices on the evolution of energy consumption and changes of attitudes towards energy consumption

In a context of sustained growth policies, the weight of energy costs in the final output is less important and can be offset by other sources of added value, such as stronger technological development and more highly skilled manpower. This means that global energy consumption is not being reduced, at least in the short term, because growth implies, despite further progress in the energy intensity of the economy, stronger energy consumption. On the other hand, the abandonment or relocation of weakly competitive and highly energy consuming activities (for instance metal production) are easier and more likely to occur in a context of liberal and competitive economy.

Stronger growth of metropolitan areas implies further suburbanisation and growing mobility, so that energy consumption in transport is not likely to be significantly reduced, in spite of technological progress in car engines. Metropolitan expansion and growing motorisation,

especially in the new member countries of Central and Eastern Europe, are not compatible with the concept of compact cities.

At the level of individuals and households, increasing energy prices certainly generate efforts to curb energy consumption. Investments are made in house and office insulation, in the search for ways of life and of working which limit mobility and which make full use of ICT technologies.

In global terms, energy consumption is not likely to decline in the competitive scenario.

3.6.3.5.3 Impacts of the diversification of energy supply systems

The competitive scenario is likely to generate significant innovations in energy production which facilitate the diversification process of the energy supply, even if such innovations do not significantly reduce the price of energy produced. Technological innovations are mainly meant to ensure efficient energy supply, even in a context of the depletion of oil and gas resources. Innovations are not only related to the increased use of renewable energy sources, but also to more an efficient and environmentally friendly use of traditional energy sources, such as coal and nuclear energy. Research on and implementation of coal gasification techniques make a stronger use of coal possible, in particular in industrial regions with significant coal reserves, especially for electricity production, for district heating and for industrial production, while respecting the Kyoto Protocol. New generations of nuclear power plants are rapidly being developed and built on the basis of public-private partnership, because of the significant amount of financial resources necessary. High electricity prices make investments in this field by the private sector attractive. The hydrogen technology is being boosted. New hydrogen production technologies are being developed which make possible a number of applications in various fields, from car engines to the heating of buildings. After 2015, new energy systems are being developed and expanded which are progressively replacing traditional systems.

The diversification of energy supply systems, boosted by technological development, benefits mainly the regions of the Pentagon. The development and application of innovative solutions in less developed regions is much more problematic, because of insufficient financial resources. The weakness of structural and rural development policies does not make possible the full exploitation of the renewable energy potential of these regions. Consequently, they remain more dependent on the use of traditional fossil energy sources (oil, gas, coal), a fact which reduces their competitiveness, because of increasing prices and more and more problematic supply.

The TEN-E are being further developed, giving precedence to the interests of economically successful regions, which are mainly the metropolitan regions of the Pentagon and a few

others outside it. The process of infrastructure development is strongly market driven. A significant number of more peripheral regions, especially in the new member countries, but also in the EU15 peripheries continue to have obsolete or insufficiently developed energy transport systems.

The diversification process favours the large energy companies, mainly those of the Pentagon. These continue to grow, also through mergers, and to enlarge their markets. A limited number of European energy oligopolies are emerging, progressively absorbing the existing regional energy companies.

3.6.3.5.4 Impacts of increasing energy prices on the economic development and on the sectoral evolution of the economy

The impact of growing energy prices on the global European economy are lower in the competitive scenario than in the other two scenarios, because of the presence of other factors boosting economic development which counteract the constraint of higher energy costs.

In the context of a competitive scenario, the sectoral evolution of the economy is more rapid than in the two other scenarios. The European economy is moving more quickly towards a more intangible and high-tech economy and is abandoning large amounts of weakly productive activities using low or intermediate technologies. This has strong territorial impacts, increasing the divide between leading metropolitan regions and other regions with traditional industries or rural character. Increasing energy prices are more detrimental to the last category of regions, because their capacity to reduce their energy consumption and to move towards innovative energy supply systems is lower.

Peripheral regions are relatively unfavoured as far as the impacts of increasing energy price are concerned. Both higher transport costs and higher production costs make their productions less competitive on global markets. In addition, the weakness of structural policies is a constraint to the modernisation of large-scale transport infrastructure.

3.6.3.5.5 Impacts of the new energy paradigm on settlement systems

In the competitive scenario, the divide between metropolitan regions and other regions in terms of attractiveness and employment opportunities is rather strong. Constraints related to high energy prices and opportunities related to the diversification of energy supply play a secondary part.

The growth of metropolitan regions is not however indifferent to energy prices in terms of settlement preferences and policies. The expansion of metropolitan regions takes place in a somewhat more concentrated way, with the development of small and medium-sized towns along public transport axes being preferred to the classical car-related suburbanisation pattern. The rapid development, after 2010, of new car engines (fuel cells, hybrid engines) reduces however significantly the energy consumption and counteracts the concentration efforts in settlement policies, generating new waves and flows of suburbanites.

At a wider scale, it can be observed that metropolitan expansion is stronger in the Pentagon and in adjacent areas than in the European peripheries, with very few exceptions. Medium-sized and small towns are only favoured if they are in the area of influence of metropolitan areas, or if they have specific factors of attractiveness (retirees, tourism etc.). Metropolitan areas benefit from new, large-scale and high-tech energy production facilities located in the region (new nuclear power plants, large plants for hydrogen production, often combined with nuclear power plants because hydrogen production requires large quantities of electricity). A number of industrial regions benefit from coal gasification facilities. Metropolitan areas are well interconnected, also at cross-border and transnational level, through high-capacity electricity and gas networks.

3.6.3.5.6 Impacts of the new energy paradigm on rural areas

In the competitive scenario, a difference has to be made between rich and central rural areas and other rural areas with more peripheral character and lower productivity. Exceptions however exist: some central rural areas (for instance in France or Germany) are weakly productive, while more peripheral rural areas (for instance in Poland) show high levels of soil fertility and productivity. In the first category of areas, market forces are sufficient to lead to intensive production of renewable energy, in particular energy crops and biofuels. In the most fertile areas, competition is emerging between the production of food and the production of energy crops. In remote rural regions, in a context of weak structural and rural development policies, the move towards the production of energy crops, biomass and biofuels is much slower. A weak investment capacity does not enable farms to become energy self-sufficient. The external dependence of remote rural regions with respect to energy supply remains high.

In the field of wind and solar energy, the divide between rich and poor rural areas is less strong, because natural parameters such as climate and geomorphology play an important part. In the cohesion countries, however, the potential of renewable energy is far from being fully exploited because of constraints in investment capacity.

Large energy companies buy or control wide areas in fertile agricultural regions (energy crops production) or in areas well suited for wind energy production. The emergence of

decentralised energy supply systems at the regional level is not possible. Energy prices are largely determined by the large companies which make huge profits. The oligopolistic character of the energy production system offsets a significant part of the benefits which energy consumers could expect from free competition between energy companies.

3.6.3.5.7 Environmental impacts of the new energy supply strategies

In the competitive scenario, the new energy supply strategies have both positive and negative impacts on the environment and on citizens' security. A number of new technologies such as hydrogen production or coal gasification have positive environmental impacts, at least in some areas. Hydrogen production requires large quantities of electricity and may therefore be polluting in places where it is produced, but hydrogen combustion is not at all detrimental to the environment and this is beneficial to the air quality in cities. The same is true for the use of hybrid cars and of gas generated by coal gasification.

The rapid revival of nuclear electricity production though generates tensions in European society. Environmental lobby organisations and green political parties organise huge protest campaigns against governmental decisions to build new power plants. Issues related to the elimination of nuclear waste and civil security are at the forefront. In a number of countries and regions, public protests are strong enough to cancel or significantly postpone governmental decisions in the field of nuclear energy supply.

In fertile rural regions, agriculture is strongly intensifying, in particular there where energy crops are being produced. Fertilisers are used, endangering the quality of soils and especially of ground water. Irrigation is also intensifying, leading in certain regions to the depletion of ground water resources, with negative impacts for the water supply of cities in the region. The creation by powerful energy companies of large wind energy parks has detrimental impacts on the quality of natural and cultural landscapes in a number of areas.

In more peripheral regions where the endogenous investment capacity is weak, the exploitation of renewable energy sources in a limited number of areas with high productivity is organised and controlled by large external companies without real local control of consequent environmental impacts.

3.6.3.5.8 Impacts of climate change on the production of energy

In the competitive scenario, under weak structural and rural development policies, the impacts of climate change in a number of rural regions, especially the southern ones, are far more detrimental to the economy and to the environment than in the other two scenarios. The lack of structural measures in southern regions aggravates the impacts of

drought (decreasing agricultural production, desertification and the multiplication of devastating forest fires). This evolution affects the energy sector rather negatively. The production of energy crops and biomass is severely constrained by deteriorating climatic conditions. Soil erosion is further expanding and the lack of afforestation measures strengthens drought and limits the water retention capacity of hilly and mountainous areas. Negative impacts on hydro-power production can be observed.

In more central and northern areas, more frequent heavy rainfalls and floods, in addition to the damages caused to settlements, are also detrimental to various rural areas, thus limiting the production capacity of energy crops.

In coastal regions, wind energy parks are threatened by heavy wind storms and hurricanes.

3.6.3.6 Environment

In the competitive scenario, the environment fades into the background of public perception, as the health of the economy is seen as more pressing an issue. Consequently, environmental policy is not allowed to slow economic growth but must be achieved in combination with economic development. In the 2005-2030 period, aggregate economic growth is slightly higher than the baseline scenario. This growth is more uneven, however, mainly benefiting the Pentagon and a few other major growth centres. Technological advancement is also most pronounced, given the emphasis on achieving Lisbon objectives. These factors all influence the state of the European natural environment, specifically levels of water stress, quality and quantity, risk of flooding, air pollution, the state of natural habitats and climate change.

3.6.3.6.1 Water resources and flooding

In general, water stress (balance between supply and demand) in Europe remains stable in the 2005-2030 period, due to increasing consumption and limited efficiency measures. Densely populated areas in the Pentagon area face particular water stress, especially in dry summers. Sometimes this is manifested by blackouts, as power plants are unable to feed enough electricity into the grid. Meanwhile, the manufacturing industry grows considerably, mainly in Eastern Europe, feeding the demand for water. The situation in Southern Europe is much more serious than elsewhere. Limited investments in desalination and efficiency measures make disparities between supply and demand widen. Only half of the power plants have implemented new cooling systems, because they are privatised, unregulated and not subsidized by structural funds. At the same time, the irrigated agricultural sector hardly increases its water efficiency, due to a lack of incentives (no water pricing). As a result, consumer water prices escalate, which affects sectors such as manufacturing, retail and tourism. Sparsely populated rural areas in Southern Europe are increasingly abandoned and in process of desertification, which threatens biodiversity.

In the competitive scenario, the effects of a spectacular economic growth in the relatively urbanized parts of Europe, and a policy where the environment is subservient to the economy, slowly begins to take its toll on water quality. In this regard, a distinction needs to be made between biological (e.g. organic) and chemical (e.g. heavy metals) sources of pollution. The former kind of pollution is often the result of agricultural activities, whereas the latter is linked to industrial and household wastewater.

Since the 1991 EU urban wastewater treatment directive, much progress has been made in improving the quality in Western Europe. In the competitive scenario, this record of success is not continued. EU policies on wastewater are only partly implemented, due to the lack of willingness to invest in costly sewage systems in small towns, and a downsizing of the structural funds for the N10. Moreover, member states are given much liberty in implementation. Most large cities are covered, and point sources close to most vulnerable ecosystems are dealt with too. However, in many nations, only secondary (physical) treatment has been introduced. As a result, the groundwater deteriorates in most densely populated areas and drinking water becomes increasingly expensive in countries that did not opt to impose more stringent controls at the national level, like Germany and Denmark.

With regard to the former kind of pollution (biological), even less progress is achieved. EU policy on diffusive pollution (Nitrate Directive) is slowed down in order to enable more intensification of agriculture in certain areas. Nitrate continues to seep into groundwater sources in rural areas as a result of fertilizers and manure in agricultural production. The challenges (and thus costs) of removing nitrates will be most serious in areas where agriculture is most concentrated in the competitive scenario, particularly in the Pentagon. Here, eutrophication becomes a severe problem, and emergency measures in nitrate diffusion will only render results in several decades time (towards 2050). Thus, by 2030 people living in regions in the core of Europe, historically renowned for clean water, increasingly buy bottled drinking water.

With regard to the risk of flooding, the main driving force in this scenario is identical to those of the other scenarios, namely climate change. The response is on the other hand different. The fixation with economic profitability over environmental concerns and a weakening interest in EU politics hinder a thorough implementation of the EU Water Directive. Local business groups succeed in thwarting plans to reserve important surfaces of land for expanded riverbeds and water retention areas, especially in rapidly growing metropolitan areas. At best, dikes are erected around the most valuable land to safeguard against flooding — usually in the most affluent areas in the Pentagon. At worst, the risk is dismissed. As a result, flood hazards increase in Central and Northern Europe due to higher river discharge peaks, whilst the construction of dikes around cities divert the flood hazard to other river districts. By 2030, the ad hoc passing on of flood risks, and the unforeseen

costs and political friction this creates, spark new interest in reinstating European level rules.

3.6.3.6.2 Air pollution and greenhouse gas emissions

Like other aspects of the environment, the control of emissions is subservient to economic growth in the competitiveness scenario. Particularly relevant to the level and intensity of air pollution are trends in environmental policy, economic and technological development and decisions on infrastructure investments.

With regard to EU environmental policies, the 2005 standards on air pollution (fine particulates and nitrogen oxide) are implemented only as far as local circumstances allow. Every country negotiates its own compliance levels and deadlines in order to gain a competitive edge. Public opinion considers environmental problems as secondary, long-term and esoteric in comparison to more immediate problems like jobs, immigration and consumer prices. The death tolls linked to particulates are seen as exaggerations of an increasingly radicalised environmental lobby. As a result, Kyoto implementation is only partly successful, and this treaty is increasingly blamed for harming Europe's competitive position vis-à-vis the United States and Asia. Most greenhouse gas reductions are achieved outside the EU, buying emission rights and implementing projects in developing countries.

As environmental policy diminishes in importance, autonomous driving forces contributing to air pollution continue unabated. Growth in road traffic resulting from an emphasis on motorways increases the volume of emissions, particularly in the Pentagon area. However, improvements in car efficiency and new technologies designed to limit dependence on fossil fuels are a mitigating factor. Also, the shift away from manufacturing to services across Europe means that dirty industry also declines in importance. The health situation has improved in most European cities and territories, except for large parts of urban Pentagon areas where problems remained almost as severe as they were in 2005. Both small particulates and ozone levels are still above EU target levels.

3.6.3.6.3 Natural areas and conservation policies

Several driving forces affect the plight of endangered species and the quality of natural environments in Europe, some of which stem from policy decisions, some of which are autonomous trends. With regard to the latter, the growth in economic activity, especially in the core region of Europe places pressure on non-productive land use, such as natural habitats. Wetlands near urban areas are transformed for urban development, and coastal areas and mountainous regions are further developed for mass-tourism. In addition, HVN farming is only supported where it is economically beneficial, and in other areas agriculture intensifies further. Species are forced to flee this human encroachment. At the same time, shifting climate zones make it necessary for fauna to migrate northward or to higher

altitudes to escape excessive heat and/or water scarcity. Other species, unable to move rapidly enough, or who found their way blocked by physical or manmade impasses, succumb to the elements.

At the same time, concerns about the protection of natural habitats and biodiversity are increasingly muted in the competitive scenario, as the immediacy of global competition dominates political and public consciousness. In all areas in which a trade-off is perceived between the two, economic interests prevail. As a result, EU policies on nature protection such as Natura2000 see their budgets slashed as time progresses, and are weakened in jurisprudence following challenges to the system. In Southern Europe, where most Natura2000 areas are to be managed by traditional farming techniques, budgets are too low to manage all areas properly. As a result, by 2020 the net decline in biodiversity has been slowed, but not stopped due to remaining lack of connectivity between protected areas, and a continuing pressure on natural areas and HNV farmland. In popular natural areas such as coasts and mountain ranges, and near urban regions in the Pentagon, biodiversity actually declines.

3.6.3.6.4 Impacts of climate change (focus on adaptation)

In the competitive scenario, climate change is recognized as a major problem, although disagreement remains about the extent to which human society is responsible for it. Measures to adapt to its consequences are principally taken at the global/international level (Kyoto). Additional measures are avoided at the EU level out of fears of harming competitiveness of Europe in the world. Some countries opt for imposing tougher standards voluntarily if their constituencies demand it. Generally this occurs in the wake of a natural disaster, and the measures taken often have a short-term or issue-based (e.g. anti-flooding) character. Since climate change is such a long-term process, the effects of this more laissez faire attitude do not make themselves felt during the scenario period. Thus, the situation described in the baseline scenario regarding desertification in Southern Europe, water conflicts, increased hazards in coastal and arid regions and a decline of energy consumption in Scandinavia resulting from climate change, applies to this scenario as well.

Territorial image of Europe by 2015
In preparation

Territorial image of Europe by 2030
In preparation

Conclusions: territorial issues arising from the baseline scenario
In preparation

4 Integrated roll-back scenario

As part of the project, the is also to produce a roll-back scenario, which should be based on a final image of how Europe **should** look like in 2030. As mentioned earlier this was interpreted as being a combination of the two axes of competition and cohesion.

Once the final image defined, the scenario will then describe one (or several) possible paths towards such a final image and/or highlight potential contradictions inherent to the diverse policy goals expressed in this final image.

Although the request was to already provide a draft of such a scenario, the team has decided that it would not be very efficient to do so, until the roll-forward scenarios were more advanced. The latter will be used as a basis for the former and it is, therefore, necessary to first go through a validation of the baseline and the two prospective scenarios before building the roll-back scenario.

However, work has already gone into the definition of the policy goals, and in this report these goals are presented together with a first attempt at translating them into more concrete territorial elements. This translation can serve as a basis for discussion with the ESPON Monitoring Committee on the further work on this scenario.

The table below lists a series of elements that will be part of the proactive or roll-back scenario. The first two columns are the result of the discussions with the ESPON MC. The third column is an attempt to imagine more concretely what the abstract goals would mean on the ground. Several things should be kept in mind while reading this list:

- Currently it is a mix of static and dynamic elements, meaning that some of the goals are more a wish for processes then for specific objectives that can be reached once and for all. In a future version we might have to separate the two.
- XXX means a value that needs to be defined. It remains to be seen whether or not it is the role of this scenario to actually define 'hard' values, but it might make the scenario more concrete if we do.
- Although the time frame for the scenarios is 2030, it seems less necessary to limit the roll-back image to what is deemed 'realistic' (i.e. feasible if the right policy choices were made). This stage of the proactive scenario process is also the opportunity to 'dream' a bit, especially since the aim of this scenario is more to communicate an idea than to explore specific policies. Once one (or several) ideal images are created, we can then show in the scenario where the contradictions and unrealistic ideas lie.
- One of the next steps will be to translate this into a more concrete geographical form, on the basis of the territorial images of the roll-forward scenarios.

General Goal	Concrete Objectives	Proactive Image
Prosper, competitive and diversified economies	more than one global integration zones	one zone in south of Scandinavia + Baltic states; one zone Vienna, Budapest, south-western Poland and Warsaw, etc; one zone Catalonia + south of France
	metropolitan areas, city clusters, networks and development corridors as motors of economic development	strong metropolitan areas and corridors between them create growth which diffuses efficiently to rest of territory
	regional development poles, including for services	idem + each regional pole offers all necessary services
	strong gateway cities	state of the art sea and air ports, with strong multimodal links to rest of territory
	strong endogenous growth, based on 'territorial capital', including natural and cultural assets	each region has capacity to generate itself the wealth it needs for its population to live in good standard of living; high local entrepreneurship; weak dependency on specific FDI; strong local markets
	regional developments based on a mix of future-oriented activities	no regional 'monocultures'; all regional economies based on high-level, future-oriented activities in different sectors (high-level services, biotech, nanotech, energy, recycling, etc)
	territorially balanced access to investment capital	equal conditions of access to capital in all regions; sufficient supply of capital in all regions
	territorially balanced employment opportunities	jobs where the people are; all regions can offer the jobs needed by the population in order to sustain good standard of living
Innovative knowledge society	territorially balanced access to knowledge: diffusion and transfer to all regions	diffusion of scientific knowledge within the EU through knowledge networks and proactive scientific policy; strong mobility of researchers; state of the art research centers in all metropolitan areas
	highly educated population with ongoing life-long learning in all regions	strong local school systems all up to a European standard; higher proportion of university-level graduates; online life-long learning

General Goal	Concrete Objectives	Proactive Image
	at least 3% of GDP spent for research across the territory	EU-redistributive process for areas where private investments are insufficient
	regional, cross-border and transnational cluster of excellence	cross-border synergies between existing research networks; specific programs for researcher mobility in those networks; pooling of resources
	territorially balanced access to ICT, both for firms and households	high-speed internet access available all over the territory
	territorially balanced uptake/use of ICT, both for firms and households	high-speed internet access as part of basic utilities (together with water, electricity, etc) all over the territory
	economic growth decoupled from (unsustainable) transport growth	regional development based on immaterial economy; local automated production of goods (local production plants, digital fabricators);
Sustainable transport	economic growth decoupled from (unsustainable) transport growth	idem
	higher proportion of public transport and railways in transport networks and usage	HST connecting all cities over a certain population size; high costs for car usage; high-frequency public transport available all metropolitan areas; dense bus networks in rural areas
	territorially balanced accessibility through public transport and railways	idem
	integrated European transport networks, with no borders as barriers	Central binding European transport network planning and implementation; HST connections across Europe
	strong secondary networks	energy-efficient intra-regional public transport (electric buses ?); rapid connections to HST
	strong inter-modal links, especially for freight	inter-modal platforms in each metropolitan area; high-speed freight trains; high-tech, automated transport management
	strong role of inland waterways and maritime transports	European canals network; inter-modal platforms alongside waterways;

General Goal	Concrete Objectives	Proactive Image
Balanced distribution of population wealth and cities, etc.	balanced distribution of population	sufficient local labour force; sustainable dependency rates
	maintenance of population and settlement patterns in peripheral areas	multi-directional migration of choice, not uni-directional migration of need; job/income creation and maintenance of services in peripheral areas;
	balanced distribution of growth and wealth	GDP/capita disparities between regions not above XXX;
	balanced (regional, european and global) accessibility	no region with multimodal accessibility index below XXX
	balanced urban hierarchy	primacy rate not above XXX;
	fair access to public (and private) services across the entire territory	access to services not farther than XXX (differentiated according to hierarchy of services);
	no (demographically and/or economically) 'desertified' areas	balanced age pyramids everywhere; no need to leave a region to have a decent life-style
	diminished importance of borders	harmonization of social security and tax systems; harmonized/integrated administrative procedures across Europe; European nationality
Sustainable settlement structure	compact settlements reducing need for transport	densification within cities
	land use planning and location policy linked to resource availability and public transport	no construction at more than XXX of existing public utility network and of a public transport hub / train station
	little or no urban sprawl, through active management of existing urban spaces	densification within cities; rapid recycling of empty spaces
	integrated management of urban areas and their rural surroundings	integrated governance of FUAs and surroundings (NUTS3/LAU1), especially in terms of land use and transport planning;
Sustainable use of energy	energy-saving construction and organisation of space	densification of cities (less free-standing houses); local alternative energy production (e.g. solar heat collectors, wind, etc)

General Goal	Concrete Objectives	Proactive Image
	high efficiency in energy use	state of the art insulation; combined heat and electricity production; low transport demand
	higher proportion of renewable energies	XXX% of renewable energies; mix according to local resources
	higher proportion of public transport and railways in transport networks and usage	see above
	territorially balanced accessibility through public transport and railways	see above
Socially inclusive society and space	no spaces of poverty	no region with less than XXX of EU median income
	no strong gradients between neighbouring regions	no region with less than XXX of its neighbours median income & GDP/capita
	no (physically) derelict areas	rapid recycling of empty spaces;
	similar access to public (and private) services (including good health provision)	access to 'sufficient' health infrastructure at low cost and in less than XXX travelling time
	no discrimination	no socio-cultural ghettos
	free movement of all citizens	no restrictions on movements of citizens
	a spatially integrated European society	harmonization of social security and tax systems; harmonized/integrated administrative procedures across Europe; European nationality
	widely available, differentiated and affordable housing	no household should pay more than 30% of income for housing
Healthy environment and hazard prevention	strong regional biodiversities	protection of indigenous species and habitats;
	interlinked natural habitats, corridors	a complete network of corridors linking all NATURA2000 areas

General Goal	Concrete Objectives	Proactive Image
	integrated management of environmentally sensitive mountain areas, marine environments, coasts, wetlands, forests and landscapes	integrated governance of sensitive areas, combining environmental, social and economic aspects; cross-border management of these areas
	higher proportion of organic farming, and less pressure on soil	at least XXX% of areas in organic farming; at least XXX% of production from organic farming; direct connections between local producers and customers at regional scale
	reduced air pollution, notably through less traffic	no loss of life expectancy because of fine particles; strong reduction in nitrogen oxide pollution
	reduced erosion and fragmentation	corridors; agricultural surfaces protected from erosion;
	sustainable water management, and reduced water pollution	integrated management of water basins, including across borders; strict pollution control; water saving measures
Diversified cultural heritage and identities	diversified cultural landscapes	maintenance of local landscapes, including related activities
	preservation of cultural heritage, including urban ensembles	creative use and financing of cultural heritage; high level of protection for remarkable sites and ensembles; integration into today's life and needs
	creation of new cultural heritage, including through modern architecture	architectural and urban competitions; proactive master planning
Territorially oriented governance	multi-sectoral approach to regional governance	regional governments/governance bodies with integrated competencies
	collaboration between all different levels of policy making	negotiated decision-making across levels; bottom-up governance for local initiative combined with top-down governance for redistribution
	general (and early) use of territorial impact assessment and expert groups for evaluation of projects and policies at all levels	TIA included in existing IA measures; network of regional expert groups
	networking of towns at national and transnational level	networking of towns for governance and regional planning issues;

General Goal	Concrete Objectives	Proactive Image
	generalised use of (decentralised) open method of coordination	open method of coordination applied at all scales, i.e. also within a national and regional context

5 Wild cards

Alexandre Dubois & Chris Smith (*Nordregio*)

5.1 Defining Wild Cards

When asked by a young journalist what was it that made his job so difficult, the then British Prime Minister, Harold Macmillan, replied in his own inimitable fashion… '*Events, dear boy, events!'*

Wild Card usage has been extensively developed in the corporate business world, particularly by companies dealing with strategic commodities in global markets (i.e. the nexus between warfare, oil, and energy). The purpose of Wild Cards is here usually to test the *reactiveness* of a given system – usually a large organisation – to unforeseen but high impact events. Such an approach is seen as highly useful to the organisations involved in 'turbulent and unforgiving environments' (Mendonca *et al.*, 2003).

As it tests the reaction capacity of a given organisation, the impact of the Wild Card in question, even if it is very high, cannot however be totally destructive, otherwise there would not be anything to 'fix' or to 'adapt to'. Wild Card analysis is thus generally seen as a means to 'ignite a strategic conversation' in the context of any given organisation (Van der Heijeden in Mendonca *et al.*, 2003).

A Wild Card can be defined as, 'a future development or event with a relatively low probably of occurrence but a likely high impact on the conduct of business' (BIPE Conseil *et al.*, 1992).

The analysis of Wild Cards is intimately linked to the notion of foreseeing potential futures. Indeed, by looking back at the developments that have occurred in recent decades it becomes obvious that the key moments impacting the development of our societies could often be retroactively traced as Wild Cards. In such cases, the Wild Cards that were developed in the circle of 'think tanks' became real events: the terrorist attacks of the 11th of September, the break-up of the Soviet Empire, the Asian tsunami…

The array of Wild Cards can be as broad as the human imagination itself, though their main characteristics are that they are ***improbable*** (but not entirely impossible) and with potentially ***wide-ranging impacts***. Consequently, 'wild cards change our frame of reference, our mental map of the world' (Steinmüller, 2004).

If the construction of Wild Cards is for the most part an imaginative process, being able to do this in a systematic manner exponentially increases the explanatory power of the exercise. Moreover, Wild Cards have to reflect the potentially different types of causes and origins of such events in order to display a wide array of potential impacts. The most difficult task in the Wild Cards exercise is therefore to structure the conception of such wild cards, in order to optimize their potential for analysis.

Long run/creeping catastrophes –*v*- Hollywood-style 'fatal impacts'

Finally, Wild Cards are often thought of as necessarily negative events, but this depends on the perspective one has (most of the time, there are both winners and losers). It is therefore interesting to bear in mind, while building the Wild Cards, that the outcome can also be positive.

5.2 Building Wild Cards

The conception process designed to identify the potential Wild Card is, of course, the key moment in utilising Wild Card analysis. In this exercise, we intend to build our Wild Cards along four main dimensions:

- Sudden event or long-term process?

Wild Cards are often described as sudden impact events that literally appear 'out of the blue', what we could call '*Hollywood-style' Wild Cards*. While such events can potentially manifest themselves rather suddenly, they nevertheless can potentially have deep antecedent causes that are often not perceived, or at least not perceived correctly. Moreover, Wild Cards can also be the result of multiple causes, and because the impacts not only add to, but also synergise with each other, the total impact becomes overwhelming. Wild Cards can then potentially emerge as:

(1) The result of a sudden random, unforeseeable, event
(2) As the sudden realisation of the importance of a long-lasting process, a *creeping catastrophe*, with climate change perhaps being the most striking contemporary example, or,
(3) In connection with the realisation of the emergence of a future potential problem.

- Plausibility: between imagination and likelihood

The question of plausibility is of course central to the exercise of Wild Card-building. In this respect, the task reveals two main obstacles. Firstly, because each of us is bound by our own *limited* perspective on events, the question of whether an event can be seen as 'more or less probable' is often difficult to definitively assess from any one individual perspective. In order then to open up the largest possible window of perspective, Wild Card construction

should be a collective process. Secondly, because Wild Cards are meant to be unpredictable, they are often initially difficult to conceive (Mendonca et al., 2003).

The degree of plausibility for any Wild Card can be assessed by using a 'surprise matrix', divided in four categories (Mendonca et al., 2003).

The plausibility scale proposed ranges from 'unimaginable surprises' to 'certain surprises', displaying an increasing likelihood that the event will occur *at some time* in the future.

(1) ***'Certain surprises'*** can, for instance, include earthquakes or other natural disasters: everybody intuitively knows that they are going to happen (i.e. in San Francisco, California), there is then a certain predictability in respect of pervious historical patterns of activity, but the issue of *exactly* when and where is simply not foreseeable.

(2) The category of ***'imaginable and probable surprises'*** could entail for instance, the re-emergence of political troubles in Russia, with Russia becoming increasingly authoritarian once again and undertaking to 'renationalise' many of the industrial sectors that were privatised during the Yeltsin years.

(3) Concerning ***'imaginable but improbable surprises'***, one such example could be gauged in relation to the political inability of the global community to solve the problem of oil dependence. As such, when the oil does effectively 'run dry' there is a refocusing on the bicycle in respect of personal mobility issues.

(4) Finally, as it seems difficult to imagine the unimaginable, we will leave the potential content of the ***'unimaginable surprises'*** category to the reader.

- Topic or subject:

There are five distinct topic areas that are cited in the literature on Wild Cards (Mendonca et al., 2003; Steinmüller, 2004): military/political, technological, economic, socio-cultural and environmental/biological (i.e. the PESTE framework).

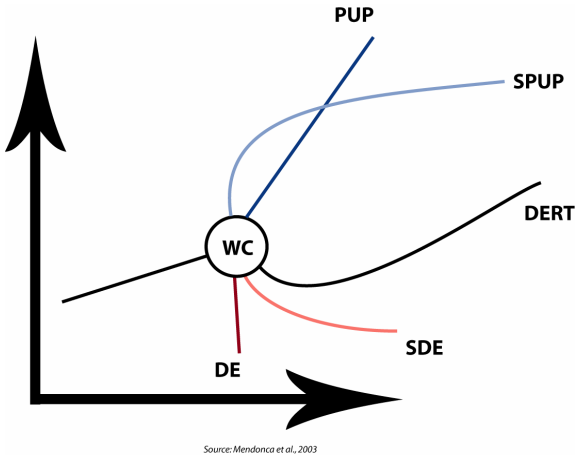
These topic areas cover a wide array of potential Wild Card situations, the common denominator here being that these subjects are deemed the most likely to have a significant impact on the overall future development of our societies.

- Impact:

An assessment of a Wild Cards' impact is directly linked with our ability to assess the response of the scenarios to the Wild Card itself, particularly in respect of their stability and sensitivity (Mendonca *et al.*, 2003). As Wild Cards are often described as *breaks in the development trend*, describing the type of break thus becomes essential and in the available literature has generally been grouped into 5 categories (Mendonca et al., 2003):

i. Dead End (DE)
ii. Slow Dead End (SDE)
iii. Dead End to a Recovery to Trend line (DERT)
iv. Push Up to Positive direction (PUP)
v. Slow Push Up to Positive direction (SPUP)

The figure below is an attempt to summarize those different categories of breaks.



Other characteristics are however also of importance when delimitating the impacts of the various Wild Cards. Firstly, a potential Wild Card becomes a Wild Card in practice *only* when it is *perceived* as such. Consequently, the timeframe of the Wild Card could be defined as the amount of time that is spent between the occurrence of the event, or its recognition as an inevitable 'creeping catastrophe', and its perception by the general public. This amount of time can be close to zero (especially in the case of so-called *Hollywood* Wild Cards), or on the other hand be as long as several, or indeed many years, as for instance with the climate change example.

It is however important to also note that, in a pedagogic sense at least, *Hollywood-style* Wild Cards that have a sudden and terrifying impact, and that are basically unforeseen until the point where only the 'superhuman' powers of a 'Bruce Willis hero-figure' can deal with

them are not very useful for our purposes. We would therefore do well to remember that the heritage of Wild Card analysis is in the business field of organisational management etc., where the point of this type of approach is to *enable organisations to adapt* to external 'shocks', which could entail even the seemingly most mundane of issues – depending on the organisation in question – such as a rise in the price of a bottle of milk.

Secondly, the actual impact could range from being locally felt to being a total system shock. As such, the impacts of various different Wild Cards can be differentiated rather than uniform in some cases, though in others, of course, the effects can be uniform across the board.

Finally, and particularly so in the case of our territorial scenarios, it would be interesting to be able to assess the territorial extent of the impacts: i.e. their micro, meso, and macro implications?

5.3 Examples of Wild Cards

As this initial draft on the application of Wild Card analysis to the development of scenarios was intended to draw out the methodology that lies behind the conception of Wild Cards, we will not yet attempt to provide here a list of potential Wild Cards. [This will be our task for the beginning of 2006]

On the contrary, in order to as efficient as possible, the Wild Card construction process should be based on collaboration between the different groups of researchers, ensuring that we continue to test our own disciplinary, ideological, and experiential frontiers, thus taking us beyond the imaginable and the probable.

A summary table of the main characteristics of the Wild Cards will, in this manner, work as a help-aid when drawing the Wild Cards.

		Environmental Biological	Slow Push Up in Positive direction		
	Unimaginable	Socio-cultural	Push Up in Positive direction		
Realisation of the emergence of a future potential problem	Imaginable and probable	Economic	Dead End to a Recovery to Trend line		
Sudden (Hollywood-style)	Imaginable but improbable	Technological	Slow Dead End	Delayed	Total
Long-term (Creeping catastrophe)	Certain	Military and political	Dead End	Immediate	Local
Process	Plausibility	Topic/Subject	Break type	Time	Impact

How can we seek to use the table? As an example:

Wild Card: ***Cold Fusion Energy***

- Process: long-term because it is the result of research, though the process of public perception is sudden: WE DON'T NEED OIL ANYMORE!
- Plausibility: Imaginable and probable
- Topic: Technological
- Time: delayed because the technology has to be tested, scaled and made commercially viable
- Impact: total, because it redistributes the energy cards around the world. The leaders are no longer the Oil-rich countries, but those that can master this technology. (Adapted from Steinmüller)

5.4 Wild Cards and ESPON 3.2 Scenarios

As the ESPON 3.2 project deals with the conception of strategic scenarios for the future development of the European territory, Wild Card analysis can be useful in studying the internal reaction of the policy scenarios to certain external system shocks.

5.4.1 Aim of the Wild Card analysis

In the framework of this project, the Wild Cards would serve as a sounding board for the developed scenarios, that is to say the baseline scenario, the two prospective scenarios, and the proactive scenario. The aim is to test qualitatively the reaction of each scenario to a panel of unexpected and potentially high-impact future developments.

The Wild Card analysis does not occur during the scenario-construction phase, as it can only be performed *after* the four different scenarios are completed. However, it should be fully integrated into the overall scenario process, as a reflexive exercise. That is to say, by testing the reactiveness of the scenarios to an external stimulus, this type of analysis enables the scenario team to elicit feedback on the coherence and relevance of the integration of its various thematic scenarios. In that sense, the Wild Card analysis functions as an *ex-ante* evaluation of the scenarios.

The scenarios that have been developed within the framework of the ESPON 3.2 project have been built along several themes. As the individual impacts are however difficult to gauge, and because it is often difficult to perceive the scenarios as a whole and not as the sum of their thematic parts, the assessment of the response of the scenarios to the selected Wild Cards can improve the understanding of how their individual parts interact with one another.

5.4.2 A three-step process

The process of the Wild Card analysis will be performed in three successive phases:

(1) Identification of the system to be tested
(2) Creation and description of the Wild Cards
(3) Application of the Wild Cards to the 4 scenarios

(1) The Wild Cards are designed to test the individual scenarios ability to deal with the impact of the wild card in question, with a particular focus on their likely territorial impacts. Indeed, the scenarios developed in the framework of this project not only describe the future territorial development of the European Union, but more particularly the policy measures and choices that are to be taken in order to achieve the overarching goals, such as *Competitiveness* and *Cohesion*. In that sense, the system that should be under scrutiny here is the policy-related developments in Europe and their territorial impacts.

(2) The second identified step in the Wild Card analysis process is the creation and description of the Wild Cards themselves. The intention for this project is to try to create the Wild Cards in a systematic manner, in order to increase their explanatory and pedagogic nature. The team suggest that a set of 10 to 12 Wild Cards should be chosen. The set

should display a wide variety of Wild Cards, especially when it comes to the topic (technological, political, environmental…) or type of impact (Dead-End, Push-Up, etc). The team believes that it is important for the relevance of this particular exercise that the topics of the Wild Cards should not reflect the different themes that were used when building the scenarios (governance, transport, enlargement…). The reason for this is that the thematic scenarios developed in the first half of 2005 were only a step towards the integration of larger and integrated scenarios, and that pursuing this thematic decomposition of the scenarios could, in the end, jeopardize their coherence.

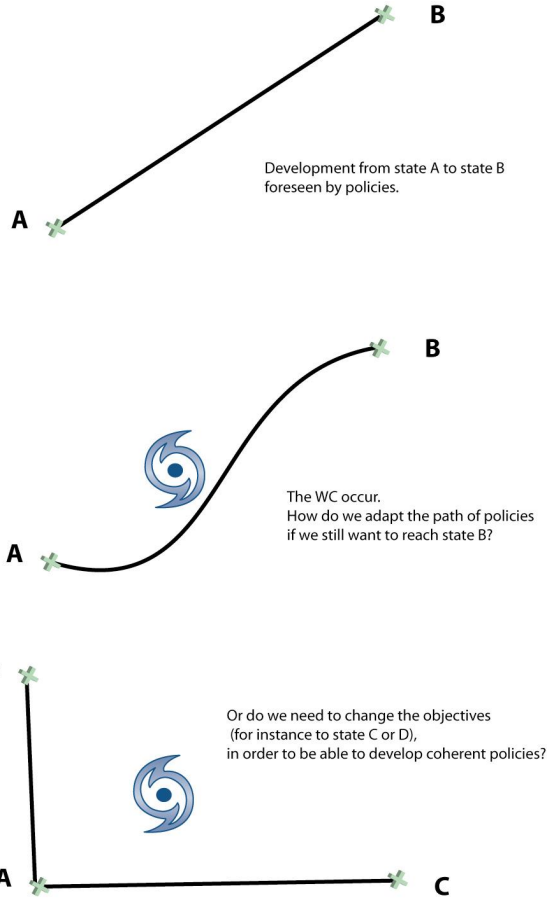
Furthermore, it is important to create Wild Cards that are tailor-made for our particular exercise and for the system of reference, namely developments in Europe at the territorial level. Indeed, the most difficult task is not to come up with Wild Cards *per se*, as there are plenty of publications already dedicated to providing and assessing them, but to come up with Wild Cards that are highly significant in the context of this ESPON 3.2 project.

In order to clarify then, let us take a more concrete example. As such, though the collision of the earth with an asteroid is often cited as the 'classical' Wild Card, how will it impact the transport policies of the EU? Or the Rural development policies? What we mean here is that for a Wild Card to be used efficiently in the analysis, it has to impact directly the system under scrutiny. In that sense, a Wild Card dealing with the doubling – with a decade – of life expectancy would raise more interesting issues (demography, retirement age…) than the 'classic' asteroid Wild Card, once again within the framework of this particular project.

(3) The final step in the Wild Card analysis process is the application of the chosen Wild Cards to the 4 scenarios developed in the framework of the ESPON 3.2 project. In order to create a comparative matrice and to assess the differences in response in terms of the scenarios, each Wild Card will be applied to all four scenarios. The application will result in a qualitative assessment of the policy-related and territorial impacts that the Wild Card has on the scenario.

Through this exercise will intend to emphasise the potential strengths and weaknesses of each scenario, when facing a particular and/or disturbing event. The wild card analysis will enable us to define new 'final images' in the scenarios that are not the result of policy developments but of an unexpected event. It would then be interesting to describe how far these new final images differ from the expected pictures.

Some further questions also emerge from the Wild Card analysis in the context of the ESPON 3.2. Scenarios. How would the potential Wild Card impact the achievement of the given objectives (Competitiveness, Cohesion, or both)? Is it possible to simply adapt the policies to the new preconditions given by the Wild Card, and therefore keep the final objectives intact? Or is it necessary to define new objectives? An attempt to illustrate those possibilities is given here below.



For instance, the states coul d be:
A Present situation
B Competitive and Cohesive Europe
C Cohesive Europe
D Competitive Europe

5.4.3 Expected outcome and results

The expected outcome of the wild card analysis is that we expect to have a better understanding of how the integrated scenarios behave when they are faced with an unexpected event or sudden development.

Second, the wild card analysis will be designed with a view to the construction of a new and original perspective on the scenarios, by challenging their reasoning and by introducing an unknown and unexpected element into scenario development. The wild card analysis aims at fostering discussion around the question: 'What if this happens…?'.

Finally, to conclude this brief summary of the use of Wild Card analysis in scenario making, we will quote Steinmüller when he stresses the reasons for using Wild Cards in scenarios:

- to complement the approach
- to test the stability of the scenarios
- as an eye-opener for the participants in the process
- and to counteract certain pitfalls (lack of imagination, wishful thinking/hyper-worst-case thinking) (Steinmüller, 2003)

5.5 Wild Card analysis Template

This section provides an initial attempt to build some potential scenarios. In the box below, we have a template for scenario construction, while in the following table we have outlined twelve possible scenarios for future consideration. These scenarios have different types of impacts at different levels and in different geographical areas. This should be treated very much as a 'first-cut', and as such, does not necessarily represent the final product for this section of the project.

Scenario Name

'Bruce Willis goes *boom boom*' etc

Type (PESTE framework)

Description of the type of Wild Card, using the PESTE framework developed earlier in this section. Moreover, the attributes of the Wild Card's impact will also be developed in this section (local/global, immediate/delayed, DE/SDE/DERT/PUP/SPUP…). These attributes will enable to make each Wild Card more specific, and thus to enhance its specific effects.

Description of the event

In this section, the chain of events and the event itself will be described.

Territorial impacts

This section will more specifically deal with the spatial consequences of the Wild Card on the European territory. This of course will be tightly linked to the places of occurrence of the Wild Card. But in more general terms, the wider repercussions on the European territory will be analysed, i.e. how the metropolitan areas will be affected or how it will impact the sustainability of the EU transport networks. We will try to base the analysis on the thematic division of the different scenarios (transport, energy, environment, rural development). In that sense, the Wild Card exercise will have a stronger impact by stressing the specific substantial changes that it has provoked on the European territory.

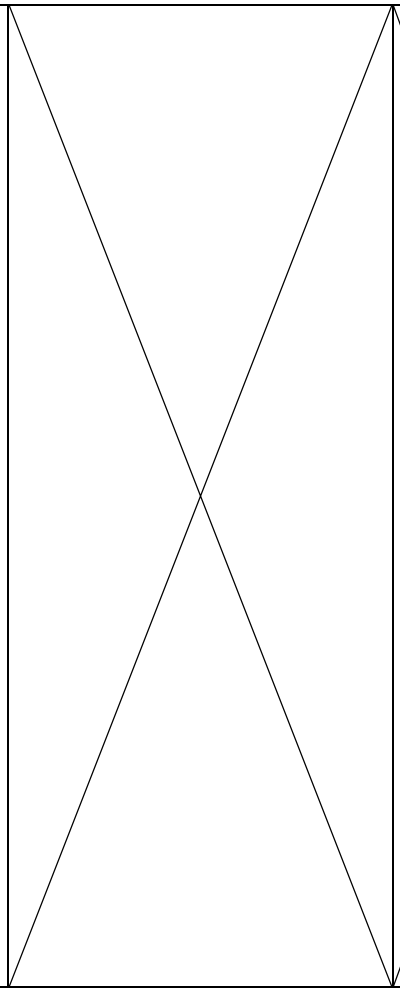
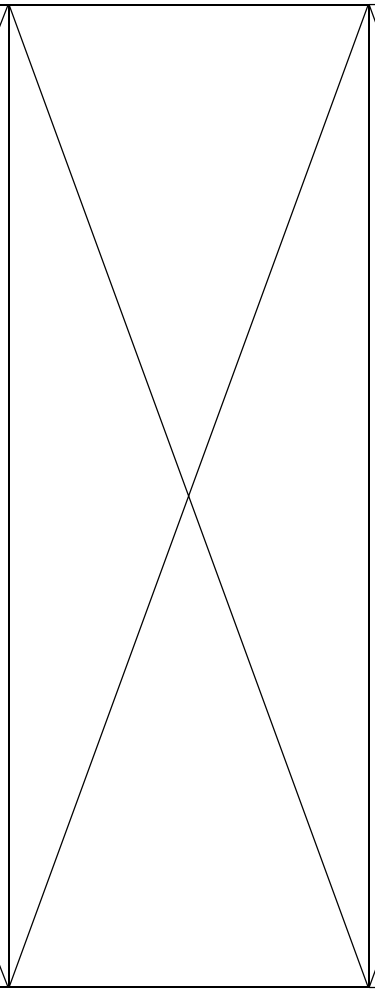
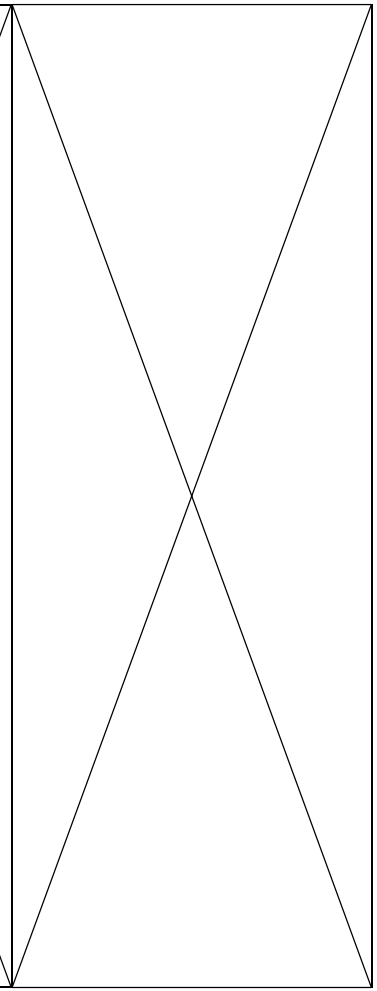
Visualisation

This final section will help the reader visualise the territorial impacts of the Wild Card on the European territory. Indeed, if the latter section was a more qualitative analysis of the impacts, in this section we will intend to draw the models' parameters (from MASST, KTEN and ETCI models) that are the most affected by the Wild Card: for instance, a very high oil price or very low fertility rate. We will draw a quantitative assumption of the changes to serve as a new input for the models developed in the framework of the ESPON 3.2 project. In that manner, we will intend to assume, with the help of the models and mapping visualisation, the territorial disparities provoked by the Wild Card.

5.6 Preliminary list of Wild Cards

POLITICAL & MILITARY	ECONOMIC	SOCIO-CULTURAL	TECHNOLOGICAL	ENVIRONMENTAL & BIOLOGICAL
Member State leaves the EU Following a Conservative electoral victory in the UK, Eurosceptic forces question the relevance of its participation in the EU, particularly in light of the decisions to promote territorial cohesion and tax harmonisation as basic EU goals. A referendum is called on the issue, and the people of the UK vote overwhelmingly to leave the Union.	**Massive devaluation of the Euro**	**Islamic expulsion from Europe** The continuing rise of Islamic fundamentalism within Europe's Muslim populations, combined with increasing social disorder and terrorism in urban areas with large concentrations of new or recent immigrants, forces European governments to take concerted action to organise the large-scale 'repatriation' of people of Islamic faith – particularly those from Pakistan, North Africa and the Middle East.	**Nanotechnology Breakthrough** Nanotechnology provides the possibility to researchers and then to industrials to manipulate atoms or molecules at a minute scale. The commercialisation of this technological breakthrough totally changes some major industrial sectors: lighter materials, chemicals that are more efficient, cures for major diseases etc etc.	**Atlantic tsunami** Significant volcanic activity on the Atlantic Seabed causes a major tsunami to occur, impacting both sides of the Atlantic coastline. In Europe, the worse affected areas include the Republic of Ireland and the Iberian coastline. The Azores and the Canaries suffer catastrophic economic and social damage.
Middle East embraces democracy	**Collapse of fishing stocks in North Sea**	**Large-scale internal European migrations**	**Nuclear incident** The continually rising oil	**Major river pollution incident**

Following the crushing of the insurgencies in Iraq and Afghanistan and the Israel-Palestine Peace Agreement, democracy sweeps across the whole region as both one party dictatorships and traditional kingdoms are swept aside in favour of democratically elected regimes.	After a number of years of increasingly tight fishing quota regimes, the Commission decides that the situation is still not improving, thus a complete ban on fishing for most species in the North Sea is implemented with immediate effect. Money is however set aside to help fishing communities re-skill etc.	After a period of successful tax and benefits integration across the Union increasingly large numbers of relatively rich retirees immigrate from Northern to Southern Europe, which combined with the continuing movement of the young from 'country to town' sees an unprecedented level of depopulation in Northern Europe, combined with massive overcrowding in the most popular parts of Southern Europe.	price hastens a return to nuclear power across Europe. In Slovakia, the Mochovce reactor on the Slovak-Hungarian border north of Budapest – built using old Soviet era technology, though upgraded in the late 1990s – experiences a 'significant nuclear incident' on a similar scale to that of Chernobyl. Immediate contamination includes the area west of Mochovce, encompassing the territory between Bratislava and Budapest.	A major accidental spillage of a strong concentration of heavy industrial compounds; sees the large-scale contamination of the Rhine river. A 100km buffer zone in the Essen and Düsseldorf area is affected. The incident occurs during the summer period when the water is most needed, entailing a significant water shortage for the Ruhr cities, and an agricultural disaster for the Netherlands.
Russia 'blackmails' EU over energy prices In addition to ongoing price rises for its gas (justified by the continual	**EU 'tax harmonisation' approved by core group of Member States** While EU tax rules are			

rise in the price of oil) Russia begins to pressure her East European neighbours and West European customers in terms of artificially restricting gas volumes. This is seen as part of a wider political attempt to restrict EU growth and cohesion. Attempts are made by Russia to negotiate with individual states over quotas etc, while Russia-EU relations reach an all time low.	based on the unanimity principle, fierce debate continued over the need for the harmonization of corporate taxes in the EU with, in addition, a minimum rate of 25% to be applied across Europe. A core group of Member States, based on France and Germany, decide that an *multi-speed* approach to integration in this field is necessary. The EU divides into two tax camps, with Britain, Ireland, Portugal and the New MS in one camp, and the original EEC 6, Austria, and the Nordic members in the other.				

All of the 'wildcards' summarised above have potential impacts that are theoretically infinite and thus difficult to map. In this sense, we should rather see the wildcards as attempts to 'test' a specific are, sub-section, or component of the wider European territorial system. As such, we cannot hope – at this level – to follow the development of the individual wildcard down onto the level of the minutiae of outcomes and impacts it could generate. Instead, we will focus on the macro-territorial level, where, in effect, the wildcards help us to ask questions in an illustrative manner like, *what happens if…*

(1) A 'major net contributor' leaves the EU…
(2) A significant portion of EU territory is in some way made unusable…
(3) A major change in EU population levels, or their spatial distribution, occurs….
(4) A major change occurs in the 'balance of power' within the global monetary system…

Such 'macro-level' changes will have significant economic, social, cultural effects. They will also however have important effects on regional transport systems and labour market patterns etc.

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6 Brainstorming on visualisation of scenarios

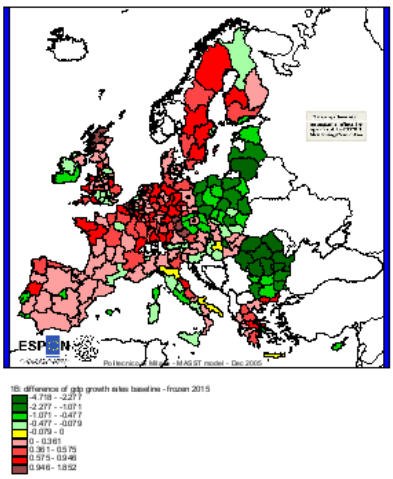
As scenarios are meant as discussion support and communication tools, their presentation is a very important aspect in the overall process. Visualisation of the processes and of the projected territorial outcomes are, therefore, integral part of what constitutes the scenarios.

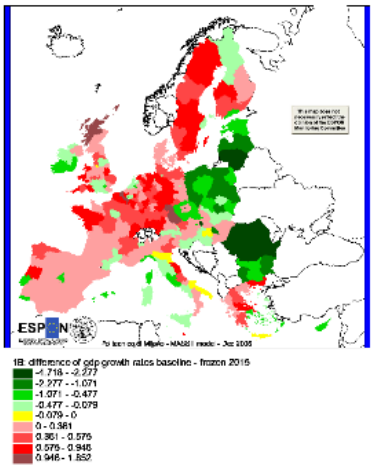
As one needs content to visualise, the main work on visualisation will start now, after this report, on the basis of the first drafts of the scenarios. The team has already begun the process through a series of brainstorming exercises, at meetings or individually.

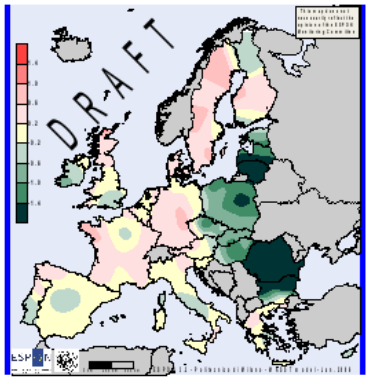
This section presents some of the results of these exercises. It is very important to understand that **the following images are (for the most part) not visualisations of the concrete scenarios**, but only exercises based on some of the concepts and driving forces identified. They have not been validated, neither by the team, nor by the ESPON Monitoring Committee. They are, therefore, to be understood as concrete examples of what is possible, in order to support the discussion with the Monitoring Committee.

6.1 Mapping quantitative projections

Quantitative projections are an important support to the scenarios. The team has spent quite some time searching for the best compromise between displaying as much information as possible and not giving the illusion of precise predictions. The figure below shows three different attempts from normal mapping to fairly long-distance smoothing. In this report the middle version, a map without borders, was chosen as the smoothed map was considered as too different from the model results. For the final report the search for solutions will continue.

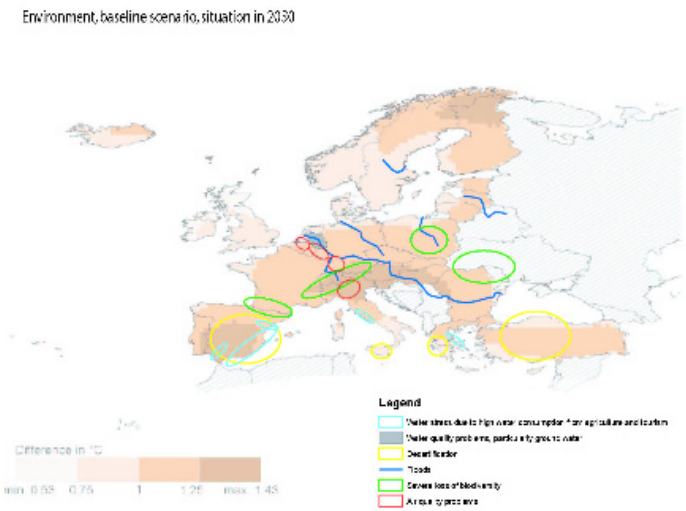






6.2 Sketching thematic scenario outcomes

Some of the team members have attempted very simple sketches in order to illustrate the geographical distribution of certain thematically limited aspects of the scenarios. In the next phase, these sketches will serve as basis for integrated schematic maps combining the different themes.


Environment, baseline scenario, situation in 2030
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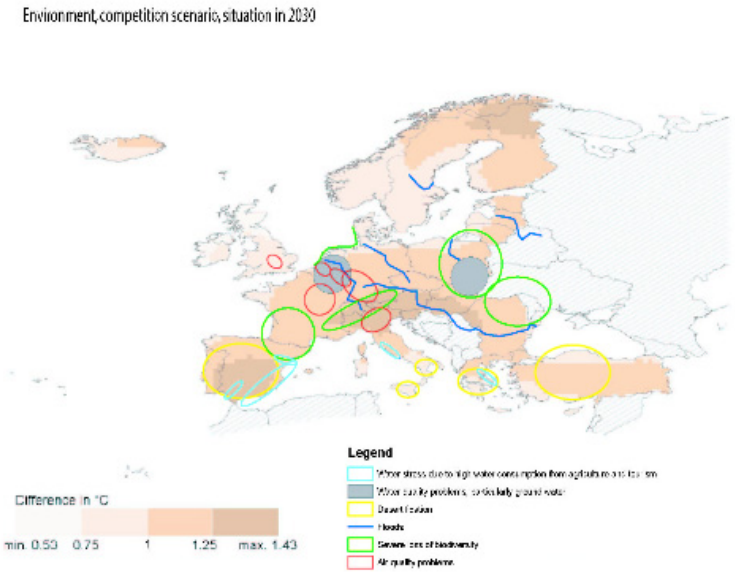
Environment, competition scenario, situation in 2030
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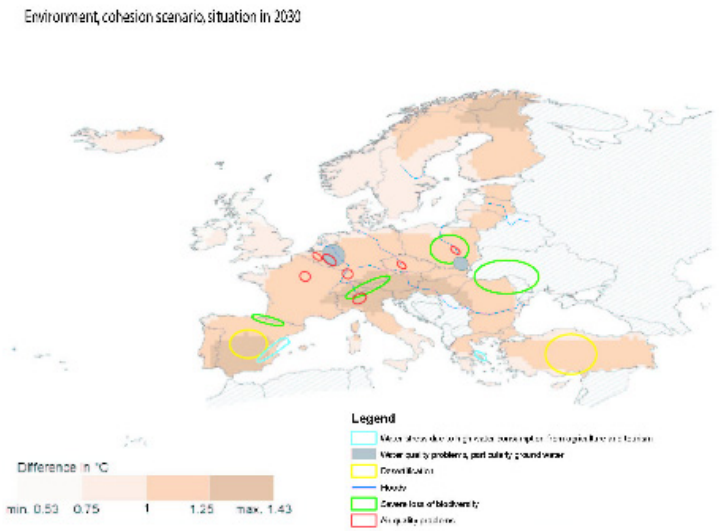
Environment, cohesion scenario, situation in 2030
Legend
Difference in °C
min. 0.53
0.75
1
1.25
max. 1.43

Figure

6.3 Schematic visualisation of driving forces and evolutions

The following images are the results of a brainstorming exercise done by the TIGRIS team. These were inspired by the scenario hypotheses and sketches, but with a very high degree of freedom, the idea of this exercise not being to depict the actual scenarios, but to open the mind to more diverse forms of visualisation.

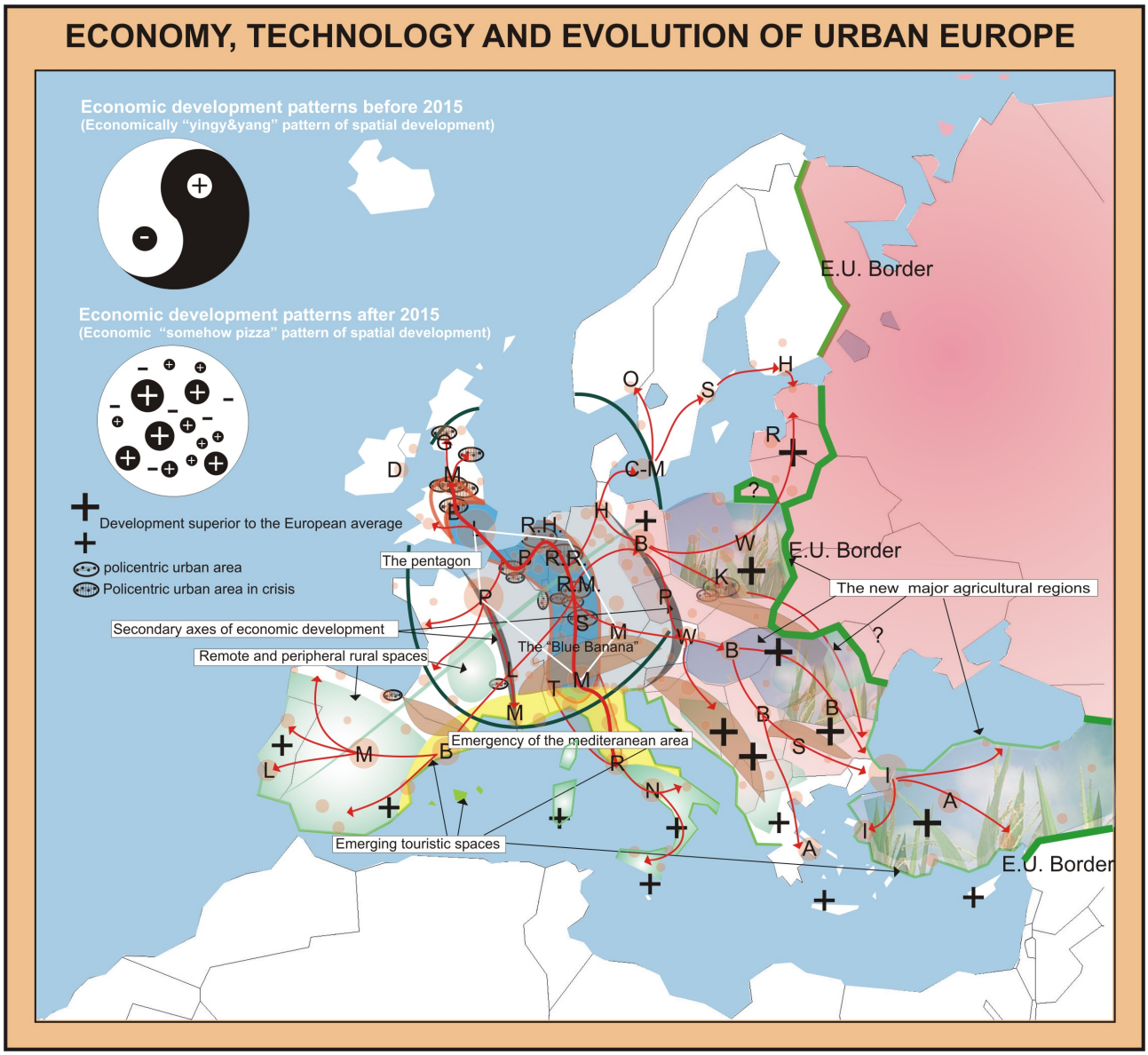

Figure 10 Economy, technology and evolution of urban Europe

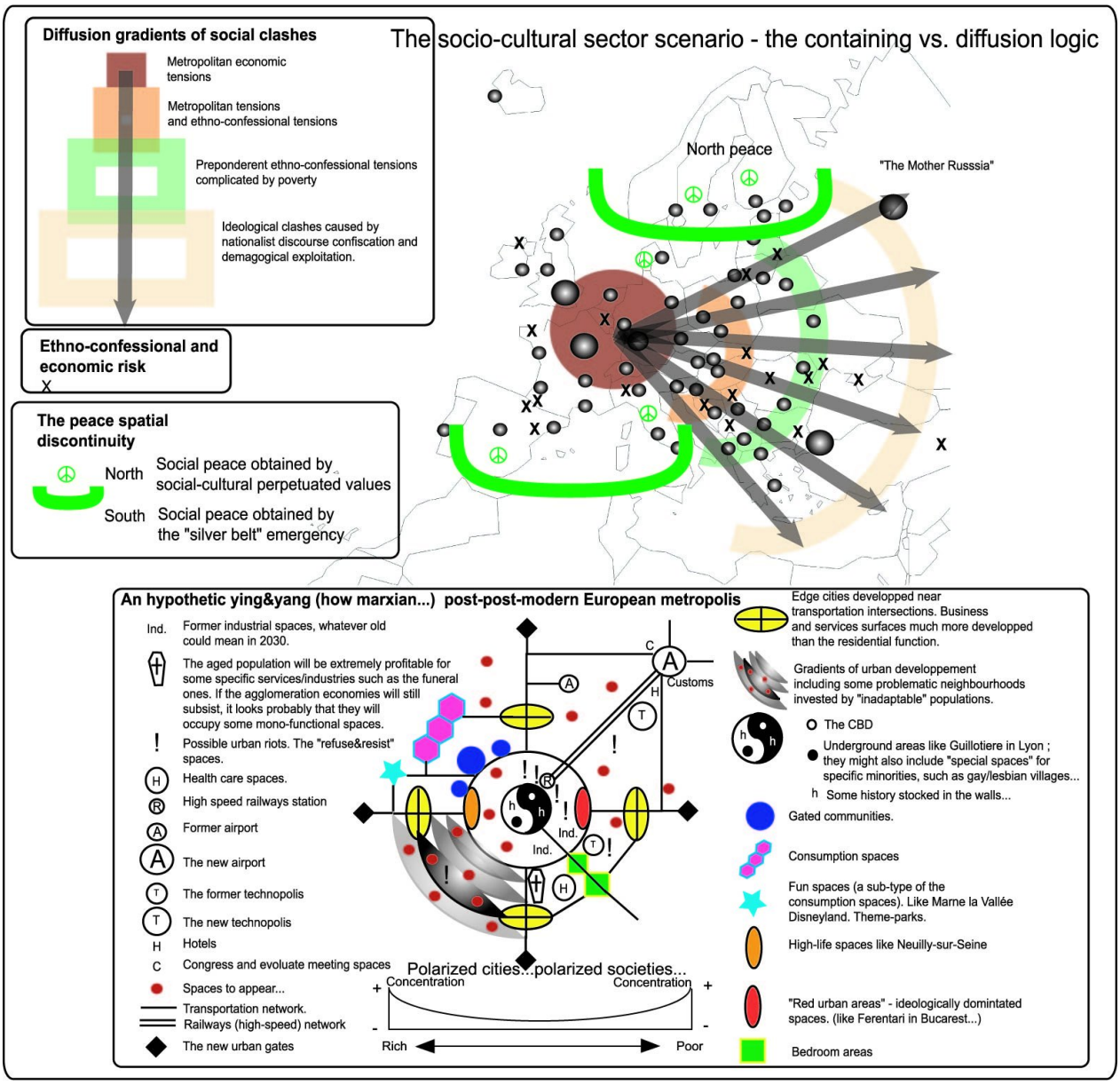

Figure 11 The socio-cultural sector scenario – the containing vs. diffusion logic

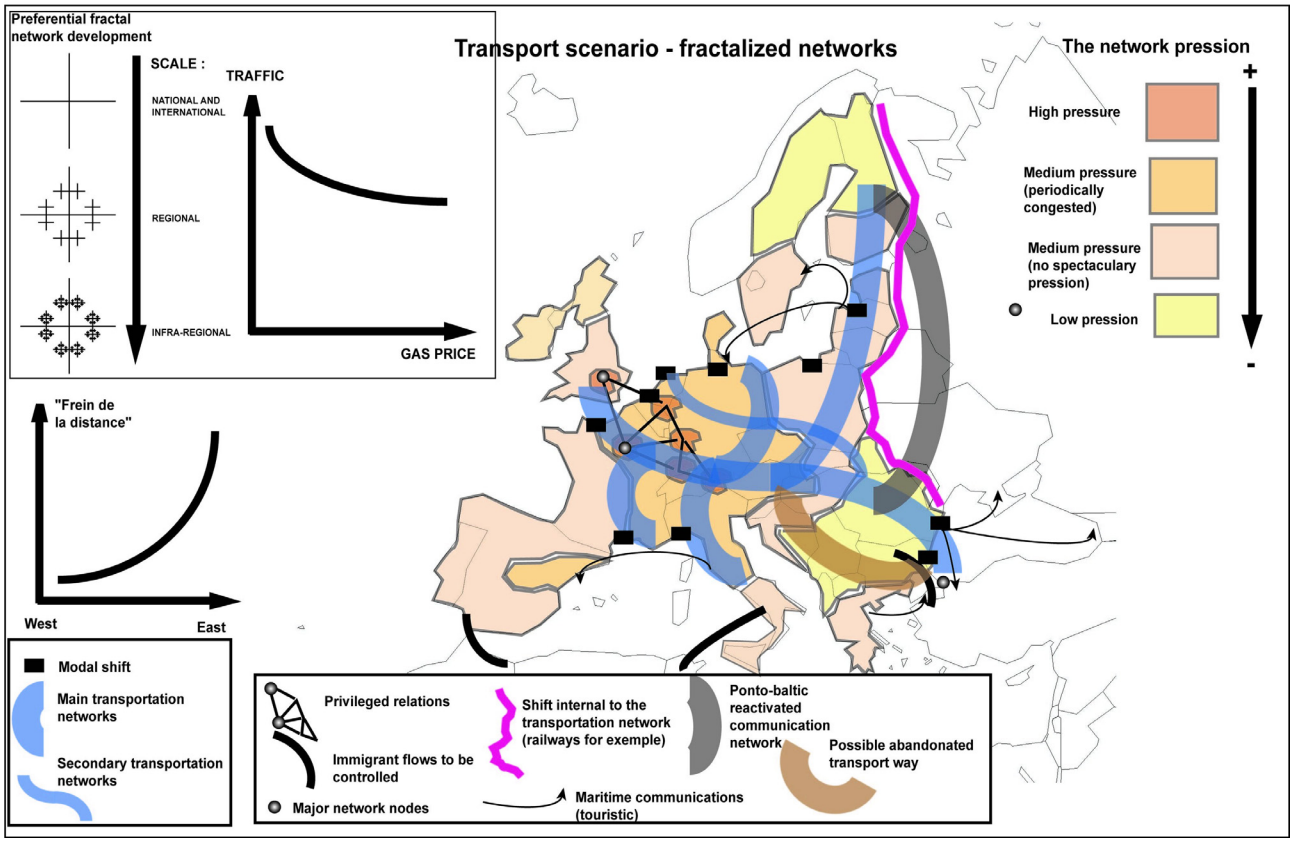

Figure 12 Transport scenario – Fractalized networks

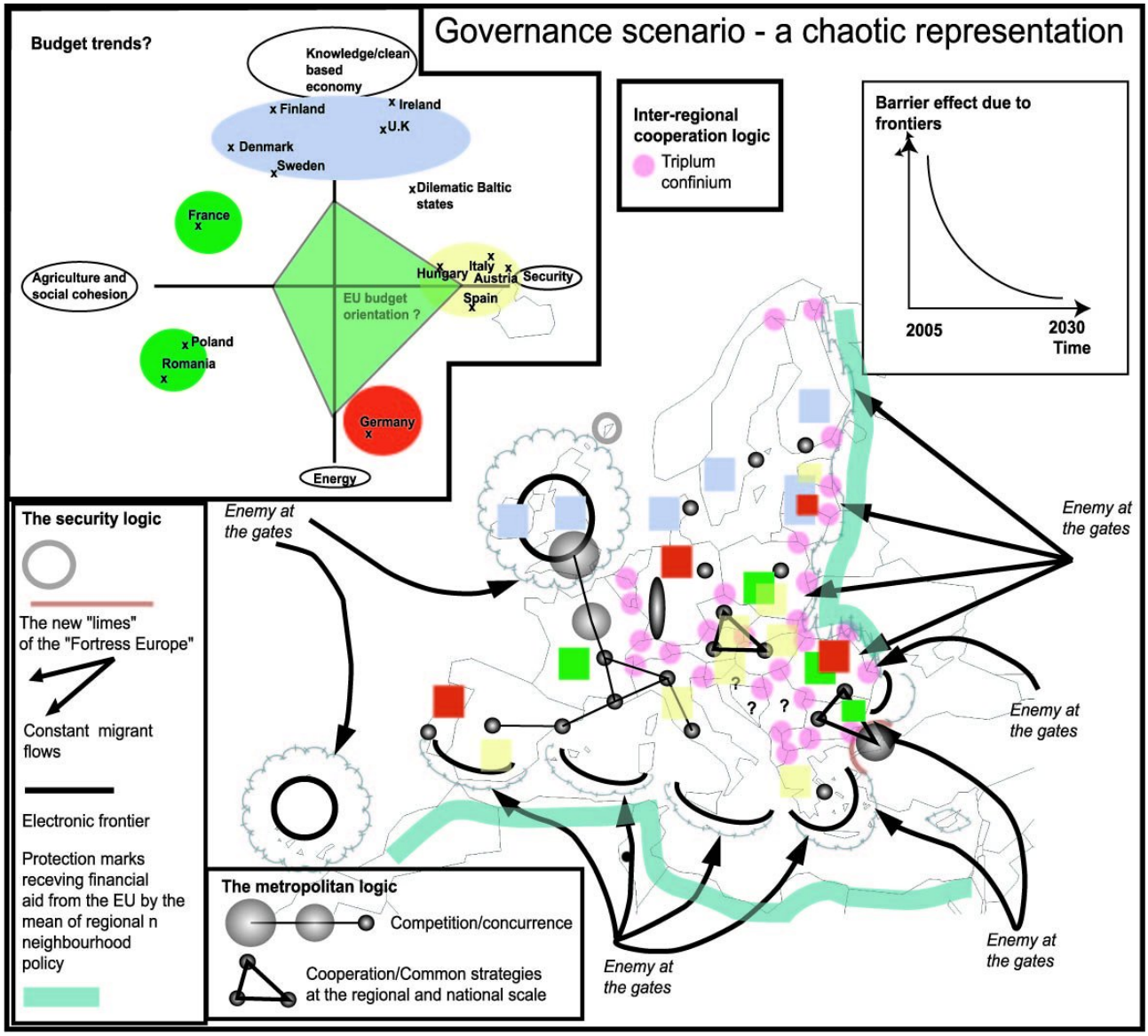

Figure 13 Governance scenario – a chaotic representation

6.4 Animated visualisation

Finally, the MCRIT team has worked on animated forms of visualisation. Again, at the current state these are to be considered as completely free-form results of brainstorming and not as the actual visualisations of the scenarios. It is, obviously, impossible to include these animations in this report, so we ask the reader to visualise them via a web browser at the following addresses:

http://www.mcrit.com/scenarios/scans.htm (loosely based on thematic sketches by team members)

and

http://www.mcrit.com/scenarios/animacions.htm (free artistic impressions on different concepts concerning Europe and its development).

ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

TPG members

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IGEAT – Institut de Gestion de l'Environnement et d'Aménagement du Territoire, Université Libre de Bruxelles (Belgium)

- **Co-leader:**

AETS – Agence Européenne «Territoires et Synergies » (France)

- **Partners:**

BBR – Bundesamt für Bauwesen und Raumordnung (Germany)
CRS- HAS – Centre for Regional Studies of the Hungarian Academy of Sciences (Hungary)
CUDEM – Centre for Urban Development and Environmental Management (United Kingdom)
DIG – Department of Management, Economics and Industrial Engineering, Politecnico di Milano (Italy)
MCRIT – Barcelona (Spain)
NISR – Ruimtelijk Planbureau (Netherlands)
NORDREGIO – Nordic Centre for Spatial Development (Sweden)
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ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

Volume 4
Elements of support
for the scenario building process

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

This basic report exists only in an electronic version.

Table of Contents

Figures and tables

Introduction

This volume presents different aspects of the project, most of which are more 'behind the scenes', i.e. all the work less visible than the actual scenarios, but without which the scenario building process would not be possible.

This project was supposed to elaborate spatial scenarios on the basis of the existing ESPON results and using the data collected by the other ESPON projects. From the very beginning it was obvious, however, that in spite of the tremendous achievements of ESPON, this would not be sufficient for the demands of the elaboration of complex integrated scenarios which have to take into account many more factors than the ESPON programme could cover and longer time series than present in the ESPON database. This is reflected in the work on the scenarios bases presented in volume 2 of this report, but, from the outset it was also decided to develop a series of quantitative tools in support of the scenario building process. These are the MASST and KTEN models for, respectively, economic and transport forecasting, the work around the elaboration of a European Territorial Cohesion Index and the elaboration of the structure and first implementation of a Long-Term Database.

Another very important part of any scenario building is the communication of these scenarios, both to experts for validation, but also, and even more so, to a general public of policy makers at different levels, other stakeholders and the population as a whole. We, therefore, also briefly present our efforts and ideas for these elements.

Models and tools in support of scenario building

1 MASST - MAcroeconomic, Sectoral, Social and Territorial

Politecnico di Milano

Prof. Roberto Camagni (responsible person)
Prof. Roberta Capello
Prof. Barbara Chizzolini
Dr. Ugo Fratesi
Dr. Alessia Spairani

This report has been written by Ugo Fratesi

1.1 Introduction

The third interim report presented here contains most of the work developed to obtain the estimates and the simulation of the quantitative scenarios within the ESPON 3.2. project.

Since the SIR, therefore, much progress has been made. First of all, the conceptual logic of the MASST model has come to a final formulation, which has also been 'tested' by presenting the theoretical approach of the model to a scientific audience in a conference. Secondly, the research group worked on the estimates of the past trends, and final results have been achieved also in this respect. Thirdly, the simulation step has been tackled and, working full time on the project, all phases of the simulation have been developed and results achieved. The simulation step requires:

- qualitative assumptions on the scenarios. In this respect, the research team of the Politecnico of Milan has worked together will all other teams and elaborated the three scenarios: the baseline, the competitive and the cohesive scenario;

- the translation of the qualitative assumptions into quantitative ones. This step is a very critical one, and required a lot of work, reading official documents on future quantitative scenarios and elaborating on past and future trends of the exogenous variables;
- the implementation of the quantitative assumptions into the MASST model, and
- the mapping of the different results.

Because of the time constraints in which all these phases have been tackled, **the results presented have to be understood as <u>provisional</u>**. Refinements and adjustments to the quantitative assumptions can take place in the near future, and will be contained in the final report.

The structure of this report is the following: Section 2 will recall the logic upon which the MASST model is built, present the final equations and their estimates. Section 3 will introduce the simulation methodology and present and compare the quantitative assumptions of the three integrated scenarios. Section 4 will present and comment the first results obtained with the model. Section 5 concludes and indicates the future steps before the end of the project.

1.2 The MASST model

1.2.1 The logic of the Model

Regional growth is in most recent theories (territorial endogenous growth theories) the result of[1]:

- a competitive process, based on supply rather than demand elements, like quality (and quantity) of local resources, product and process innovation, technological advances, local knowledge. Pure demand driven growth models are therefore non-appropriate;
- a social process, since it is based not only on material production factors, but also on non-material resources. Social elements (like social capital à la Putman, relational capital à la Camagni, trust à la Becattini, leadership à la Stimson and Stough) give rise to local cumulative processes of knowledge creation, to processes of collective and interactive learning, reinforcing decision-making processes of local actors. These elements have an active and vital role in defining local economic competitiveness and growth. Traditional local

[1] Capello, R. (2005) A quantitative territorial model for the measurement of regional growth in the new Europe, paper presented to the ERSA conference of Amsterdam, August 2005.

growth models based merely on resource endowment have a limited interpretative power in this respect;

- a territorial and spatial process, interpreting territory as an autonomous production factor, rather than the mere geographical place where development occurs. Territory generates increasing returns, cumulative self-reinforcing mechanisms of growth in the form of dynamic agglomeration economies; in this perspective, local economic growth is also the result of spatial processes, rather than of a mere efficient resource allocation or of an increase in resources endowment. A-spatial local growth models are for this reason non-appropriate;
- an interactive process of the local economy within the wider national and international economic system. Pure bottom-up models refrain from the opportunity of measuring national-regional linkages, and have therefore to be avoided.

The specification of our MASST (MAcroeconomic, Sectoral, Social and Territorial) model reflects two specific needs. The first need has a theoretical nature. The MASST model wishes to keep the above-mentioned theoretical elements into account; it has first of all to be a territorial model, where spatial linkages among regions (like proximity effects) and the territorial structure of regions (urbanised, agglomerated, rural structure of regions) find a role in explaining local growth. It has to be a local competitive model, in which the dynamics of the local economy is merely explained by supply elements like quality and quantity of resource endowment; last, it is a macroeconomic model, since it has an aggregate approach to growth, where the dynamics of aggregate macro-economic components play a role.

The second need has a practical nature, since it is strictly related to the forecasting use we want to make of the model. The MASST model is intended to be a forecasting model, in which the main spontaneous and normative driving forces of change that will characterise the dynamics of the European Economy in the next fifteen years have to find a role. For this reason, the MASST model has to incorporate:

- macroeconomic elements, in order to model macroeconomic tendencies and policies;
- institutional elements, in order to measure future policy choices concerning the 'deepening' or 'widening' of the present institutional agreements;
- strategic economic resources, recognised to have a crucial role in the future of the European Economy either by official governmental documents (like human resources in science and technology or infrastructure endowment in the Lisbon agenda), or by their intrinsic nature (like energy use);
- territorial elements, in order to obtain differentiated territorial scenarios.

1.2.1.1 The two components of the MASST model

As mentioned in the Second Interim Report, the MASST model interprets regional growth as the result of two effects: a national growth and a differential growth effect:

$$\Delta Y_r = \Delta Y_n + s_r \qquad (1)$$

where ΔY_r and ΔY_n denote the GDP growth rate respectively of the region and the nation, and s_r represents the regional differential growth with respect to the nation.

This definition of regional growth allows to separate out the cyclical components from the structural components in the explanation of regional growth rate. In the logic of the model the cyclical component of growth is measured at the national level: private consumption growth, private investment growth, public expenditure growth and export and import growth. This part of the model is able to capture the cyclical macroeconomic (national) and integration effects generated by spontaneous trends and/or policies on regional growth; macroeconomic policies and trends in interest rates, in public expenditure, in inflation rates, in investment rates differ radically among European Countries (especially between Eastern and Western Countries); even among the old EU15 Countries the still existing difference in macroeconomic conditions (like inflation rates or efficiency wages) can explain the different regional growth patterns. The cyclical component allows to capture the specific Country effects on local growth. In its present structure, the MASST model imposes the same regional reaction to a national shock.

The structural component of growth (the shift component) is, on the contrary, measured at the regional level, since competitiveness finds its roots in the local system. The increase in the quality and quantity of production factors, like human capital and population, in infrastructure endowment, in energy consumption, as well as the sectoral and territorial structure of the regions and the interregional spatial linkages of regions are the main elements explaining the relative regional growth with respect to its nation.[2]

[2] This is a typical supply side approach to regional growth, which is developed by traditional and modern neoclassical growth theories and by approaches of endogenous development. For the neoclassical approaches, see among others Lucas R. (1988), 'On the Mechanics of Economic Development', *Journal of Monetary Economics*, vol. 22, pp. 3-42, and Romer P. (1986), 'Increasing Returns and Long-Run Growth', *Journal of Political Economy*, vol. 94, n. 5, pp. 1002-1037. For endogenous, bottom-up, development theories see maong others Biehl D. (1986), *The Contribution of Infrastructure to Regional Development, Regional Policy Division*, European Community, Brussels; Becattini G. (1990), 'The Marshallian Industrial District as a Socio-economic Notion', in Pyke F., Becattini G. e Sengenberger W. (eds.), *Industrial Districts and Interfirm Cooperation in Italy*, International Institute of Labour Studies, Ginevra, pp. 37-51; Stöhr W. (1990), 'On the Theory and

In analytical terms, the two components are estimated in two sub-models, whose final specifications are included in this report:

a) National component

The final specification of the national component is expressed as follows:

$$\Delta Y_{nt} = \Delta C_{nt-1} + \Delta I_{nt-1} + \Delta G_{nt-1} + \Delta X_{nt-1} - \Delta M_{nt-1} \quad (2)$$

where ΔY_{nt} denotes the GDP growth rate of a generic Country n at time t, and ΔC_{nt-1}, ΔI_{nt-1}, ΔG_{nt-1}, ΔX_{nt-1}, ΔM_{nt-1} represent the growth rate respectively of private consumption, investments, public expenditure, export and import of a generic Country n at time t-1.

In equation (2), the growth rates of public expenditure are exogenous. Consumption, investment, export and import growth rates are instead endogenously determined by the model as follows.

Private consumption growth rate of a generic Country n at time t is represented by a traditional keynesian consumption growth equation, as follows:

$$\Delta C_{nt} = a + c\Delta Y_{nt-1} \quad (3)$$

where *a* is the part of the consumption growth which is independent from income growth, while *c* is the marginal propensity to consumption, measuring the increase in consumption growth due to an (temporally lagged) increase in income growth. Both *a* and *c* are allowed to vary across groups of countries, as it will be better precised with the analysis of the ecometric specification.

Private investment growth of a generic Country *n* at time *t* is expressed by the following equation:

Practice of Local Development in Europe', in Stöhr W. (ed.), *Global Challenge and Local Responses*, Mansell Publisher, London, pp. 35-54.

$$\Delta I_{nt} = \alpha_1 \Delta Y_{nt-1} - \alpha_2 \Delta i_{nt-1} - \alpha_3 \Delta ULC_{nt-1} + \alpha_4 FDI_{nt-1} \quad (4)$$

indicating that investment growth depends on:
- interest rates changes (Δi_{nt-1}), negatively linked to investment growth as explained in the keynesian tradition;
- changes in domestic demand (ΔY_{nt-1}), as suggested by the accelerator theory;
- changes in unit labour cost (ΔULC_{nt-1}), as an inverse measure of the level of national competitiveness, and therefore negatively linked to investment growth;
- the share of FDI flows on domestic investments made in the Country (FDI_{nt-1}), given the domino effect that a flow of FDI may generate on domestic investment growth.

All explanatory variables are temporally lagged at time t-1.

The **import** growth equation defines real imports at the national level as follows:

$$\Delta M_{nt} = \beta_1 \Delta Y_{nt-1} - \beta_2 E_{nt-1} + \beta_3 \Pi_{nt-1} + \beta_4 FDI_{nt-1} \quad (5)$$

stating that import growth depends on the following explanatory variables, temporally lagged:

- changes in domestic demand (ΔY_{nt-1});
- nominal exchange rate (E_{nt-1}), negatively linked to import growth;
- inflation rate (Π_{nt-1});
- the share of FDI flows on domestic investments made in the Country (FDI_{nt-1}), expecting a positive sign in the relationship because of the domino effect that FDI may generate not only on internal investment growth but also in import growth.

Exports are often exogenous in simple demand-led models, since their amount depends on external demand which is not affected by, for example, internal income.
However, it has to be remembered that export also depends on the competitiveness of national products in the international markets. This can be achieved through a higher quality/price ratio, which, in turn, depends on the innovativeness and efficiency of production and on the level of prices in the market. For this reason, exports have been included in the MASST as follows:

$$\Delta X_{nt} = \gamma_1 \Delta ULC_{t-1} + \gamma_2 E_{nt-1} + \gamma_3 \Pi_{nt-1} \quad (5)$$

Where E_{nt-1} is still the nominal exchange rate positively linked to export growth, Π_{nt-1} is the inflation rate and ULC, the Unit Labour Cost, is a measure of the competitiveness of the productive system.

Regional component

The analytical structure of the regional differential sub-model is the following:

s_{rt}= *f (economic and human resources; strutural and sectoral characteristics; spatial processes, territorial specificities and spatial typologies, integration processes)* (7)

The model specification estimates the regional differential growth (s_{rt}) through a quasi-production function approach in which structural elements, like economic and human resources, structural and sectoral characteristics, spatial processes, integration processes and territorial specificities find a role.

All variables but three (regional population growth, level of entrepreneurship and local spillovers) are exogenously treated:

Economic and human resources are measured by:

- the regional average population growth rate;
- the regional share of human resources in S&T in Eastern Countries;
- the regional share of human resources in S&T in Urban Regions;
- the regional energy consumption by population;
- the regional energy consumption by population in tertiary specialised regions;
- the pillar 2 Expenditure per a.w.u.

Structural and sectoral characteristics are measured by:

- the regional share of tertiary activity;
- the share of self-employees on employment;
- the relative regional density of infrastructure endowment;
- the relative regional density of infrastructure endowment in agglomerated areas.

Spatial processes are measured by:

- the spatial spillovers;
- the spatial spillovers in the Pentagon regions;
- the spatial spillovers in urban areas in Eastern Countries.

The relevant regional spatial typologies are the following:

- regions with megas;

- pentagon regions;
- rural regions in Eastern Countries.

European integration processes are finally measured by:

- the regional integration potentials in Eastern Countries;
- the regional integration potentials in Western Countries.

The first endogenously determined variable is regional population growth which is endogenously obtained by estimating three times, one for each of the three relevant age groups of table 3, the following relation:

$$\Delta P_{t-1} = \lambda_0 + \lambda_1 fr_{t-2} + \lambda_2 mr_{t-2} + \lambda_3 im_{t-2} \quad (8)$$

where:
fr = fertility rate
mr = mortality rate
im = interregional migration

On its turn, migration is the result of local unemployment level and wage differentials between the European average wage and local wage level:

$$im_{rt-2} = \eta_0 + \eta_1 u_{rt-3} + \eta_2 (w_{et-3} - w_{rt-3}) \quad (9)$$

where:
u = unemployment
w_e = European average wage
w_e = regional average wage

The second endogenous variable is the entrepreneurship of regions, measured by the share of self employed persons on employment. This share can be influenced by policy measures, in particular, in this model, it appears to react positively to the total structural funds expenditure per person:

$$selfempl_t = f(policies) \quad (10)$$

The third and last endogenous variable is the spatial spillover index. Its level, in fact, depends by definition on the growth behaviour of other neighbouring regions.

1.2.1.2 The characteristics of MASST

Given the above-mentioned logical and analytical characteristics of the model, the main technical specifications of the MASST model can be summarised as follows[3]:

(a) the model is first of all an interactive national-regional model. It combines top-down and bottom-up approaches, so that an interdependent system of national and regional effects is built. Such a structure allows vertical feedbacks between the regional and national economy to be taken into account;
(b) it is an integrated model. In its structure, the model finds a specific place for both socio-economic and spatial (horizontal) feedbacks among regional economies. While the former are captured by the socio-economic conditions generating interregional migration flows, the latter are measured by spatial spillover effects, as explained below;
(c) it is a spatial-territorial model. The spatial and territorial dimensions have a role in the explanation of regional growth in two ways. First of all, the model directly captures proximity effects through the measurement of spatial spillovers (i.e. the growth rate of a region also depending on the growth rate of neighbouring regions); moreover, with the introduction of variables interpreting the territorial (agglomerated, urbanised, rural) structure, the model indirectly measures the agglomeration economy (diseconomy) effects that influence growth (decline) in a cumulative way;
(d) it is an endogenous and local competitiveness driven model in the explanation of regional growth differentials. Regional differential growth is explained by local factors and interregional competitiveness stems from specific locational and local resource endowment of a region;
(e) it is a macroeconomic (multinational) model. Short term (macroeconomic) effects are dealt with at national level, and their feedbacks on national economies taken into consideration in explaining local growth;
(f) it is a recursive dynamic model. The outcome of one period of time at both national and regional level enters the definition of the output of the following period, in a cumulative and self-defining development pattern;
(g) given the above characteristics, the model is a multi-layer policy impact assessment model. The structure of the model allows in fact to measure the impact of national (and supranational) policy instruments on both regional and national growth, and the impact of regional policies on regional growth.

[3] See Capello (2005).

Needless to say, some interpretative limits characterise the MASST model. The main limits regard some choices made in the specification of the model and data unavailability, namely:

- the impossibility to have differentiated regional feedbacks of national policies and trends. In its present specification, the MASST model captures the vertical feedbacks of a national policy on regional growth, but distributes them uniformly among regions;
- for what concerns missing data, the MASST model suffers from the lack of data capturing social (intangible) elements; the role of these elements, highly emphasised in modern literature, will therefore not be measured in our model.

1.2.2 Endogenous and exogenous variables in MASST

The estimation and simulation of the MASST model requires the use of a large dataset.
This has been completed for 27 countries, the EU25 plus Bulgaria and Romania. Eurostat does not provide data for several indicators for Switzerland and Norway. In econometric modelling, it is considered methodologically incorrect to use data from different sources for a single indicator. Thus, these countries have been labelled as 'missing data'. They may be included again if relevant comparable data for these countries become available before the end of the project.

1.2.2.1 Sources of data

The dataset is based on two main sources: the Espon database, in its June 2005 update, and the Eurostat database, which is constantly updated on-line and made available through the website http://epp.eurostat.cec.eu.int/pls/portal. Most data from the Eurostat database have been downloaded during the spring of 2005. A small amount of data come from differentiated sources such as the OECD.
Since it is composed by two components, the estimation of the model requires two separate databases: one for the data at national level and one for the data at regional level. The two dataset, however, are fully compatible since the database at regional level includes some relevant national data, which are entered using the same *id* that they had at national level. For example, in the regional dataset, national real GDP per capita growth rate in regions of country number *x* is the same for all regions of that country and has the same value it has in the national dataset.
The data at both national and regional levels have been collected for a period covering 8 years, from 1995 to 2002 included. This has allowed to use panel estimation techniques at national level. Other data, especially when coming from the Espon database, were available only for 1 year (tipically 2000) and were consequently used as structural variables.

The data at regional level have been collected at NUTS2 level, because many relevant data were not available at the smaller NUTS3 level. In a limited number of cases that will be described below, the NUTS2 level data come actually from the aggregation of NUTS3 level data. This process was sometimes computationally intensive but never theoretically challenging.

The use of two different sources was at the basis of some problems of compatibility, in particular at regional level. In fact, the Espon database is based on an older classification of NUTS with respect to the latest available Eurostat data.

Since this is an Espon project, the choice was to use the Espon NUTS and to make the Eurostat data compatible with this classification when they were not so originally. This included the use of techniques of aggregation/disaggregation, interpolation, extrapolation. This has especially affected some specific regions of countries, such as Finland, for which the new Nuts are very different from the old ones.

1.2.2.2 Description of data

At national level, the data used are described in Table 1.

These data are almost all coming from the Eurostat database and taken at ESA95. It has to be noticed that economic data, when included in the Espon database, are normally coming from Eurostat.

National variables (NUTS0 level)	*Definitions*	*Period covered*	*Source of raw data*
GDP growth rate	Annual % growth rate of real GDP	1995-2002	Eurostat
Annual change in interest rate	Absolute change in short-term interest rates (3 months)	1995-2002	Eurostat
Annual change in unit labour cost	Absolute change in unit labour cost (calculated as unit salary * number of employees / GDP)	1995-2002	Eurostat
Share of FDI on total internal investments	% Flow of FDI / Gross Fixed Capital Formation	1995-2002	Unctad-UN (World investment report)
Nominal exchange rate	Nominal effective exchange rate calculated on 41 countries (NEER41)	1995-2002	Eurostat
Inflation rate	Inflation rate (%change of CPI over previous year)	1995-2002	Eurostat
Consumption growth	% annual real consumption growth rate	1995-2002	Eurostat
Investment growth	% annual real gross fixed capital formation growth rate	1995-2002	Eurostat
Import growth	% annual real import growth	1995-2002	Eurostat
Export growth	% annual real import growth	1995-2002	Eurostat
Eastern Countries	All former Eastern Economies	dummy	
New EU Countries	The 10 new Member Countries who joined the EU on the 1/5/04	dummy	

Table 1 Variables used by the MASST at national level

At regional level, more work was needed to adjust the data. The first group of variables used concerned traditional economic variables. They come (Table 2) from Eurostat or from Espon, depending on which source has the most complete data.

Regional economic variables (NUTS2 level)	*Defintions*	*Period covered*	*Source of raw data*
Regional share of human resources in S&T	% of people working in S&T on population	2000	Eurostat
Self-employmen	number of self-employed persons on total employment	2001	Eurostat
Regional average annual population growth rate	Average annual population growth rate at NUTS 2	1995-2002	Eurostat
Unemployed persons	number of unemployed persons on population	2001	Eurostat
Relative regional density of infrastructure endowment	Km of roads on surface at NUTS 2 on km of roads on surface at NUTS 0	2001	Espon
Regional share of tertiary activity	People employed in services in percentage of the total	2001	Espon
Regional average annual differential GDP growth rate	Annual average relative percentage GDP growth rate	1999-2002	Eurostat
Regional differential GDP	Absolute difference between per capita GDP level at NUTS 2 and per capita GDP level at EU level in the period 1995-2002	1995-2002	Eurostat

Table 2 Traditional economic variables used at regional level

The second group of variables included demographic and socio-economic data, as well as a number of dummies to identify the regional typologies, as defined by previous Espon projects. (Table 3)

Data	*Definition*	*Source of raw data*
Agglomerated regions	With a centre of > 300.000 inhabitants and a population density > 300inhabitants / km sq. or a population density 150 – 300 inhabitants / km sq.	Espon database
Urban regions	With a centre between 150.000 and 300.000 inhabitants and a population density 150 – 300 inhabitants / km sq. (or a smaller population density – 100-150 inh. /km with a bigger centre (>300.000) or a population density between 100 – 150 inh./km sq.	Espon database
Rural regions	With a population density < 100 / km sq. and a centre > 125.000 inh. or a population density < 100 / km sq. with a centre < 125.000.	Espon database
Megas regions	Regions with the location of at least one of the 76 FUAs with the highest average score in a combined indicator of transport, population, manufacturing, knowledge, decision-making in the private sectors.	Espon database

Pentagon regions	Regions located within the Pentagon formed by the five European cities of Milan, Munich, Amsterdam, London, Paris.	Espon database
Regional energy consumption per capita	Total energy consumption on population in the year 2002	Espon database
Net immigration flows (people between 17-27 years)	Average net immigration flows of people between 17-27 years in the period 1/1/95 – 1/1/00	Espon database
Net immigration flows (people between 32-42 years)	Average net immigration flows of people between 32-42 years in the period 1/1/95 – 1/1/00	Espon database
Net immigration flows (people between 52-67 years)	Average net immigration flows of people between 52-67 years in the period 1/1/95 – 1/1/	Espon database
Regional crude birth rate	Share of births on population	Eurostat
Regional crude death rate	Share of deaths on population	Eurostat

Table 3 Territorial and Socio-Economic Data used at NUTS2 level

Finally, the database included two indicators of spatial specific effects, calculated starting from the economic data coming from Eurostat: the first one, the spatial spillovers, was intended to measure the effects of other regions' growth on the region's growth, weighted by the physical distance and was hence defined as:

$$SP_{rt} = \sum_{j=1}^{n} \frac{1}{n} \frac{\Delta Y_{jt}}{d_{rjt}}$$

The second one was aimed at measuring the effects of a barrier fall on regional GDP; in particular, it was used to measure the effects of the integration of the integration of the 10 New member states inside the EU and of the possible integration of Bulgaria and Romania. This variable hence affected only the regions at the borders, and was hence calculated as:

$$IP_{rt} = \sum_{j=1}^{n} \frac{1}{n} \frac{\Delta Y_{jt} - Y\Delta_{rt}}{d_{rj}} - \sum_{j=1}^{n} \frac{1}{n} \frac{\Delta Y_{jt} - Y\Delta_{rt}}{d_{rj}^2}$$

where:

ΔY_t = per capita income growth

Y_t = per capita income

j = all neighbouring regions of region r

d_{rj}= physical distance between region r and j

n = number of neighbour regions

m = weight given to physical distance between regions, measuring higher spatial friction when economic barriers are present (tariff, transport costs).

Indicator (NUTS2 level)	*Definition*	*Source of raw data*
Spatial spillovers	Sum of the relative annual regional growth rates of all other regions than region *i* divided by the distance between each other region and region *i*.	Calculation with Eurostat data
Economic Integration potential	Sum of the annual absolute difference between income growth rates of regions *j* and region *i* divided by the distance between region *i* and all other regions *j* *less* Sum of the annual absolute difference between income growth rates of regions *j* and region *i* divided by the squared distance between region *i* and all other regions *j*, calculated only for those regions at the border between Eastern and Western Countries.	Calculation with Eurostat data

Table 4 Specific Spatial Effects Indicators at NUTS2 level

1.2.3 Final econometric specifications of the model

1.2.3.1 The National Component

The sub-model of the national component of growth is determined by four equations, representing respectively the consumption growth (eq .3), the investment growth (eq. 4) the import growth (eq. 5) and the export growth (eq. 6) equations, plus the pseudo-identity (eq. 2). Estimations cover 27 Countries (25 EU Member States, Romania and Bulgaria), in a period of time between 1995 and 2002. All independent variables are lagged one year with respect to the dependent variable.

Table 5 contains the results of all equation estimates for the national component of MASST

From the econometric point of view, in all equations no specific Country effect emerges, given the econometrically insignificant use of panel (fixed or random effects) models. The model is satisfyingly estimated through OLS common constant (with robust standard errors) method. The expected variable parameters prove robust and have the expected sign, with only one exception, in the export equation growth, which will be explained in the section on the export growth equation.

The R-square of the equations was significantly higher when the regressions were run with the introduction of a (significant) time trend. However, given the long-run forecasting purpose of the model, the introduction of a time trend was not recommendable since, due to the relatively short extension of the panel (8 years for absolute values, 7 for variations), the time trend would capture conjunctural instead of structural aspects.

For this reasons, all regressions have been re-run without the time trend, obtaining very similar coefficients and t-statistics.

Dependent variables / *Independent variables (lagged 1 year)*	***Consumption growth***	***Investment growth***	***Import growth model***	***Export growth***	***lagged GDP growth (Pseudo-Identity)***
Constant	1.33 (3.61)***	.597 (0.66)	13.86 (3.41)***	-7.26 (-0.86)	
Real GDP growth rate	0.557 (12.02)***	1.01 (4.06)***	.506 (2.16)**		
Dummy for new member coutries of the EU	1.97 (3.11)***				
Real GDP Growth rate in new member countries of the EU	-0.318 (-2.50)**				
Absolute change in interest rates		-.528 (-2.31)**			
% Change in unit labour cost		-.433 (-1.87)*		-.426 (-2-21)**	
Share of FDI on total internal investments (Eastern countries only)		.048 (076)	.063 (1.33)		
Nominal exchange rate			-.094 (-2-23)**	.138 (1.61)*	
Inflation rate			.212 (2.81)***	.407 (4.22)***	
Consumption real growth rate					.738 (10.95)***
Investment real growth rate					.103 (4.56)***
Public expenditure real growth rate					.015 (0.37)
Export growth rate					.265 (9.10)***
Import real growth rate					-.186 (-5.17)***
Type of estimate	OLS common constant (robust estimates)	OLS common constant (robust estimates)	OLS common constant (robust estimates)	OLS common constant (robust estimates)	OLS no-constant (robust estimates)
Number of observations	183	132	178	151	182
R-square	0.32	0.25	0.11	0.17	.92

Table 5 Results of regressions of the national component of MASST

Consumption growth equation

The first column of Table 5 contains the results of the consumption growth equation estimates.

The overall model performs well, with an R-square equal to 0.32.

From the economic point of view, the model suggests that consumption growth is dependent on income growth, with a positive and significant sign. Differences emerge in the consumption growth behaviour between New and Old Member States of the European Union in that:

- new EU Countries show a higher consumption growth rate than the EU15 Members;
- on the other hand, new Countries have a lower marginal propensity to consumption, as rationally expected.

Investment growth equation

Column 2 of Table 5 is devoted to the results of the investment growth estimates. The R-square of the full model, at 0.25, is satisfactory, and all coefficients have the expected sign.

The economic interpretations of the results suggest that:

- domestic demand growth has a positive and significant influence on investment growth, in line with the accelerator theory;
- interest rate increases have a negative impact on investment growth, as the Keynesian investment theory states;
- loss of competitiveness (measured in the model with an increase in unit labour costs) is of detriment to investment growth;
- finally, in the Eastern European countries, the share of FDI flows on domestic investments positively acts on investment growth. The domino effect of FDI on domestic investment growth is therefore proved to be valid for these countries, whereas for the old 15 members of the EU this effect is not significant and therefore neglected. Notice that the coefficient for FDI share in New Member States, which was significant regressing with the time trend (which was not taken into consideration in the regressions for reasons explained above), becomes slightly non-significant without, but it does not change its coefficient.

Other possible regressors, such as a Country risk indicator built on the basis of the Kauffmann database, were tried but no significant and robust results were achieved. The same unsatisfactory results were achieved when Country dummy variables like Eastern or New Country dummies were introduced. The average tax level indicator (government revenue on GDP) and all other available tax levels were also taken into consideration in the regression exercises but no significant results were achieved.

Import growth equation

The third column of Table 5 reports the results for the import growth model. Despite a lower R-square when compared to previous equation estimates (equal to 0.11), the model is acceptable since all coefficients have the expected and robust sign.

The economic results reflect our expectations, since:

- domestic demand growth influences positively import growth;
- nominal exchange rate (corrected by inflation rate to obtain a real effect) negatively influence import growth;
- interestingly enough, the share of FDI flows on total domestic investment is positively linked to import growth, witnessing that the presence of FDI in a Country not only generates a domino effect on domestic investment growth but also gives rise to an increasing dependence of domestic production to external resources, at least in the short period. Also in this case the coefficient for FDI share in New Member States, which was significant regressing with the time trend, becomes slightly non-significant without, but it does not change its coefficient.

Export growth equation

The fourth column of Table 5 reports the results for the export growth model. The R-square increases to 0.17 and all the coefficients but 1 have the expected signs, i.e. reflect the effects of competitiveness on export growth:

- the efficiency in production, as measured by the unit labour cost is positively (i.e. has a negative coefficient) linked to export growth.
- exchange rate devaluations positively affect exports, as it is normal since this makes domestic price cheaper on the international markets.
- the prices of domestic products, measured by the inflation rate turn out to be positively linked to the export growth. This is against the economic trade theory which predicts that export fall with increasing domestic prices. However, the explanation for this coefficient is strictly econometric: it captures and interprets the fact that the Eastern countries, characterized by higher inflation, are also the ones with higher growth of exports, due to their increasing integration in the international markets. Since the inflation variable was needed to balance the fact that interest rates in the equation are nominal, the choice was to keep it.

1.2.3.2 The Local Component

The local component sub-model is structured around six equations: the regional differential growth equation, the population growth equation, the three migration flows equations and, finally, an equation for the effects of structural funds.

The regional differential growth equation estimates

Table 6 presents the results of the estimates of the regional differential growth equation. Data availability generally hampers regional econometric model estimates. In this work, the limitation consists in the lack of a time series database which obliges the estimate of a cross-section model. In order to avoid endogeneity problems, the spatial and economic integration indicators, built respectively on the growth rate and of the level of income of the neighbouring regions (weighted by distance), have been calculated for a previous period with respect to the dependent variable. In this way, the logic expectation that spatial and integration processes do not adjust instantaneously but need time to take place, is respected.

Independent variable	*Coefficient*	*t-statistics*	*sig.*
Constant	-1.74	-1.14	
Economic resources			
Regional average population growth rate (1995-2002)	0.4529	1.85	*
Regional share of human resources in S&T in Eastern Countries in 2001	0.1529	3.54	***
Regional share of human resources in S&T in Urban Regions in 2001	0.0424	3.4	***
Regional energy consumption by population in 2002	0.0039	1.42	
Regional energy consumption by population in tertiary specialised regions in 2002	-8.8E-05	-2.45	**
Pillar 2 Expenditure per a.w.u.	0.0152	1.23	
Structural and sectoral characteristics:			
Regional share of tertiary activity in 2001	0.0467	3.03	***
Share of self-employees on employment in 2001	0.0102	0.54	
Relative regional density of infrastructure endowment in 2001	-0.1992	-1.58	
Relative regional density of infrastructure endowment in agglomerated areas in 2001	0.1328	1.11	
Spatial processes:			
Spatial spillovers (1997-98)	-187.29	-2.18	**
Spatial spillovers in the Pentagon regions (1997-98)	282.96	2.21	**
Spatial spillovers in urban areas in Eastern Countries (1997-98)	-162.91	-2.96	***
Regional spatial typologies			
Dummy for regions with megas	0.3871	1.84	*
Dummy for pentagon regions	-2.71	-1.88	*
Dummy for rural regions in Eastern Countries	-0.7057	-1.43	
European integration process:			

Regional integration potentials in Eastern Countries (1998-99)	-62.06	-1.29	
Regional integration potentials in Western Countries (1998-99)	56.65	1.5	
*** = significant at 99%			
** = significant at 95%			
* = significant at 90%			

Table 6 Results of regressions of the national component of MASST

The dependent variable is the regional average annual differential GDP growth rate between 1999 and 2002, representing the regional differential growth (s) of equation 1.

From the econometric point of view, a large number of experiments were conducted with alternative models and specifications. The estimates for most variable parameters proved extremely robust and no sign ever changed. The general conclusion of these experiments was that the model perform well and that there are few underlying statistical or specification problems. Most coefficients are significant and with the right sign and the significance of the full model is acceptable (R-square equal to 0.33). Moreover, spatial autocorrelation in the residuals has been checked through a Wald test of lamba, and gave a negative result.

From the economic point of view, the model suggests that the regional competitiveness finds its roots in the presence of (a) local economic resources, (b) structural and sectoral characteristics, (c) spatial processes, (d) regional spatial typologies and (e) economic integration processes.

(a) Local economic resources

The presence of a high quality of human capital is proved once again to be an important element explaining local competitiveness; the non-rival and partially non-excludable nature of a part of the outcome of knowledge creation, as theorised in Romer's endogenous growth model[4], induces more knowledge generation, and creates dynamic increasing returns in the form of a faster growth rate. Our results prove the knowledge spillover effects once again, and add an interesting element to this statement. These effects seem to be accompanied by decreasing returns, in that Eastern Country regions, characterised by lower level of knowledge, experience greater positive effects from knowledge spillovers than highly and technologically advanced Western regions.

[4] Romer P. (1986), 'Increasing Returns and Long-Run Growth', Journal of Political Economy, vol. 94, n. 5, pp. 1002-1037.

The results witness also that human resource growth, measured in terms of population growth, plays an important element in explaining local competitiveness. By the same token, energy resource consumption has a positive, although not significant, impact on local growth; this sign becomes a significant sign when energy consumption is measured in tertiary activity regions. In these areas the energy consumption coefficient has a lower value, witnessing a more limited (though positive) effect of energy consumption on growth, due both to the specialisation patterns and increasing returns in energy consumption of urbanised tertiary areas.

The resources spent in development policies are also important for the growth of regions. For instance, Pillar 2 expenditure per average working unit was added to the equation for policy-simulation purposes and, although slightly non significant, the coefficient has the expected positive sign.

(b) Structural and sectoral characteristics

The relative infrastructure endowment coefficient has a negative and non-significant sign. The conclusion of this result is that in general a better infrastructure endowment with respect to the national average does not justify a greater competitiveness of the local economy. Interestingly enough, results change in terms of sign when infrastructure endowment is related to the high agglomerated regions where the level of relative infrastructure endowment does make a difference in generating a more competitive local economy; in agglomerated regions, in fact, a rich infrastructure endowment allows to keep the decreasing returns and the inefficiency of a highly congested infrastructure under control.

In terms of sectoral structure, the model proves that the share of tertiary activity in a region explains its differential growth, having the coefficient of this variable a positive and significant sign. This result fits well with the empirical evidence that higher competitive gains stem from tertiary rather than industrial activities.

Entrepreneuship is also an important characteristic of competitive regions. This was a variable for which it was difficult to find measures available for all regions; the best proxi for entrepreneurship turned out to be the share of self-employed persons on total employment, a variable which was also endogenized and made dependent on structural funds expenditure. The effects of this variable is, as expected, positive, although slightly statistically non significant.

(c) Spatial processes

The most updated literature on spatial growth gives a great emphasis to spatial processes, in the form of increasing returns, agglomeration economies, cumulative self-reinforcing processes and spatial spillovers. Our model witnesses that these processes do have an effect on regional differential growth, and are in general negative; faster growing regions tend systematically to attract more resources (more productive and highly paid workers, more efficient and dynamic firms, more financial investments) from its neighbouring regions, increasing the differential in economic growth rate with them. This result is in line with other empirical studies on spatial effects on regional differential growth[5].

A striking effect takes place when spatial spillover effects are estimated for specific territorial areas.
In those macro-areas measuring a greater density of productive activities and population, and therefore expected to be characterised by greater dynamic agglomeration economies, spatial spillovers are positive: a faster growing area spreads around its positive effects, and stimulates local production and growth of its neighbouring regions. It is the case of the pentagon regions, where spatial spillovers turn out to be positive in opposition to the general estimates. On the contrary, high negative spatial spillovers occur in highly urbanised regions in Eastern Countries, where spatial spillovers accentuate their negative aspects; urban regions in Eastern Countries follow a typical polarised dynamic pattern of growth.

(d) Regional spatial typologies

Regional growth also depends on the spatial typologies of the regions.
Their centralicity or peripherality, the strenght of agglomeration economies acting inside them, their industrial vocation, are all factors that are important in determining the performance of European Regions.
The first typology of regions introduced in the model is the NUTS2 regions that include one or more MEGAs (Metropolitan European Growth Areas), as defined by the Espon project 1.1.1. These are cities selected on the basis of five functional specialisation and performance indicators, namely: population, accessibility, manufacturing specialisation,

[5] Cheshire P. (1995), 'A New Phase of Urban Dispersion in Western Europe? The Evidence for the 1980s', vol. 32, pp. 1045-1063.
Cheshire P. and Carbonaro G. (1996), 'Urban Economic Growth in Europe', Urban Studies, vol. 33, no. 7, pp. 1111-1128.

degree of knowledge and distribution of headquarters of top European firms. All these variables have originally been collected at FUA (Functional Urban Area) level and combined to give an overall ranking of FUAs; the 76 FUAs with the highest average score have been labelled MEGAs. Since the MASST model is estimated at Nuts 2 level, regions of this level have been considered as MEGAs when they contain at least one MEGA city within their border.

Regions with MEGAs are growing significantly faster than the rest of the regions, since they are taking advantage of the dynamisms of the cities inside them.

The second typology of regions introduced in the model and behaving significantly differently from the other regions is the Pentagon regions, indicating the regions located within the Pentagon area delineated by the five European cities of Munich, Milan, Paris, London and Amsterdam.

These are the regions of the core areas of the EU, the most accessible and normally the most developed. These regions, ceteris paribus, are growing significanly less than the others, signalling that they are probably entering a phase in which the increasing returns from agglomeration and centrality are curbing down. It has however to be noticed that most pentagon regions usually perform better than the rest in a large number of other indicators, so that they can overcome this negative factor and achieve a positive performance.

The last geographical factor taken into account by the model is the settlement structure. Regions are in fact divided into agglomerated, urban and rural regions, on the basis of the type of urban system (dimension and density of cities) present in the region (cfr. Espon project 3.1).

The only settlement variable to be significant as a dummy in the regional differential growth is the rural regions of the Eastern countries. These regions are normally performing worse than the rest of the regions, as evidenced by a negative coefficient whose significance is very close to 90%.

(e) Economic integration processes

The last group of variables contained in the model measures the effects of a more integrated Europe. As mentioned before (sec. 2.2.2), the concept of integration potential is measured on the basis of the change taking place in the economic potential of a region once integration takes place. Economic potential, in turn, is defined as the accessibility to total income at any location allowing for distance, transport costs and tariffs[6]. In our case, the change in economic potential due to enlargement is measured by calculating the difference

[6] Clark C., Wilson F. and Bradley J. (1969), 'Industrial Location and Economic Potential in Western Europe', Regional Studies, vol. 3, pp. 197-212.

between two economic integration potential indicators. The first indicator, measuring the situation before integration, is built by squaring the distance among regions lying at the border between Eastern and Western Europe; the second is constructed with real distances.

The results are interesting in this respect. They suggest that in the first stages of its implementation the enlargement process is detrimental to the weakest regions, which offer a large market potential to more advanced and competitive areas; at the same time, it generates advantages to advanced regions, able to grasp new market opportunities. The integration potential coefficient has in fact a negative sign for Eastern Country regions and a positive one for Western Country areas.

The population growth equation estimates

The population growth equation is explained by natural population dynamics and by interregional migration flows, which in turn are explained by socio-economic aspects.

Table 7a presents the results of the estimates of the population growth rate equation. The model is satisfactory from the overall point of view (R-square = 0.65), all coefficients have the expected sign and all but one are highly significant.

As expected, the birth rate and death rate (lagged one year) have a positive and negative sign, respectively. Immigration flows of people also increase population growth rate, with the exception of people between 52-67 years. This latter has a negative but not significant impact on the population growth, which may find an explanation in the low fertility rate of this group of people. Tendencies to lose population of this age are typical of new EU Countries and of agglomerated regions; economic difficulties, physical congestion and in general agglomeration diseconomies (high land prices) explain these tendencies.

Independent variables	*Coefficient*	*t-statistics*	*sig.*
a) Regression of average population growth rate 1996-2002			
Constant	-0.084	-0.25	
Crude birth rate (lagged 1 year)	0.104	6.66	***
Crude death rate (lagged 1 year)	-0.079	-2.98	***
Net immigration flows (people between 17-27 years). Average mean in the period 1995-2000	0.012	2.91	***
Net immigration flows (people between 32-42). Average mean in the period 1995-2000	0.046	4.95	***
Net immigration flows (people between 52-67 years). Average mean in the period 1995-2000	-0.014	-0.57	
New EU Countries (including Bulgaria and Romania)	-0.333	-4.95	***
Agglomerated regions	-0.181	-3.24	***
b) Regression of quota of self-employed on total employment			
Constant	11.07	19.5	***
Structural funds expenditure per capita 94-99	0.011	7.31	***
*** = significant at 99%			
** = significant at 95%			
* = significant at 90%			

Table 7 Results for the population growth equation and for the share of self-employed on employment.

The Eastern countries are also behaving significantly differently from the rest of the regions. They are normally increasing less or decreasing more their population with respect to their western counterparts. Since the effects of mortality and of natality are already taken into account by the respective variables, this behaviour can be ascribed to the international out-migration flows that affect the Eastern countries.

Finally, also the spatial typology of regions is affecting their performance, agglomerated regions are losing population with respect to the others (i.e. the rural and urban). This may be a signal that people are, ceteris paribus, out-migrating the most agglomerated regions in order to decrease the personal costs of congestion.

The migration flow equation estimates

Given the critical role of the immigration flows for our model, specific equations have been estimated, with the aim to endogenise immigration flows. Table 8 presents the results.

Interestingly enough, the estimates of a unique immigration flow equation did not provide any interesting results. The availability of data according to the age structure of immigrating people was rather useful in this respect. As Table 8 shows, the reasons explaining migration flows are in fact rather different for the three different age groups.

Dependent Variables	*Net immigration flows (people*	*Net immigration flows (people*	*Net immigration flows (people*
Constant	1.40 (0.72)	7.61 (8.53)***	1.79 (1.33)
Regional relative per capita GDP level with respect to the EU (lagged 1 year)	0.79 (4.79) ***		
Regional relative per capita GDP level with respect to the EU (lagged 1 year) in Eastern Countries		0.2 (5.28) ***	
Regional relative per capita GDP level with respect to the EU (lagged 1 year) in Western Countries		-0.34 (-5.56) ***	-0.36 (-7.08) ***
Unemployment rate (lagged 1 year)	-0.92 (-2.72) ***	-0.93 (-5.83) ***	-0.57 (-4.72) ***
Regional share of tertiary activity			0.05 (2.15) **
Dummy for megas regions	4.66 (2.87) ***		
Dummy for agglomerated regions	4.67 (2.54) **	-2.27 (-3.34) ***	-2.88 (-5.07) ***
Dummy for Eastern countries	10.48 (4.21) ***		
*** = significant at 99%			
** = significant at 95%			
* = significant at 90%			

Table 8 Results of the regression for the migration equations.

The youngest group of people (comprising 17-27 years old people) move for economic reasons, towards areas with higher regional GDP levels and lower unemployment rates. They are attracted by metropolitan dynamic regions (megas) and agglomerated areas, which represent the location of high education activities and higher opportunities for entering the labour market (Table 8, first column).

The motivations of migrations for the group of people between 32-42 are different (Table 8, second column). Unemployment rate remains an important reasons for migrating out of a territory; greater regional per capita GDP is instead an attractive factor for Eastern regions, while it registers a negative sign in Western Countries. In the latter, greater per capita GDP is mostly associated to those areas having greater productive activities but lower increasing growth rates and therefore higher unemployment rates; on the contrary Eastern Countries still register relative higher per capita GDP in areas with increasing productive activities and employment opportunities. Agglomerated areas tend to lose this group of people.

The net immigration flows of people between 52-67 years old follow different explicative patterns (Table 8, column 3). People of this age are either already employed people or retired workers. The employed group of people moves towards regions with lower unemployment rate.
The retired group of people moves for tourism or health reasons towards more touristic tertiary areas and away from agglomerated regions, where congestion costs hamper the quality of life, and from the richest regions, where the cost of living is higher.

The self-employment estimates

The quota of self-employees on employment has in this model the role as the proxi for entrepreneurship. This variable is positively and significantly affected (table 7b) by the structural fund expenditure per capita, since many strcutural funds actions can increase the opportunities of new initiatives for people in less developed regions. In this way, this variable also allows to introduce the effects of structural funds in the model.

1.3 Simulations with the MASST

1.3.1 The methodology of simulation

The MASST model, once it is estimated and all coefficients are obtained, behaves similarly to a normal forecasting model. The latest available actual data in sample (normally the 2002, when not available an extrapolation on the past) is used to forecast the variables of the first period of simulation, the year 2003. After this year, all forecasts are based on the data forecasted for the previous year and on the values of the exogenous variables.

All equations are those described in section 2 of the report. In particular, it is important to remark that regional growth, in the model, is composed by the national component and the differential shift. For this reason:

- the model first forecasts the national growth rate using the equations of the national part;
- it then produces all the forecasts of the endogenous components of the regional differential shift;
- finally, the regional growth rate is obtained by adding the national growth rate and the differential shift.

With this growth rate, it is possible to forecast the level of GDP. The same procedure is applied to the population. Hence, GDP per capita estimates are possible.

The national and the regional growth rates produced in the model are fully compatible. In fact, the growth rate of the sum of GDPs of the regions of one country are identical to the growth rate forecasted by the national component of the model.

1.3.1.1 The definition of scenarios on the basis of targets and of speeds of adjustment

The model includes some endogenous and some exogenous variables. The endogenous variables are calculated by the model at each run (i.e at each year), using the equations with the estimated coefficients.

There are a total of 12 endogenous variables:

At national level:

- real GDP growth rate;
- consumption growth;
- investment growth;
- import growth;
- export growth.

At regional level:

- real GDP growth rate calculated as differential shift;
- the share of self employed on total workforce;
- population growth;
- immigration of people between 17-27 years;
- immigration of people between 32-42 years;

- immigration of people between 52-67 years)

- spillovers, i.e regional growth due to the growth of neighbouring regions.

All other variables are exogenous in the model, and can hence be used to produce different scenarios.

In order to produce simulations, the values of the exogenous variables are to be introduced for each year and each geographical unit. This can be accomplished with an ad-hoc procedure, providing ad-hoc values, but this procedure would be very hard in terms of data entering and, more important, would not make explicit enough the actual hypotheses on which the scenario is built upon. To have an idea, to simulate the model for 13 year, the period until 2015, 2108 values of exogenous variables are needed at national level and 30303 at regional level.

A significant reduction in the number of values to be entered can be achieved through the procedure of 'targets'. We can in fact assume that any regional or national starting value tends to achieve a long-run value, adjusting to it with a given speed of adjustment. The formula is therefore:

$$x_t = x_{t-1} + s(T - x_{t-1}) \qquad (11)$$

where x is the value of the exogenous territorial variable for a given region/country, T is the long run (target) value to which the variable converges and s is the speed of adjustment. A value of 1 in the speed of adjustment implies an immediate adjustment (in one year) of the variable to its target.

The target values can be the same for all geographical units (for example, at national level, the growth rate of public expenditure in the baseline scenario), can be different for each geographical unit and entered as a vector (for example, at regional level, the CAP expenditure) or can be differentiated by regional/country typologies.
The latter is a very interesting feature given by the MASST model: for example, the targets of employment in tertiary activities has been differentiated by regional typologies, i.e. megas and agglomerated regions versus urban and rural regions in addition to EU15 and other countries. The use of targets implicitly implies the convergence of the same type of regions towards the same long run value.

Also the speed of adjustment can be differentiated between geographical units and/or by type of variable. In the scenario design process, structural variables (e.g. the birth and death rates) are always assumed to adjust very slowly, with an adjustment coefficient of 0.1. The non structural values are assumed to react more rapidly. In the same way, the adjustment speed of policy variables is generally higher, but can be differentiated according to the assumed efficiency of public administrations in the implementation of policies, for instance, it is always assumed to be 0.8 for old EU15 members and 0.5 for the new members of the EU.

1.3.2 Scenario assumptions

For this third interim report, three scenarios are produced with the MASST, corresponding to the three qualitative integrated scenarios of the project (cfr. the volume on the integrated scenarios of this third interim report). The MASST only includes measurable variables and focuses on economic growth as indicator. For this reason the qualitative aspects of the integrated scenarios are impossible to take into consideration. However, all the quantitative hypotheses concerning the patterns of the exogenous variables in the MASST are as similar as possible to the qualitative hypotheses of the integrated scenarios and were defined in collaboration with the entire TPG.

The scenario assumptions, as evidenced above, are introduced as targets and speeds of adjustment, which generate the exogenous variables starting from their initial actual value. All quantitative assumptions on targets are included in table 9.

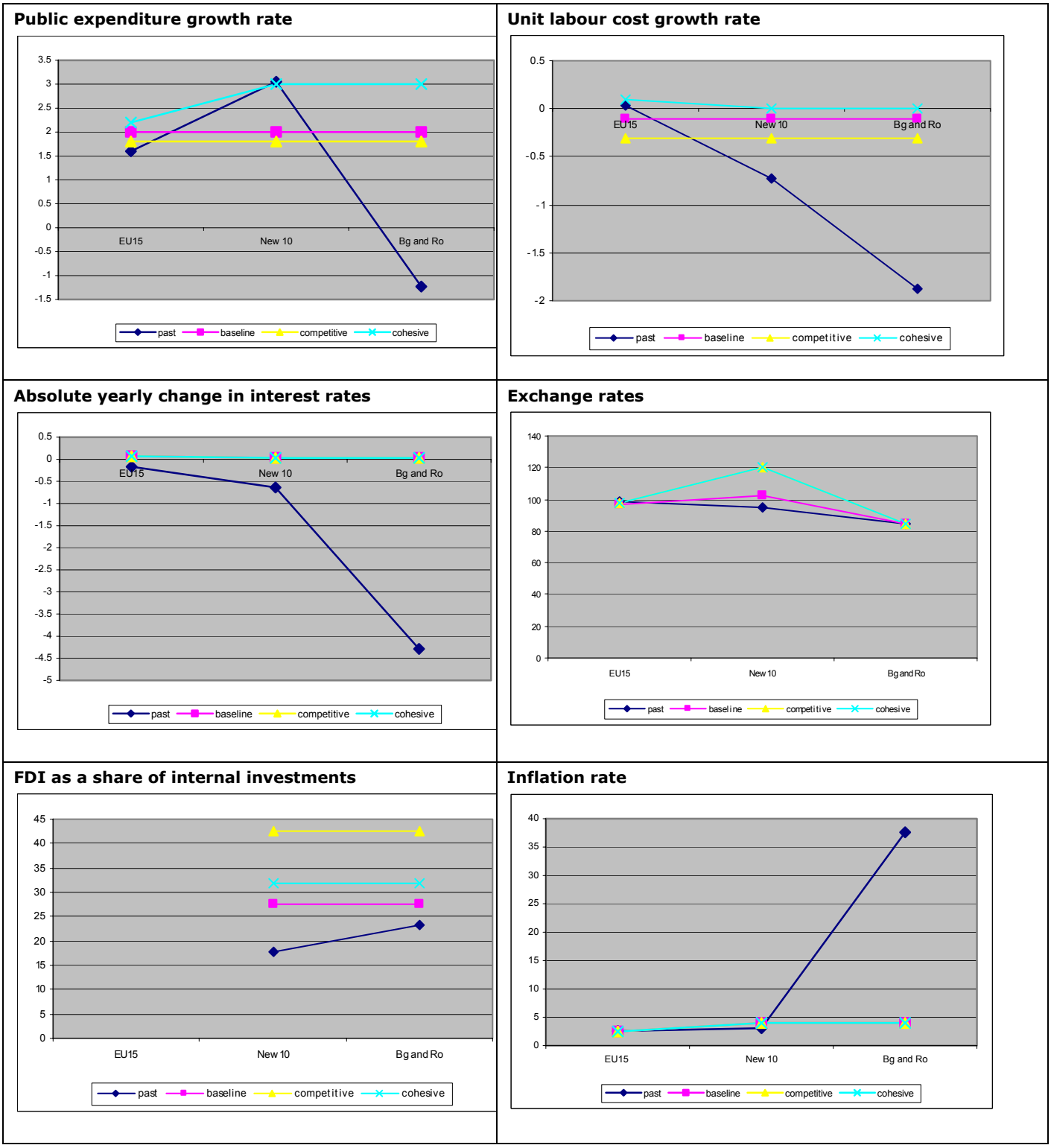

Figure 1 **Graphical confrontation of the assumptions of the three scenarios: National variables**

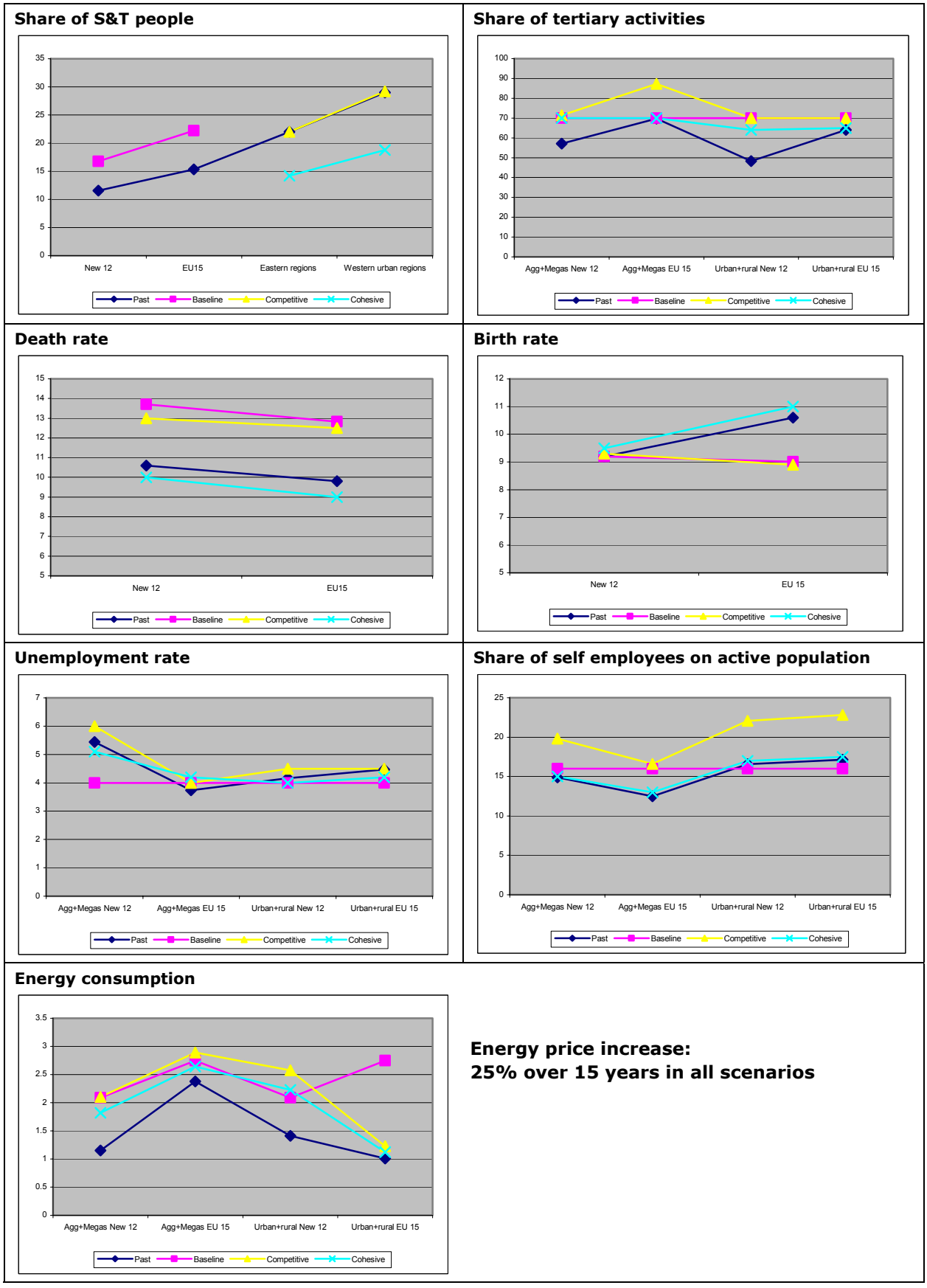

Figure 2 **Graphical confrontation of the assumptions of the three scenarios: Regional variables**

	*Starting values**		*Target values in 2015*		
	Past trends in the period 1995-2002	*Values in 2002*	*baseline scenario*	*competitive scenario*	*cohesive scenario*
		National variables			
Public expenditure yearly growth rate					
New 10	3.1		2	1.8	3.0
EU15	1.6		2	1.8	2.2
Bg and Ro	-1.2		2	1.8	3.0
Unit labour cost yearly growth rate					
New 10	-0.73		-0.1	-0.3	0.0
EU15	0.04		-0.1	-0.3	0.1
Bg and Ro	-1.88		-0.1	-0.3	0.0
Yearly difference in interest rates					
New 10	-0.64		0.033	0.033	0.033
EU15	-0.17		0.067	0.067	0.067
Bg and Ro	-4.29		0.033	0.033	0.033
Exchange rates index					
New 10	95.0		102.0	120	120
EU15	99.0		97.1	97.6	97.6
Bg and Ro	85.0		85.0		
FDI as a share of internal investments					
New 10	17.75		27.65	42.54	31.97
Bg and Ro	23.37		27.65	42.54	31.97
Inflation rate					
New 10		3.09	4.00	4.00	4.00
EU15		2.58	2.50	2.50	2.50
Bg and Ro		14.15	4.00	4.00	4.00
		Regional variables			
Share of S&T people **					
New 12		11.57	16.78		
EU15		15.33	22.23		
Eastern regions		22.00		22.00	14.20
Western urban regions		29.00		29.20	18.80
Energy consumption					
New 12		1.32	2.09		
EU15		2.48	2.75		
Agglomerated and megas in New 12		1.15		2.10	1.82
Agglomerated and megas in EU 15		2.38		2.89	2.64
Urban and rural in New 12		1.41		2.58	2.23
Urban and rural in EU 15		1.01		1.23	1.12
Energy price increase			25% over 15 years	25% over 15 years	25% over 15 years
Death rates					
new 12		10.60	13.70	13.00	10.00
EU15		9.80	12.83	12.50	9.00
Birth rates					
new 12		9.20	9.20	9.30	9.50
EU 15		10.60	9.01	8.90	11.00
Unemployment rate					
new 12		5.11	4.00		
EU 15		3.95	4.00		
Agglomerated and megas in New 12		5.44		6.00	5.10
Agglomerated and megas in EU 15		3.74		4.00	4.20
Urban and rural in New 12		4.16		4.50	4.00
Urban and rural in EU 15		4.47		4.50	4.20
Share of self employees on employment					
new 12		17.04	16.00		
EU 15		15.25	16.00		
Agglomerated and megas in New 12		14.89		19.80	15.00
Agglomerated and megas in EU 15		12.48		16.60	13.00
Urban and rural in New 12		16.58		22.05	17.00
Urban and rural in EU 15		17.15		22.81	17.50
Share of tertiary activities					
new 12		51.37	70.00		
EU 15		70.00	70.00		
Agglomerated and megas in New 12		57.13		71.41	70.00
Agglomerated and megas in EU 15		69.78		87.23	70.00
Urban and rural in New 12		48.33		70.00	64.00
Urban and rural in EU 15		64.00		70.00	65.00
Transport infrastructures		KTEN	KTEN	KTEN	KTEN
Pillar 2 CAP expenses			In the West: present regional amount plus 5% of regional Pillar1. In the East, the same total amount than in the West divided by agricultural population	As in the baseline, divided by 2	As in the baseline, multiplied by 1.5
Structural funds			total amount constant, 50% to East, 50% to West	total amount halved, given all to the East	total amount doubled, given all to the East

* the choice between a past trend or a value in 2002 depends on data availability

Table 9 Target for the exogenous variables in the three scenarios

In the same way, the baseline scenario, which will be discussed below, will be compared with a purely extrapolative scenario in which all exogenous variables are kept constant at their value in 2002. This allows to forecast what would be the patterns of the endogenous variables if nothing would change with respect to the situation of the last year of the sample. The 'competitive' and the 'cohesive' scenarios will instead be compared to the results of the baseline scenario.

Figures 9 and 10 allow to graphically compare the assumptions of the three scenarios amongst each other and with the past, the latter being represented by the average of 1995-2002 for variables entering the model in terms of variations and the year 2002 for variables entering the model in absolute terms.

1.3.2.1 The baseline scenario

The baseline scenario, extensively described in other sections of this report, is a scenario built on the assumptions that the present socio-economic tendencies at work will last for the next decade and a half, and that no strong external shocks as well as no drastic changes in macroeconomic and structural policies will intervene and generate changes in the trajectories of these variables.
All quantitative assumptions suit this hypothesis and the specific hypotheses formulated by the other teams.

a) National variables

The speed of adjustment of these variables to targets is differentiated by Old 15 and New 12[7] members of the EU. The efficiency in achieving the results in EU15 countries is 0.8 for cyclical variables; 01. for structural variables. In New12 countries the efficiency in achieving the results is lower: 0.5 for cyclical variables; 0.1 for structural variables. The target variables are instead differentiated between Old 15, New 10 members and the two pre-accession countries (Bulgaria and Romania). The latter in fact strongly differ in terms of the past values of the macroeconomic variables. These differences do not allow to always define the same target variables of the New 10.

[7] This includes the New 10 member states of the EU plus the two candidate countries of Bulgaria and Romania.

For the national variables, the value has been chosen as the mean of the values in the period 1995-2005. From 2002 to 2015 the values are predictions made by EU, OCSE, UN, taking into account the main tendencies expected in the short term forecasts.

For the EU15 it is predicted a slow but positive economic recovery expressed by:

- an inflation rate not over 2.5%, almost stable with the present values (target 2.5%);
- small increase in public expenditure growth rates because of the Maastricht parameters (target Δg =2%);
- an increase in interest rates of 2% in 15 years (target Δi = 0.066);
- a tiny re-evaluation of exchange rate, keeping with respect to the dollar the actual strong position (target = 99; the present value is 97.1);
- an increase in the advantages in terms of unit labour costs due to an increase in labour productivity higher than the increase in wages (target Δclup = -0.1).

New 12 countries slowly but steadily tend towards convergence with EU15 values:

- decreasing inflation rate without reaching the average of EU15 (target inflation rate = 4%);
- an increase of public expenditure growth rates not over 2%, due to the tighter financial constraint of entering the EU (target Δg = 2%);
- an increase in interest rates of half the one of EU15, i.e. 2% over 15 years (target Δi = 0.033%);
- a tendency in New 10 member states to achieve higher attractiveness for FDI (target: increase of ratio FDI flows on investements of one quarter of the annual average growth rate of the past 7 years, i.e. 3% per year); Bulgaria and Romania would converge to New10 values;
- a small de-evaluation of the exchange rate in the 10 new member states (target = 102; the present value is 95), keeping with respect to euro a comparative advantage. Stable with respect to the present exchange rate in Bulgaria and Romania (target = 85; the present value is the same);
- an increase of productivity in terms of unit labour costs. However, due to a possible increase in wages towards western values, this increase will not represent a gain in relative terms with respect to the old EU15 members (target Δclup = -0.1, average 1995-2002 was -0.73 for New10 and -1.88 for Bulgaria and Romania).

b) Regional variables

The assumed efficiency in achieving the targets is also in this case lower for Eastern countries for cyclical variables (0.5 with respect to 0.8). The speed of adjustment of structural variables, on the contrary, is for all regions low (s=0.1).

In both EU15 and New Member States plus Bulgaria and Romania there will be a steady implementation of the EU policies aiming at increasing EU competitiveness (and knowledge-based growth) and real convergence. Moreover, the baseline scenario is based on the following assumptions:

- a steady adoption of the Lisbon agenda, which is reflected in MASST in a steady increase in S&T human resources. The target in EU15 is 22.23% which is the actual value plus an yearly increase of 3%, the same that the EU15 had on average in the past; the target for New12 countries is 16.78%, which accounts for the same yearly percentage increase with respect to the present value;
- a tendency of energy consumption to increase, especially in the East, despite the Kyoto agreement, because of the economic recovery. The consumption in EU15 will increase from 2.48 to 2.75 Ktoe per 1000 persons, in New 12 the increase will be from 1.32 to 2.09. The target values are obtained multiplying the initial values by the percentage increment in energy consumption of the European Commission's 'Green paper towards a European strategy for the security of energy supply'. The increase of energy consumption is curbed by an increase of 25% in energy prices;
- a tendency of tertiary activities to increase in Eastern Countries to the average EU mean (target = 70%), and remain stable in Western Countries (target 70%), where it is already very high;
- stable share of self-employees at EU level (target = 16%);
- tendency towards natural unemployment rate equal to 4% (UN forecasts) due to the economic recovery combined with the labour market reforms in the East and a stable low unemployment rate due to the economic recovery combined with the labour market reforms in the West (target natural unemployment = 4%; past value in the West 3.95%, past value in the East 5.11%);
- birth rate target as the one of the scenario B0 of the ESPON project 1.1.4; this is a scenario built on the assumption that labour force remains constant, and the changes in total population are only reflect the changes in the age structure;
- a death rate target also coming from the demographic scenario B0 of the ESPON project 1.1.4:

- an increase in infrastructure measured as increase of total Km of roads, motorways railways provided by MCRIT (cfr. Other sections of this report);
- the CAP only enters the model as Pillar 2 expenses, since those of Pillar 1 are not significantly affecting regional growth. They are based on the following assumptions: total expenses of EU in CAP will remain constant; in 2013 pillar 1 expenses will shift (compulsory) to Pillar 2 by 5%; in 2015 new countries will get the same level of CAP as EU15. Since the share of Pillar 1 on total CAP is very small, it is possible to assume an increase of Pillar 2 expenditure even in cases in which total CAP expenditure decreases. These qualitative assumptions lead to the following quantitative targets: for the regions of EU 15 the target of Pillar 2 will be equal to the present value with an increase of 5%; this means that the regions in EU15 that are not receiving Pillar 2 assistance will remain as such, with a target of 0. It is not possible to forecast in detail how the Pillar 2 expenditure will be allocated in the Eastern regions. For this reason, the most conservative hypothesis is to assume that all these regions will achieve the same Pillar 2 expenditure per AWU (average working unit, the way in which this variable enters the regression) of the EU15.
- Concerning the structural funds, the target variable is obtained by assuming that the total of this assistance will remain stable and that it will be divided in 50% in the west and 50% in the new 10 member states, with Bulgaria and Romania being excluded. This means that the assisted regions of EU15 have a target which is half of their present value, whereas in the Eastern countries, where this value doesn't exist, it is assumed, with the most neutral hypothesis, that structural funds will be distributed according to regional population.

1.3.2.2 The competitive scenario

The scenario on 'competitive Europe through liberalisation' (cfr. other sections of this report) is built on the assumptions that:

- a significant reshaping of policies in favour of the 'champions' will be put in place originating from the bad performance of the Lisbon Strategy during the period 2000-2005, ;
- policies towards competitiveness of the European economy will be mostly based on 'private' resources, mainly available in rich areas and Countries;
- labour market reforms (towards more flexibility in the labour market) will take place increasing labour productivity;
- a more 'competitive' Europe will emerge as the result of efficiency-oritented, rather than cohesion-oriented, policies. Greater competitiveness will be registered vis-à-vis US and the emerging Countries.

a) National variables

The speed of adjustment of these variables to targets is differentiated, as are the targets themselves, by Old 15 and New 12[8] members of the EU. The efficiency in achieving the results in EU15 countries is 0.8 for cyclical variables; 01. for structural variables. In New12 countries the efficiency in achieving the results is lower: 0.5 for cyclical variables; 0.1 for structural variables

In EU15 members, the qualitative assumptions of the scenario are declined as follows:

I. the annual increase in public expenditure reduces more than in the baseline scenario (target = 1.8%);
II. the decrease of unit labour cost is 3 times than in the baseline scenario, as a consequence of policies targeting the competitiveness (target = -0.3);
III. for the interest rates the same assumptions of the baseline scenario are confirmed;
IV. for the exchange rates the same assumptions of the baseline scenario are confirmed;
V. FDI/Investments increase at a growth rate which is half of the average annual growth rate in the past 6 years, i.e. 6% a year (target = 42.54).

b) Regional variables

The assumed efficiency in achieving the targets is also in this case lower for Eastern countries for cyclical variables (0.5 with respect to 0.8). The speed of adjustment of structural variables, on the contrary, is for all regions low (s=0.1).

At regional level it is assumed that the EU budget is reduced, and policies mainly targeted to the national champions, i.e. metropolitan and agglomerated areas. Moreover, EU expenditures are targeted towards R&D, education, ICTs and accessibility. Finally, the CAP is subject to rapid and radical liberalisation.

For this reason, the targets of the competitive scenario are differentiated not only between EU15 and New12, but also in two main typologies of regions: the agglomerated and megas and the urban and rural[9].

[8] This includes the New 10 member states of the EU plus the two candidate countries of Bulgaria and Romania.
[9] Since the megas are not mutually excluding with the other three, should a region be megas and urban or rural, it was considered within the agglomerated and megas.

From these qualitative assumptions, the quantitative hypotheses regard:

The fertility rate and mortality rate assumptions are the ones of scenario C1 of Espon project 1.1.4.

The unemployment rate is higher than in the baseline scenario, apart from the agglomerated and megas regions of western Europe regions (targets = 6 for Megas and agglomerated in New12; 4 for megas and agglomerated in EU15; 4.5 for urban and rural, regions, both in New12 and EU15).

The share of self-employees will increase because of the attempt to achieve the Lisbon objectves (target = a doubled constant in the regression). However, structural funds, which in the model affect this variable, will decrease by 50% and be given only to eastern Countries (Bulgaria and Romania excluded). Therefore, the increase of self-employment will be reduced.

The share of S&T employees will increase because of the attempt to achieve the Lisbon objectives, (0.6% increase per year, which is the double of the one for the baseline and gives a target variable of 22 in Estern urban regions and 29.2 in Western urban regions).

The increase in energy consumption will double with respect to the baseline in the East, and 1% additional increase in the West.

The share of tertiary activity target is the same of the baseline for rural and urban areas (70%, i.e. the current EU15 average); instead for agglomerated and megas regions, there is an increase of 25% with respect to the past, giving a target of 71.4% in the East and 87.23% in the West.

The megas and pentagon regions are expected to increase their growth rate: this is obtained by doubling their coefficient values.

Bulgaria and Romania will join the EU in 2008. Barriers decrease for the bordering regions of these countries from that year.

The increase in infrastructure is measured as increase of total Km of roads, motorways and railways. The target variable is calculated by MCRIT (cfr. Other sections of this report);

The pillar 2 expenditure is calculated as half of the Pillar 2 expenditure of the baseline scenario.

The structural fund total amount will be halved and all will be given to the Eastern regions, in proportion to the regional population[10], the target is therefore 0 for all EU15 regions.

[10] This is the most neutral hypothesis on how these funds can be allocated, since there is no political decision on which the hypothesis can be based.

1.3.2.3 The cohesive scenario

The socio-economically and territorially cohesive scenario is a policy scenario built on the assumptions that public funds will be devoted to weakest regions. Structural reforms will be targeted to 'social diseases' more than to the achievement of 'competitiveness goals' (labour market reform will be more in favour of a reduction of unemployment despite the loss in efficiency).

These assumptions are translated into quantitative assumptions by:
- giving a decisive increase in all variables related to cohesive policy instruments (public expenditure; structural funds, CAP);
- giving a lower increase with respect to the baseline scenario to some strategic variables concerning competitiveness.

a) National variables

The speed of adjustment of these variables to targets is differentiated, as are the targets themselves, by Old 15 and New 12[11] members of the EU. The efficiency in achieving the results in EU15 countries is 0.8 for cyclical variables; 01. for structural variables. In New12 countries the efficiency in achieving the results is lower: 0.5 for cyclical variables; 0.1 for structural variables.
The annual percentage increase in public expenditure is higher than in the baseline scenario, especially in the East, since the old member have tighter financial constraints (target is 3% for New12 countries and 2.2 for EU15).
The unit labour cost stops decreasing in the East and increases in the West as a consequence of policies of support (target is 0 for New12 and +0.1 for EU15).
For the interest rates the same assumptions of the baseline scenario are confirmed.
For the exchange rates the same assumptions of the baseline scenario are confirmed.
FDI/Investments increase at a growth rate which is one third of the average annual growth rate in the past 6 years, i.e. 4% a year, more than in the baseline and less than in the competitive scenario (target = 31.97).

[11] This includes the New 10 member states of the EU plus the two candidate countries of Bulgaria and Romania.

b) Regional variables

The assumed efficiency in achieving the targets is also in this case lower for Eastern countries for cyclical variables (0.5 with respect to 0.8). The speed of adjustment of structural variables, on the contrary, is for all regions low (s=0.1).

As it was done in the competitive scenario, also in this scenario it will be distinguished between the two regional typologies of agglomerated and megas regions versus urban and rural ones.
The regional assumptions on which this scenario is based are that
- the EU budget is increased, and policies mainly targeted to weak (rural and urban) areas;
- EU expenditures are targeted towards unemployment, SF and CAP;
- SF expenditure double with respect to the baseline scenario and also the part of CAP devoted to rural development increases.

From here, quantitative changes regard:

- as far as fertility rate and mortality rate are concerned, a better balance of population structure implied that the mortality rate decreases with respect to the baseline scenario and that the fertility rate increases;
- unemployment rate increases slightly with respect to the baseline scenario in the EU15 (target: 4.2%). In the East, the weakest regions (the urban and rural) maintain the same value of the baseline scenario (target 4%), whereas the potentially stronger agglomerated and megas regions have an increase of unemployment with respect to the baseline (target 5.1%);
- the share of selfemployees is maintained constant for the part not related to SF (constant not changed); the impact of Structural funds is different from the baseline scenario (see below);
- the structural funds total amount is doubled and given all to the Eastern Countries (Bulgaria and Romania included), in proportion to the regional population;
- the energy consumption increases as in baseline (3.1% per year for agglomerated and megas regions in the new 12 member countries; 0.07% per year agglomerated and megas regions of the EU15), but the targets are differentiated by regional typology;
- the share of S&T employees will increase because of the attempt to achieve the Lisbon objectives, but since less funds are made available for competitiveness targets, the increase is less than the baseline (1.5% increase per year, which gives a target variable of 14.2 for the urban regions in the East and of 18.8 for the urban regions in the West);

- the share of tertiary activity is in megas and agglomerated areas the actual share of EU15 (target 70%); urban and rural areas of the West remain almost constant (target = 65%) and the urban and rural areas of the New12 tend to converge to the present value of urban and rural of EU15 (target 64%);
- rural regions in the 12 eastern countries increase their growth rate. This is obtained by doubling the value of the coefficient in the equation;
- Bulgaria and Romania join the EU in 2008. The barriers decrease and they are eligible for structural funds from then;
- the increase in infrastructure is measured as increase of total Km of roads, motorways and railways and is provided by MCRIT (cfr. other sections of this report);
- the pillar 2 expenditure is calculated as in the baseline but then increased by 50% (target ½ of the baseline target); notice that this doesn't necessarily needs an increase of the CAP budget, if modulation increases.

1.4 First results of the model

The model can be used to produce predictions in a large number of regional and national variables. In this third interim report the analysis will concentrate the effects of the different scenario assumptions on some selected indicators, chosen because of their interest. All these indicators are analyzed at regional NUTS2 level, to show the potentiality of MASST for territorial analysis.
The analysis of results of MASST in the three scenarios will be completed in the final report, where all simulation will use definitive scenario assumptions.

First provisional draft results are presented together with the scenarios in volume 3 of this report.

2 KTEN - Know trans-European Networks

MCRIT

Efrain Larrea
Andreu Ulied

2.1 Introduction and overview

This section provides an overview of KTEN. Next sections present KTEN in depth and main results already achieved (definition of transport infrastructure scenarios, definition of demand scenarios, and traffic forecast for the year 2000 and 2030 considering all Transeuropean networks operational). Next steps will be to apply the model for three scenarios and two time periods, and the calculation of all spatial development and environmental indicators.

Transport infrastructure scenarios are based on selecting those road and rail projects within TENs more likely to be built according to the policy-aims defined for each ESPON 3.2 scenario (baseline, cohesive and competitive); Transport demand scenarios are based on defining passenger and freight growth and modal share, also according to the policy aims of each scenario. Both definitions of infrastructure and demand scenarios are based on quantitative objective criteria that reflect European policy aims.

Concerning the initial definition of the modeling exercise, two main improvements have being implemented:

- Using the baseline demand scenario, and supposing all Transeuropean networks being operational in 2030, a number of indicators have been calculated for each link and/or region: profitability or European interest based on a user's marginal cost proxy, reduction of regional infrastructure gap, support to less developed regions in terms of GDP per capita. These indicators are then used as a reference to define the actual infrastructure scenarios.

- Trip and freight forecast matrices were disaggregated at NUTS3 (the model produces forecast at NUTS2, and afterwards are disaggregated based on a gravitatory formulation in order to get flows at NUT3, which are needed to make the traffic assignment exercise precise enough to calculate the indicators needed to define infrastructure scenarios.

Next, a detailed description of KTEN, and KTEN relation with MASST is introduced:

KTEN Purpose: KTEN, together with MASST, have been used to precise qualitative scenarios into quantitative ones, providing an economic, spatial and environmental strategic assessment of them. In particular, KTEN is used to define transport network scenarios and evaluate them, from an European perspective.

KTEN Definition: ("Know trans-European Networks") is a passenger and freight traffic forecast metamodel developed to facilitate a strategic analysis of the trans-European Transport Networks in a wider pan-European and Mediterranean scale.

KTEN Formulation: It is a sequential Four-steps model, with combined modal split and assignment on multimodal networks; assignment of interurban trips and freight between NUTS3 is made without congestion constraints (1 complete run of KTEN takes about 4 days; KTEN is 4GB large in total).

KTEN Information: It uses STREAMS results, WTO and EUROSTAT Air Traffic OD databases, ETIS-BASE freight matrices.

KTEN Integration with MASST: infrastructure regional endowment as output for MASST, GDP and population predictions from MASST as inputs.

KTEN main outputs: Multimodal passenger trips and costs and freight forecast between NUTS2 (disaggregated into NUTS3), traffics on rail, road, air and maritime links, relative European interest of road and rail links (considering interurban NUTS3 relation), spatial development and environmental aggregated indicators.

KTEN steps:

2. Definition of infrastructure scenarios using IGIS project database according to the scenarios sketched by ESPON 3.2 TPG, following expert criteria.

3. Calculation of construction costs, which are sent to MASST.

4. MASST provides provisional GDP and population forecasts.

5. Calculation of travel costs between NUTS2 capitals for different transport modes in a year 2000 scenario and a complete scenario with all infrastructures finished.

6. Creation of future passenger and freight matrices for the complete scenario.

7. Assignment of matrices and calculation of indicators.

8. Redefinition of infrastructure scenarios using calculated indicators.

9. Calculation of construction costs, which are sent again to MASST.

10. MASST provides definitive GDP and population forecasts.

11. Calculation of travel costs between NUTS2 capitals for different transport modes and all scenarios.

12. Creation of future passenger and freight matrices for all scenarios.

13. Assignment of matrices and calculation of indicators.

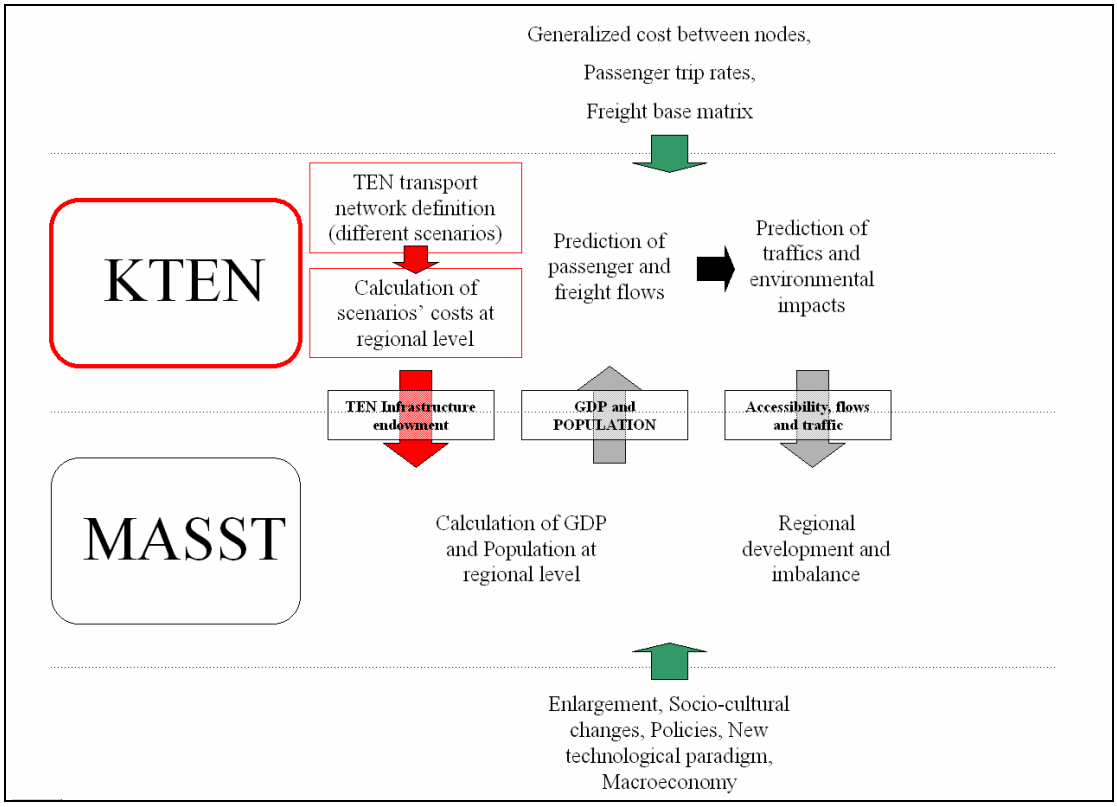

Figure 3 Scheme of interrelation between KTEN and MASST models

2.2 Scenario definition

2.2.1 Policy definition of scenarios

The infrastructure scenarios are defined based on both political aims and scientific criteria; policy aims determine maximum budget lines for road and rail, for 2015 and 2030, and the decision-making frame. No significant differences concerning ports and airports, and urban infrastructure, are considered in the scenarios.

- Competitive scenario: projects are selected based on socioeconomic profitability only. There is no preference for rail and no strong policies in favor of modal shift; it is assumed in the scenario that the improvement of road vehicle efficiency, road traffic management systems, will produce more efficient use of road and much less environmental impacts. Road pricing is applied on all roads and rail services tend to be adapted to demand and have market prices with no subsidies. This is the most efficient scenario from a transport-economics point of view (the one with the lowest marginal costs in both roads and rail).

- Cohesive scenario: projects are selected based on reducing the infrastructure endowment gap between regions. Policy is based on more roads for regions with less road endowment, and a balanced investment on roads and rail in regions with higher levels of road transport endowment. This is the scenario that can have higher impact inducing economic growth in less developed regions.

- Baseline scenario: projects are selected based on socioeconomic profitability but regions with GDP below the average have a specific budget. Strong policies to induce modal shift. It is assumed that rail technology and rail management will improve enough to carry this traffic increases. This scenario can be considered as the most sustainable, assuming an improvement in rail management.

2.2.1.1 Competitive scenario

Infrastructures are built according to their socioeconomic profitability, based on a Cost-Benefit Analysis (CBA) appraisal that includes both environmental externalities and indirect territorial impacts. The RAILPAG defined by the European Investment Bank, for instance, proposes an updated methodology to evaluate rail infrastructure projects; according to CBA, the selection criteria could be not to build projects with CBA below a given threshold (measuring CBA in vehicle flow increase per invested €, and fixing priorities based on a CBA ranking). A proxy of this CBA is the marginal cost of the foreseen increase in passenger and freight traffic, and the savings of the existing traffic thanks to the time and cost reductions produced for the new infrastructure project. The total budget to be allocated could be separated into a 'road budget' and 'rail budget'. The relative budget for roads or rail is then a political decision based on policy aims more global than the transport policy. The total investment in infrastructure will be less than the total possible, since projects with low profitability will not be built.

Method to define the infrastructure scenarios:

- Evaluation of the current road and rail CBA proxy
- From the European list of projects, ranked according to CBA proxy, select until the total budget allocated is reached

2.2.1.2 Cohesive scenario

Infrastructures are built according to territorial criteria, based on assuring a minimum level of accessibility to cities and regions, without regarding the existing traffic or the economic development level. Since less developed regions use to have less resources available to build infrastructures, this policy requires transfers from most developed regions. Priorities are fixed based on reducing territorial gaps, starting by building those projects with higher expectations on traffic (so those that may induce more mobility, relations and development opportunities).

Method to define the infrastructure scenarios:

- Evaluation of the current road and rail densities, and relative gaps.
- Regional distribution of road and rail budgets based on gaps
- From the regional list of projects, ranked according to CBA proxy, select until the regional allocated budget is reached

2.2.1.3 Baseline scenario

Infrastructures are selected based on both CBA and GDP gaps. Regions are classified into two groups, based on GDP (those above the average and those below). For each group, infrastructures are selected based on CBA ranks similar to the competitive scenario (CBA thresholds will be smaller in the baseline scenario than in the competitive).

Method to define the infrastructure scenarios:

- Evaluation of the current road and rail CBA.
- Analysis of GDP evolution
- From the list of projects for both group of regions, ranked according to CBA, select until the regional allocated budget to rail and road is reached.

2.2.2 Demand scenarios

Coherent with the infrastructure and supply management scenarios, there are demand scenarios that are based on assumptions regarding population, economic growth, spatial patterns, and other key elements relatively exogenous to transport infrastructure.

The following table summarizes the different variables that define the demand scenarios (shown values are provisional and somehow 'qualitative' and can not be directly used in the model, they first need a re-scaling):

SCENARIO	2015 BASELINE	2015 COHESIVE	2015 COMPETITIVE	2030 BASELINE	2030 COHESIVE	2030 COMPETITIVE
	Environmental	Territorial	Economic	Environmental	Territorial	Economic
Main indicator	Development GDP	Endowment ACC	Efficiency CBA	Development GDP	Endowment ACC	Efficiency CBA
Main aim	Balancing modes	Balancing regions	Balancing sectors	Balancing modes	Balancing regions	Balancing sectors
PASSENGER						
GDP elasticity	1,0%	1,5%	1,0%	1,0%	1,0%	0,5%
POP elasticity	0,5%	1,0%	0,5%	0,5%	0,5%	0,5%
Work trips/worker per day	2,2	2,5	2	2,2	2,1	2
Study trips/student per day	2	2	2	2	2	2
Maximum trips/person per year	1000	1100	1050	1000	1100	1050
Minimum trips/person per year	100	125	110	100	125	110
Maximum leisure/personal trip ratio	60%	55%	65%	60%	55%	65%
Minimum leisure/personal trip ratio	40%	40%	40%	40%	40%	40%
Users' costs perception	70,0%	55,0%	80,0%	80,0%	75,0%	100,0%
FREIGHT						
GDP elasticity	1,5%	2,0%	1,5%	1,5%	1,5%	1,0%
POP elasticity	1,0%	1,5%	1,0%	1,0%	1,0%	0,8%
Market integration level of EU-15	1	1	1	1	1	1
Market integration level of EU-25	2	2	2	1	1	1
Market integration level of EU-27	2	2	3	2	2	2
Market integration level of EFTA countries	2	2	3	1	1	2
Market integration level of Future Candidate countries	2	1	4	2	2	3
Market integration level of Rest of the World	2	1	4	2	2	3
Carriers' costs perception	75,0%	60,0%	90,0%	80,0%	75,0%	100,0%
Cost allocation to roads	40,0%	60,0%	60,0%	40,0%	60,0%	60,0%
Cost allocation to rails	40,0%	40,0%	20,0%	40,0%	40,0%	20,0%

Table 10 Demand scenarios variables

2.3 Model description

This chapter intends to be a basic description of the steps required to run the model.

As it has been previously said KTEN model is interrelated with MASST model, which provides GDP and Population predictions. However KTEN can be used standalone in future predictions, applying the GDP and Population values obtained from MASST during the first run of the model, and project profitability ratios previously calculated.

KTEN is divided in five modules:

1. Infrastructure definition module: it allows to define which infrastructures will be constructed in each scenario.
2. Passenger forecast module: it generates the future passenger flows between NUTS3 for each scenario.
3. Freight forecast module: it generates the future freight flows between NUTS3 for each scenario.
4. Assignation module: it assigns the passenger and freight flows to the infrastructure network.
5. Spatial and environmental indicators module: calculates different indicators based on the obtained traffics. (Under development)

2.3.1 Infrastructure definition module

The definition of infrastructure scenarios is done through a set of parameters which control the amount of budget to be spent and its spatial and temporal distribution.

For the three scenarios, baseline, cohesive and competitive, the first step is to choose the minimum acceptable profitability of the infrastructure projects, measured as the ratio of vehicle increase forecast divided by the monetary cost of the project.

Three different profitability limits must be defined for every scenario, one for each transport mode (road, rail and inland waterways).

2.3.1.1 Competitive scenario infrastructure parameters

The competitive scenario is based only on profitability, so apart from profitability thresholds it has only parameters concerning temporal distribution of budget for each transport mode.

The following table summarizes all the parameters for competitive scenario with example values:

	Profitability threshold	2015	2030
Road budget	5Mveh/M€	60%	40%
Rail budget	0,5Mveh/M€	50%	50%
Inland waterways budget	0,05Mveh/M€	45%	55%

Table 11 Infrastructure definition parameters for competitive scenario

2.3.1.2 Cohesive scenario infrastructure parameters

The cohesive scenario attempts to reduce the infrastructure gap between regions and a new variable has to be introduced to achieve this objective. The density of each network is calculated for each NUTS2 region in the year 2000 and compared with the European average. Then we classify regions above and below the average of infrastructure density and distribute the budget according to user-defined percentages between regions and time periods.

The following table summarizes all the parameters for cohesive scenario with example values:

	Profitability threshold	GAP <1	GAP >1	2015	2030
Road budget	3Mveh/M€	60%	40%	45%	55%
Rail budget	0,1Mveh/M€	57%	43%	40%	60%
Inland waterways budget	0,09Mveh/M€	50%	50%	50%	50%

Table 12 Infrastructure definition parameters for competitive scenario

2.3.1.3 Baseline scenario infrastructure parameters

The construction of the baseline scenario is based on the GDP gap between regions. The GDP per capita of each NUTS2 region in the year 2000 is calculated and compared with the European average. Then regions are classified in two groups above and below the average of GDP per capita and the budget is distributed according to user-defined percentages between regions and time periods.

The following table summarizes all the parameters for cohesive scenario with example values:

	Profitability threshold	GAP <1	GAP >1	2015	2030
Road budget	2Mveh/M€	55%	45%	45%	55%
Rail budget	0,15Mveh/M€	60%	40%	40%	60%
Inland waterways budget	0,21Mveh/M€	50%	50%	50%	50%

Table 13 Infrastructure definition parameters for baseline scenario

After all these parameters are defined, KTEN updates the network attributes and calculates the matrix of generalized cost of travel between each NUTS2 region for each scenario and time period. This is a total of six cost matrices that will be used in the following modules.

2.3.2 Passenger forecast module

The passenger forecast module generates the matrices of passenger trips between NUTS2 regions. The mathematical formulation of the model is described later in depth in its specific chapter.

The passenger module needs some inputs to produce a forecast matrix that is consistent with the scenario being defined. It also incorporates the cost matrices calculated in the infrastructure definition module to define the modal split.

2.3.2.1 Horizon year

The model allows selecting the desired horizon year for the simulation. This directly affects the values of GDP and Population used.

There is a built-in table with the predictions of GDP and Population change provided by MASST model for the three scenarios (Baseline, Cohesive and Competitive) and two horizons (2015 and 2030). Values for countries not covered by MASST model are extracted from the paper 'European Energy and Transport trends 2030'. Values from EUROSTAT are taken as year 2000 base values. Simulated years are 2015 and 2030.

2.3.2.2 GDP elasticity

Elasticity of GDP is a parameter that allows simulating the direct relation between economy and people movement. It controls the decoupling of trip generation and economy growth.

Present trends show that improvement of the economy in a given region, which we can measure with an indicator such as GDP, implies a growth of generated trips. However, this trend can change in the future reinforcing or decreasing the relation.

The quotient $\dfrac{\dfrac{\Delta trips}{trips_i}}{\dfrac{\Delta GDP}{GDP_i}}$ is what we call elasticity ε and measures how much does the trips

volume change for a given GDP variation. Both variations are relative %

The model allows controlling the GDP elasticity with the parameter ***GDP ε.*** A change of 1% in the elasticity is translated into a 1% variation of the predicted flow. Any number can be chosen, either negative or fractionary; a value of 0 means the model assumes present trend will not change in time.

This parameter should only be different from 0 in case there is a change of trends between present and forecast scenarios.

Recommended values range from –3% up to 3%

2.3.2.3 Population elasticity

Elasticity of POPULATION is a parameter that allows simulating the direct relation between demography and people movement. It controls the decoupling of trip attraction and population growth.

Present trends show that a growth of population in a region, implies a growth of trips towards it. However, this trend can change in the future reinforcing or decreasing the relation.

The quotient $\frac{\frac{\Delta trips}{trips_i}}{\frac{\Delta POP}{POP_i}}$ is what we call elasticity ε and measures how much does the freight tonnage change for a given POP variation. Both variations are relative %

The model allows controlling the POP elasticity with the parameter ***POP ε.*** A change of 1% in the elasticity is translated into a 1% variation of the predicted flow. Any number can be chosen, either negative or fractionary; a value of 0 means the model assumes present trend will not change in time.

This parameter should only be different from 0 in case there is a change of trends between present and forecast scenarios.

Recommended values range from –3% up to 3%

2.3.2.4 Work trip rate

This parameter indicates how many daily trips are done for work purpose, and is defined at regional level (NUTS2), i.e. one value for each region to allow the simulation of different socio-cultural tendencies. 2 is the minimum value, but as some people go home for lunch the average value rises to 2.2.

2.3.2.5 Study trip rate

This parameter indicates how many daily trips are done for study purpose, and is defined again at regional level (NUTS2), so one value for each region should be chosen. 2 is the average value.

2.3.2.6 Leisure and personal trips

The model defines the number of leisure and personal trips at regional level depending on the GDP. The user must define the minimum and maximum total trips per year and the parameters of the equation relating GDP and trips. Then work and study trips are deducted from this total of trips and the result are the leisure and personal trips.

2.3.2.7 Leisure / Personal ratio

To determine the ratio between leisure and personal trips the model applies an equation based on the ratio of foreign population. The user should provide the minimum and maximum leisure/personal ratios and the equation parameters.

2.3.2.8 Passengers' cost perception

The model divides the trips in three modes, road, rail and air (modal split), according to distribution curves that define the percentage of each mode depending on the straight line distance. To simulate future scenarios the distance in each relation is reduced according to the cost variation (that is calculated in the scenario definition module) affected by the Passengers' cost perception factor.

This factor can be interpreted as the user's perception of costs. A value of 0 means that cost variation will not affect the user's choice. 1 is the recommended value and the higher it is, the higher the modal change will be.

The effect of modal change depends on the initial point on the modal split curves, so it can not be determined a priori. However, due to the shape of the curves, a decrease in the cost of a relation means that the share of air mode will decrease in favor of road and rail.

Once a passenger trip matrix is created, the module disaggregates it from NUTS2 to NUTS3 according to the year 2000 NUTS3 population distribution in each NUTS2.

2.3.3 Freight forecast module

The freight forecast module generates the matrices of freight flows between NUTS2 regions. The mathematical formulation of the model is described later in depth in its specific chapter.

The freight module needs some inputs to produce a forecast matrix that is consistent with the scenario being defined. It also incorporates the cost matrices calculated in the infrastructure definition module to define the modal split.

2.3.3.1 Horizon year

The model allows selecting the desired horizon year for the simulation. This affects directly on the values of GDP and Population used.

There is a built-in table with the predictions of GDP and Population change provided by MASST model for the three scenarios (Baseline, Cohesive and Competitive) and two horizons (2015 and 2030). Values for countries not covered by MASST model are extracted from the paper 'European Energy and Transport trends 2030'. Values from EUROSTAT are taken as year 2000 base values. Simulated years are 2015 and 2030.

2.3.3.2 GDP elasticity

Elasticity of GDP is a parameter that allows simulating the direct relation between economy and freight. It controls the decoupling of freight generation and economy growth.

Present trends show that improvement of the economy in a given region, which we can measure with an indicator such as GDP, implies a growth of generated freight goods. However, this trend can change in the future reinforcing or decreasing the relation.

The quotient $\frac{\frac{\Delta freight}{freight_i}}{\frac{\Delta GDP}{GDP_i}}$ is what we call elasticity ε and measures how much does the freight tonnage change for a given GDP variation. Both variations are relative %

The model allows controlling the GDP elasticity with the parameter ***GDP ε.*** A change of 1% in the elasticity is translated into a 1% variation of the predicted flow. Any number can be chosen, either negative or fractionary; a value of 0 means the model assumes present trend will not change in time.

Variation of elasticity is only possible if strategies are developed, so this parameter should only be different from 0 in case there is a change of trends between present and forecast scenarios.

Recommended values range from –3% up to 3%

2.3.3.3 Population elasticity

Elasticity of POPULATION is a parameter that allows simulating the direct relation between demography and freight. It controls the decoupling of freight attraction and population growth.

Present trends show that a growth of population in a region, implies a growth of consumed freight goods. However, this trend can change in the future reinforcing or decreasing the relation.

The quotient $\frac{\frac{\Delta freight}{freight_i}}{\frac{\Delta POP}{POP_i}}$ is what we call elasticity ε and measures how much does the freight tonnage change for a given POP variation. Both variations are relative %

The model allows controlling the POP elasticity with the parameter ***POP ε.*** A change of 1% in the elasticity is translated into a 1% variation of the predicted flow. Any number can be chosen, either negative or fractionary; a value of 0 means the model assumes present trend will not change in time.

Variation of elasticity is only possible if strategies are developed, so this parameter should only be different from 0 in case there is a change of trends between present and forecast scenarios.

Recommended values range from –3% up to 3%

2.3.3.4 Market integration

The present level of commercial relations between the different countries can suffer variations in the future. The enlargement of the EU will translate in a growth of freight interchange between accession countries and older members.

There can be changes too with the EFTA countries, Iceland, Norway and Switzerland, and with other possible accession candidates like Turkey or the Balkans, as well as with the rest of the world.

This degree of relation is simulated by the dummy parameter K_{ij} in the model equations. There are 17 different values to represent these relations, which have been calibrated against ETIS original data. To allow changes in this parameter the flows have been grouped in 6 mutually excluding categories:

EU-15: Includes all flows with origin an destination inside the EU-15

EU-25: Includes flows with origin and destination inside the 10 new members and between these and EU-15

EU-27: Includes flows with origin and destination inside Bulgaria and Romania and between these and EU-25

EFTA: Includes flows with origin and destination between Iceland, Norway and Switzerland and EU-27

Future Candidates: Includes flows with origin and destination between Turkey and the Balkans and the EU-27

Rest of the World: Flows not included in the previous categories, divided in different zones (rest Europe, Maghreb, Asia, America-Australia, Africa-Mid Asia)

The model lets the user select one out of four different qualitative changes to each one of the six categories, none / low / middle / high improvement, which translate directly in a multiplying factor for the K_{ij} values yielding the following growths for the considered relation: 0%, 50%, 100%, 200%

Depending on the combination of values selected the final predicted tonnage can vary in a range between 0 and 200%. Provided that the most important flows are those concerning the EU-15 category, changes here will greatly vary the total tonnage generating a global impact on the network. On the other hand the lesser flows from the other categories will only have a minor impact when changed.

2.3.3.5 Carriers' cost perception

This parameter controls the global variation of modal distribution and can be interpreted as the impact of pricing changes in the carriers' modal choice. Mathematically it is the power affecting the cost variation.

A value of 0 means the cost variation does not affect modal distribution. Each increment of 1 unit translates in a 1% variation of flow for a mode with a 1% cost variation. For example, if road cost decreases 5% for a given relation and change factor is 1, road quote will increase 5% taken from the rail.

A good value is 1. If policies of rail encouragement are adopted, the number can be increased meaning that users are more sensitive to rail improvements.

2.3.3.6 Cost allocation

This parameter has two values that can be changed, one for road and another for rail, which represent the average variation of costs. The purpose of this parameter is to simulate policies that encourage or discourage a certain transport mode like toll or oil taxes.

The effect of changing the global cost is directly linked to the selected Carriers' cost perception, so if change factor is 0 the global cost will not change the modal distribution.

User can choose whether the parameter refers to a year variation or a variation of the whole simulated period.

It must be noticed that a high increase in costs will reduce the volume of freight transported, provided that cost between nodes is a factor that affects it directly. Given the low share of rail transport comparing to road, a little variation of road costs can generate an important change in total volume, so to simulate an encouraging of rail mode the rail cost should be decreased, whereas an increase in road cost should lead to a similar modal split but the total volume would be noticeably affected.

Once a freight flow matrix is created, the module disaggregates it from NUTS2 to NUTS3 according to the year 2000 NUTS3 population distribution in each NUTS2.

2.3.4 Assignation module

Once the matrices are calculated the next step is assigning them onto the infrastructure networks. The process of assignation is described in depth in its specific chapter.

Here there are no parameters to change, provided that the infrastructure network itself has a set of velocity values depending on the type of link.

The results of this module are the flows of freight and passengers in each of the network links.

2.3.5 Spatial and environmental indicators module

The previously obtained flows are used to calculate different indicators to assess the territorial impact by means of accessibility, infrastructure endowment or traffic congestion, and the environmental impact by means of CO2 generation.

Some parameters need to be defined in order to calculate the indicators. The first ones are the mean occupation rates of the vehicles, i.e. how many people travel in one single car or train wagon, or how many tones does a truck carry.

The following table shows these occupation rates:

	Road (car or truck)	Rail (passenger or freight wagon)	Short sea shipping or Ferry	Inland waterways
Mean ocupation (Pax/veh)	2	100	500	-
Mean tonnage (T/veh)	14	40	17.000	2.000

Table 14 Occupation rates

Other parameters that need to be defined are the energy consumption factors or the CO2 emission rates for each transport mode.
Indicators will be based on these parameters and the traffic results of matrices assignations. They are still under development.

2.4 Passenger forecast module

2.4.1 Trip generation

Trip generation is calculated considering zone-based ratios (by NUTS 2 or equivalent) and the trip purposes are business (trips from home to workplace and study place or vice versa, i.e. the obligated mobility), leisure (trips which are not obligated, like holidays) and visit (personal trips which do not respond to a leisure purpose and are not obligated). Business trips depend on the work and study trips rates by group of age, internal trip rates to define the self containing trips, and the external trip rates. (see Fig. 4)

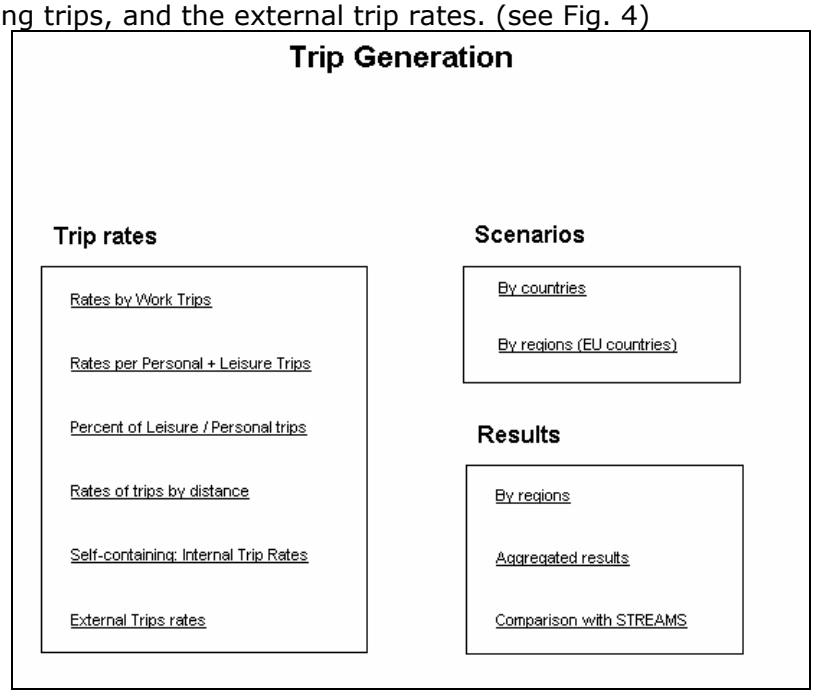

Figure 4 Main interface of KTEN passenger Trip generation module

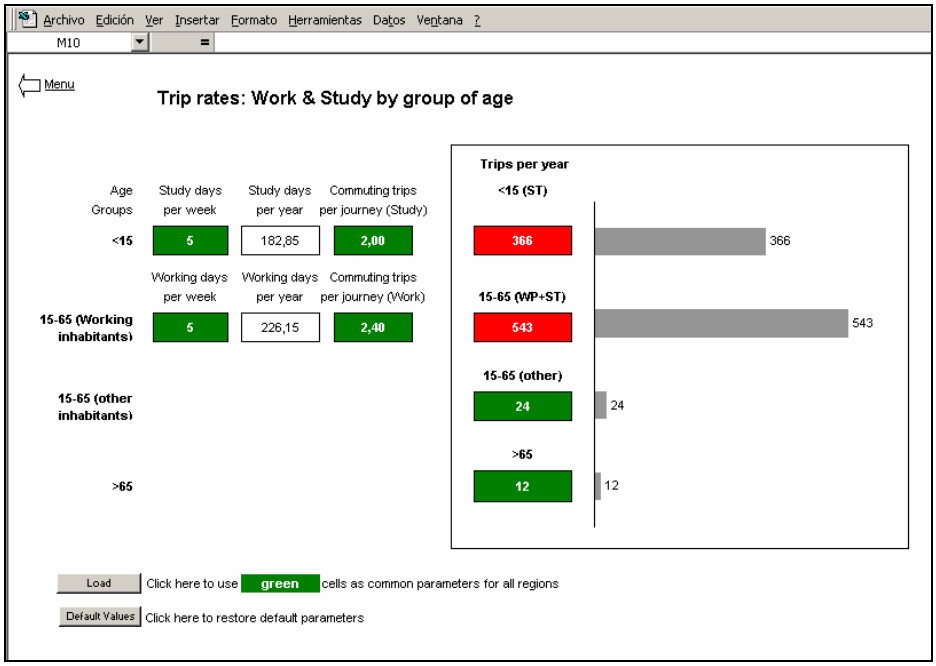

Figure 5 Trip rates interface of KTEN passenger Trip generation module

Leisure and personal trips, as well as annual commuting trips, need a maximum and minimum annual trip asymptotes per inhabitant. Leisure and personal annual trips depending on the GDP are calculated following a logistic function:

$$f(x) = A_i + \frac{1}{\frac{1}{A_s - A_i} + ab^x}$$

where A_s and A_i are the superior and inferior asynptotes of leisure and personal anual trips, a and b are parameters and x is the GDP per capita. The percentage of leisure trips regarding total leisure and personal trips is calculated with the same function. In this case x is the percentage of non-national inhabitants (the more non-national inhabitants live in a given region, the more trips by visit purpose will be generated instead of leisure purpose, as it is supposed that being non-national will make you spend your spare time in visiting the familiars in your origin country) and A_s and A_i are the superior and inferior asynptotes of the percentage of leisure and personal to total anual trips. The percentage of personal trips is the complementary of the leisure trips. (see Fig. 6 and 7)

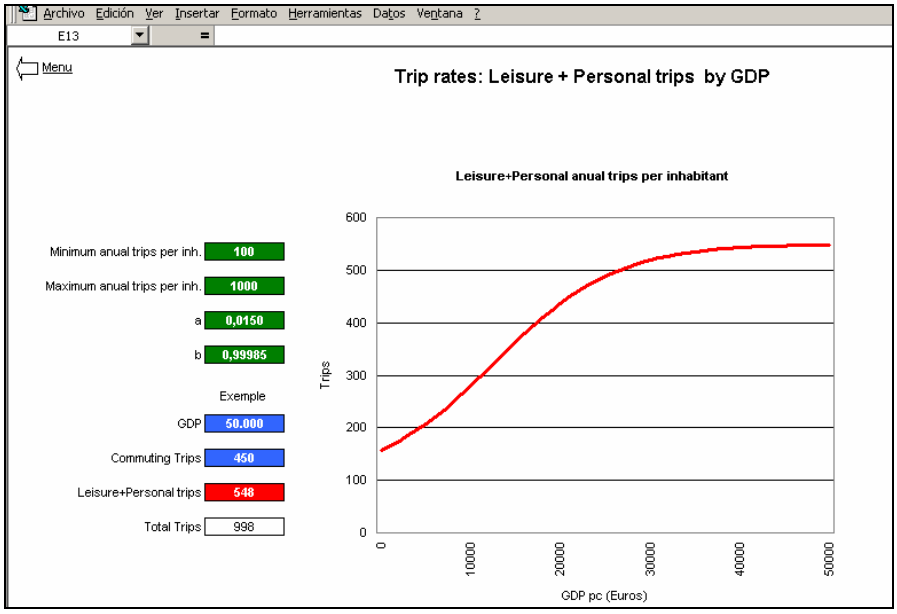

Figure 6 Leisure and Personal trips by GDP of the KTEN passenger Trip generation module

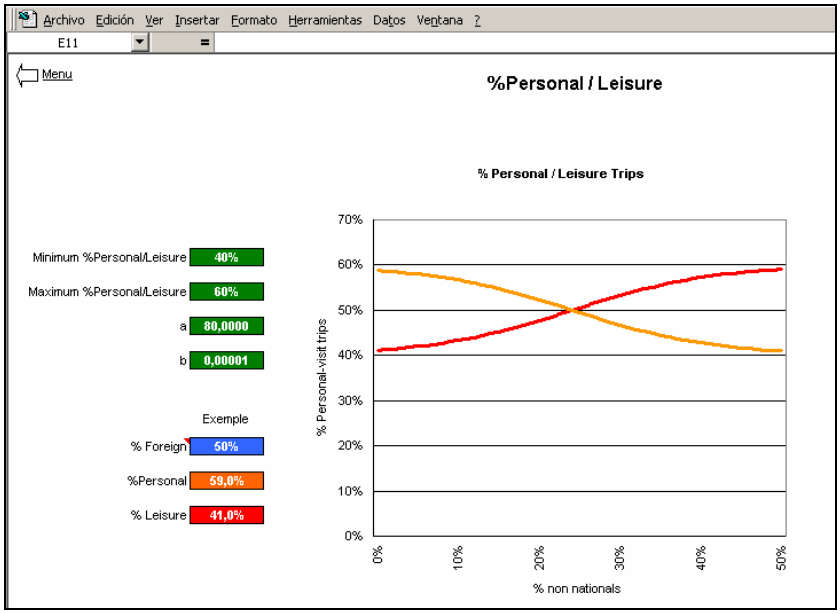

Figure 7 Relation between Leisure and Personal trips of the KTEN passenger Trip generation module

2.4.2 Trip Distribution

To calculate business trip distribution, KTEN uses the following expression:

$$V_{i,j} = O_i \cdot A_i \cdot K_{i,j}^{\alpha} \cdot Cap_j^{\beta} \cdot Pop_j^{\gamma} \cdot Gdp_j^{\delta} \cdot C_{i,j}^{\rho}$$

where,
$V_{i,j}$ trips between zone (i) and zone (j)

O_i the origins from zone (i)
A_i calibration parameter to reach the Origins condition
$K_{i,j}^{\alpha}$ relationship between the countries containing the zones (i) and (j)
Cap_j^{β} capitatility index (4 for European Capitality ,2 for capital of country and 1 for others)
Pop_j^{α} population of zone (j)
Gdp_j^{δ} gross domestic product of zone (j)
$C_{i,j}^{\rho}$ cost to travel from zone (i) to zone (j)

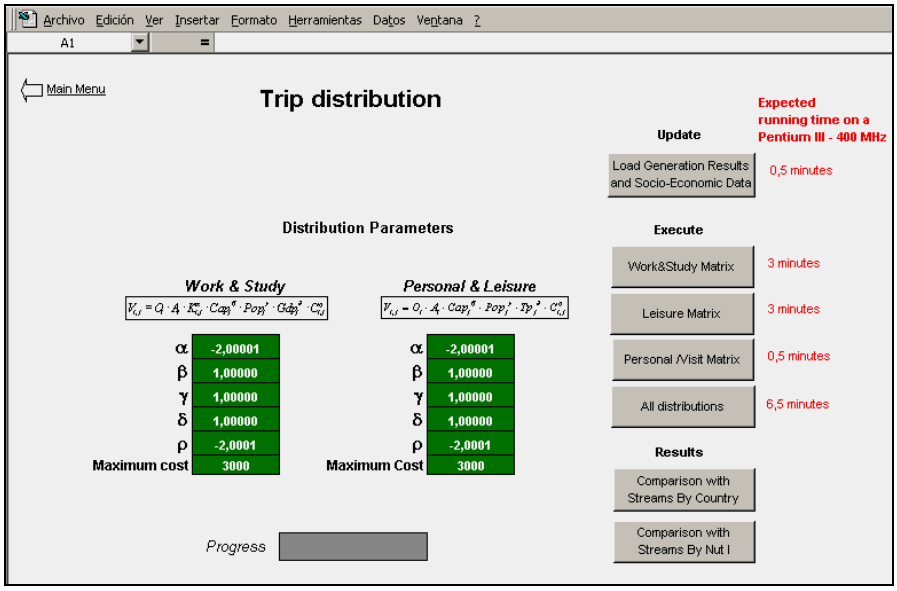

Figure 8 Interface of KTEN passenger Trip distribution module

Leisure and personal trip distribution is calculated using the following expression :

$$V_{i,j} = O_i \cdot A_i \cdot Cap_j^{\beta} \cdot Pop_j^{\gamma} \cdot Tp_j^{\delta} \cdot C_{i,j}^{\rho}$$

where,
$V_{i,j}$ the trips between zone (i) and zone (j)
O_i the origins from zone (i)
A_i calibration parameter to reach the Origins condition
Cap_j^{β} capitatility index (4 for European Capitality,2 for capital of country and 1 for others)
Pop_j^{α} population of zone (j)
Tp_j^{δ} Tourist pressure on site of zone (j)
$C_{i,j}^{\rho}$ cost to travel from zone (i) to zone (j)

2.4.3 Modal Split and Assignment

Modal split is calculated considering the following percentages for every mode (see Figure 9) depending on the distance in km from zone (i) to zone (j) using road network and ferry lines.

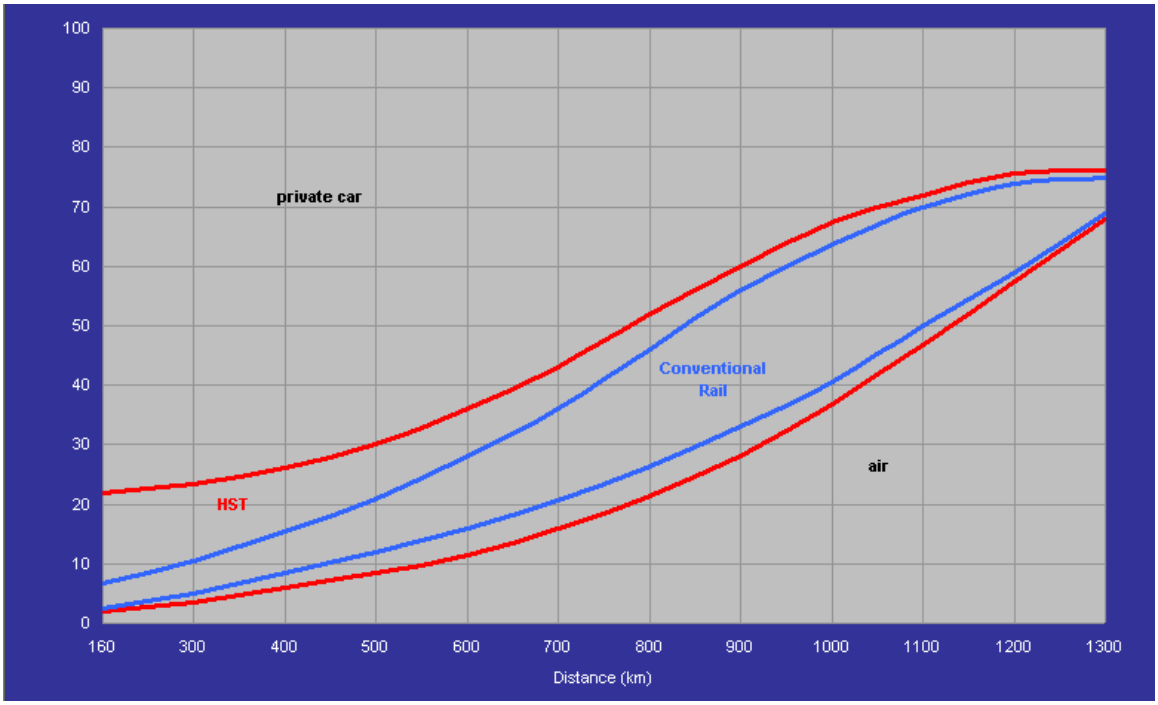

Figure 9 **Modal split for interregional trips. Source: ESPON Project 1.2.1, Mcrit.**

The average length of business trips by car from zone (i) is calculated with the expression:

$$K_{ijk} = \left(\sum_n L_{ijn} * N_{ijkn} \right) / \sum_n N_{ijkn}$$

Where
K_{ijk} km per person per mode *j* by purpose *k* in NUTS3 *i*
L_{ijn} cost (in km) from $NUTS2_i$ to $NUTS2_n$ using the mode *j*
N_{ijkn} number of trips from $NUTS2_i$ to $NUTS2_n$ using the mode *j* by purpose *k*.

Assignment: Matrices of trips can be taken from passenger module and assigned on the transport network of the GIS system.

2.5 Freight forecast module

2.5.1 ETIS matrix

The underlying basic data of the freight module are the ETIS-BASE freight matrices. First of all ETIS matrices have been tested against EUROSTAT's COMEXT database to check their accuracy. ETIS matrices have been aggregated by transport mode, freight type and region, obtaining flows between countries. These values are compared with real COMEXT data (which is aggregated at NUTS0 level):

	ETIS	COMEXT	Relative diff	ETIS distribution	COMEXT distribution	Relative diff
	Export	Export	Export	Export	Export	Export
AT	30.348.805	31.934.850	-5%	2,20%	2,54%	-1,32%
BE	158.568.092	155.737.933	2%	11,51%	12,39%	2,35%
CZ	27.452.112	28.237.130	-3%	1,99%	2,25%	-0,65%
DE	223.737.186	217.984.312	3%	16,24%	17,34%	4,78%
DK	31.612.422	35.553.067	-11%	2,29%	2,83%	-3,27%
EE	9.063.575	7.547.784	20%	0,66%	0,60%	1,26%
ES	56.851.628	57.459.546	-1%	4,13%	4,57%	-0,50%
FI	27.895.338	26.547.050	5%	2,03%	2,11%	1,12%
FR	152.721.675	151.713.462	1%	11,09%	12,07%	0,84%
GR	9.014.981	9.555.236	-6%	0,65%	0,76%	-0,45%
HU	12.427.058	12.445.236	0%	0,90%	0,99%	-0,02%
IE	9.007.666	7.386.507	22%	0,65%	0,59%	1,35%
IT	70.281.371	72.665.063	-3%	5,10%	5,78%	-1,98%
LT	9.575.129	6.825.395	40%	0,70%	0,54%	2,28%
LU	11.545.012	14.321.617	-19%	0,84%	1,14%	-2,31%
LV	10.642.898	8.171.735	30%	0,77%	0,65%	2,05%
MT	497.426	40.532	1127%	0,04%	0,00%	0,38%
NL	324.873.149	206.543.341	57%	23,58%	16,43%	98,23%
PT	12.903.071	12.357.560	4%	0,94%	0,98%	0,45%
SE	49.888.028	50.406.293	-1%	3,62%	4,01%	-0,43%
SI	3.397.230	5.293.453	-36%	0,25%	0,42%	-1,57%
UK	135.170.173	138.290.698	-2%	9,81%	11,00%	-2,59%
Total	1.377.474.025	1.257.017.801	10%	100,00%	100,00%	100,00%

Table 15 Comparison between ETIS and COMEXT exportation databases

There is a good prediction in the total export freight volume and the distribution of most of the countries. However, analyzing each country in detail, islands and little countries are less well adjusted, especially the Netherlands. On the other hand, where the volume of exportations is high, relative differences are lesser.

	ETIS Import	COMEXT Import	Relative diff Import	ETIS distribution Import	COMEXT distribution Import	Relative diff Import
AT	39.464.147	38.495.073	3%	2,86%	3,18%	0,58%
BE	202.006.840	175.897.279	15%	14,67%	14,54%	15,56%
CZ	12.299.262	11.785.849	4%	0,89%	0,97%	0,31%
DE	315.258.678	276.228.633	14%	22,89%	22,83%	23,27%
DK	22.755.434	21.835.027	4%	1,65%	1,80%	0,55%
EE	2.062.542	1.997.264	3%	0,15%	0,17%	0,04%
ES	68.328.560	65.852.505	4%	4,96%	5,44%	1,48%
FI	21.341.393	21.333.461	0%	1,55%	1,76%	0,00%
FR	171.048.606	155.505.491	10%	12,42%	12,85%	9,26%
GR	16.843.180	12.078.571	39%	1,22%	1,00%	2,84%
HU	9.192.556	9.089.334	1%	0,67%	0,75%	0,06%
IE	19.766.969	15.683.739	26%	1,44%	1,30%	2,43%
IT	91.829.415	94.567.178	-3%	6,67%	7,82%	-1,63%
LT	2.011.987	2.005.366	0%	0,15%	0,17%	0,00%
LU	17.325.695	18.368.157	-6%	1,26%	1,52%	-0,62%
LV	6.115.373	2.108.614	190%	0,44%	0,17%	2,39%
MT	3.811.619	1.496.856	155%	0,28%	0,12%	1,38%
NL	194.769.493	132.832.821	47%	14,14%	10,98%	36,92%
PT	25.840.810	25.121.342	3%	1,88%	2,08%	0,43%
SE	39.777.223	37.307.487	7%	2,89%	3,08%	1,47%
SI	7.247.378	6.951.181	4%	0,53%	0,57%	0,18%
UK	88.376.865	83.170.858	6%	6,42%	6,88%	3,10%
Total	1.377.474.025	1.209.712.085	14%	100,00%	100,00%	100,00%

Table 16 Comparison between ETIS and COMEXT importation databases

Concerning importations, the global error is higher but is quite well distributed. Now the most significant differences are for Netherlands, Belgium and Germany.

The following maps illustrate the ETIS-BASE data both in terms of both total freight generated per NUTS3 region (figure 1) and in terms of freight flows by corridors (figure 2). In order to create the later an All-or-Nothing assignation model was used for the assignation of regional traffics onto corridors:

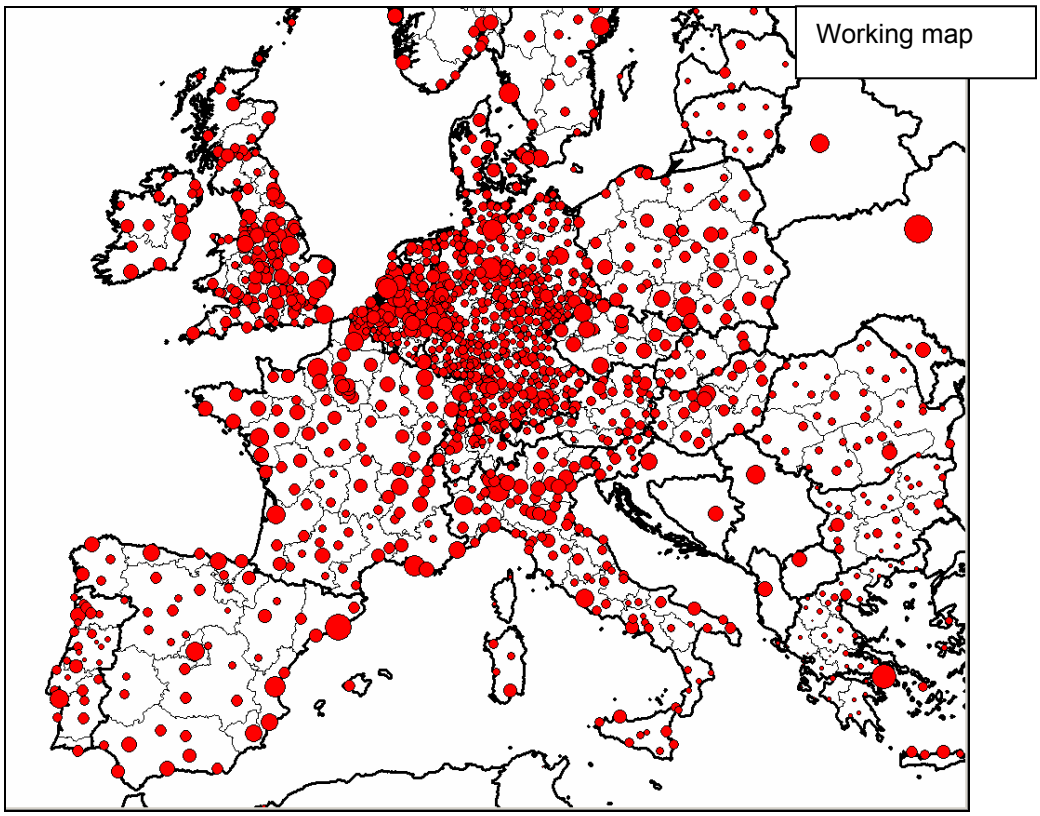

Figure 10 Road freight generation at NUTS3 level

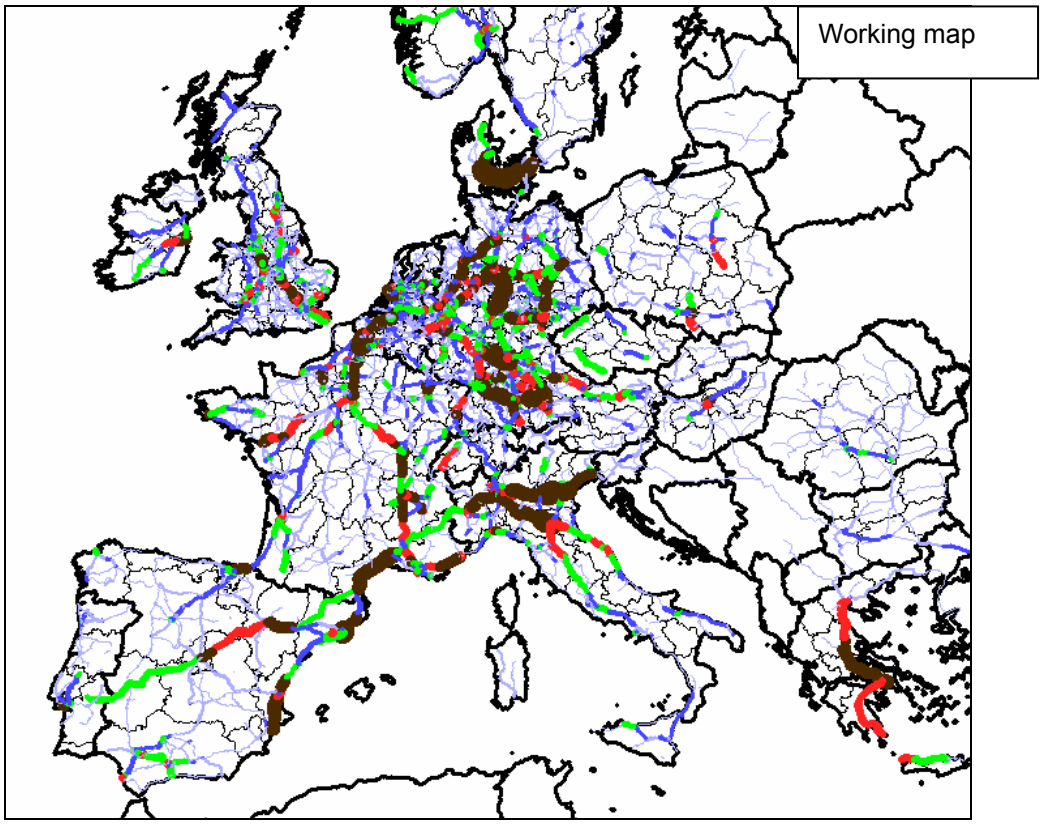

Figure 11 Road freight traffics

2.5.2 Generation - Distribution model

Since there is little available data at regional level, the model will estimate directly generation-distribution, based on two parameters: GDP at origin and Population at destination. In addition a dummy parameter will be calculated to simulate the growth of commercial operations between old, new and future EU members.

The gravitational equation used in the model is as follows:

$$V_{ij} = K_{ij}^{\alpha} \cdot GDP_o^{\beta} \cdot POP_d^{\gamma} \cdot e^{-\delta C_{ij}}$$

Where

V_{ij} = Tones transported from zone i to zone j
K_{ij} = Dummy between country of zone i and country of zone j
GDP_o = GDP for the origin zone
POP_d = Population at destination zone
C_{ij} = Cost of travel between zones i and j
α, β, γ, δ = regression fitting parameters

2.5.3 Modal split

A modal split model has to be applied afterwards in order to obtain the flows for road and rail, given that the generation-distribution model only predicts total flows between origin and destination but not the transport mode of the flow.

The modal split model has to provide the modal split for both the base and the predicted year. As ETIS-BASE matrices provide an initial modal split for year 2000, the two most typical formulations will be tested to reproduce it.

First of all costs are calculated using the existing infrastructure network graph. The model chooses the cheapest route between each pair O-D in terms of time, and calculates the distance and time of travel. This has to be done thrice, one for road, one for rail and one for short sea shipping and inland waterways.

Now we can calculate the generalized cost introducing two new values, the value of time and operational cost. Thus there are three costs, road, rail and water modes, for each O-D pair:

$$C_{ij} = T_{ij} \cdot VT + D_{ij} \cdot OC$$

Where

T_{ij} = time of travel between i and j
VT = value of time
D_{ij} = distance between i and j
OC = operational cost

The most typical discrete choice model is the logit:

$$\%V_{ij}^{a} = \frac{e^{-kC_{ij}^{a}}}{e^{-kC_{ij}^{a}} + e^{-kC_{ij}^{b}}}$$

Where

$\%V_{ij}^{a}$ = percent of tones transported by mode a between i and j
k = logit parameter
C_{ij}^{n} = cost of travel between i and j by mode n
a, b = transport modes

We try to reproduce ETIS-BASE modal split by calibrating the logit formula through three parameters, k, VT and OC. Results show a low fitting, as best logit prediction and original data have a correlation of ρ = 0,02426

As results are not satisfactory another option is essayed, the binary probit model:

$$P^{a} = \Phi\left[\frac{\left(C_{ij}^{a} - C_{ij}^{b}\right)}{\sigma_{\varepsilon}}\right]$$

Which states that the probability of choosing mode a, equals to the accumulated standard normal distribution. Here σ_{ε} allows standardization and is obtained from the statistical parameters of the cost functions for each mode:

$$\sigma_{\varepsilon}^{2} = \sigma_{a}^{2} + \sigma_{b}^{2} - 2\rho\sigma_{a}\sigma_{b}$$

The only parameters in this model are those that vary the cost functions; that is Value of Time and Operational Cost. Again, results are poor with a value of ρ = 0,02424.

Due to the bad results, the modal split from ETIS-BASE freight is applied directly to calculate the generalized costs of the network for each O-D pair in the base year.

2.5.4 Calibration

Now the generation-distribution model has to be calibrated against ETIS flow data to ensure it provides correct results. Free variables for calibration are the following:

- α, β, γ: powers for dummy K_{ij}, Population and GDP
- δ: power of the negative exponential formula for Generalized Cost
- K_{ij}: values of the dummy variable for each type of O-D relation
- VT, OC: although not truly Value of Time and Operative Costs, these variables are used for calibration, and provided that they are free to change, their real meaning is no more than mere adjusting factors. However, these values are applied afterwards

when assigning the matrices, so they must be within some limits or the assignation will not behave correctly.

The dummy variable K_{ij} controls the level of relation between countries and allows to simulate the changes in the common market due to the admission of new countries. This way we are able to reproduce the enhancement of commercial relations between EU-15, the new EU-25 countries and the future candidates like Bulgaria and Romania.

Relations have been classified depending on the following factors:

- Belonging group (BENELUX, EU-15, EU-25, EU-27, EFTA, Future accessing countries, rest of non-EU Europe, Rest of the world)
- Islands

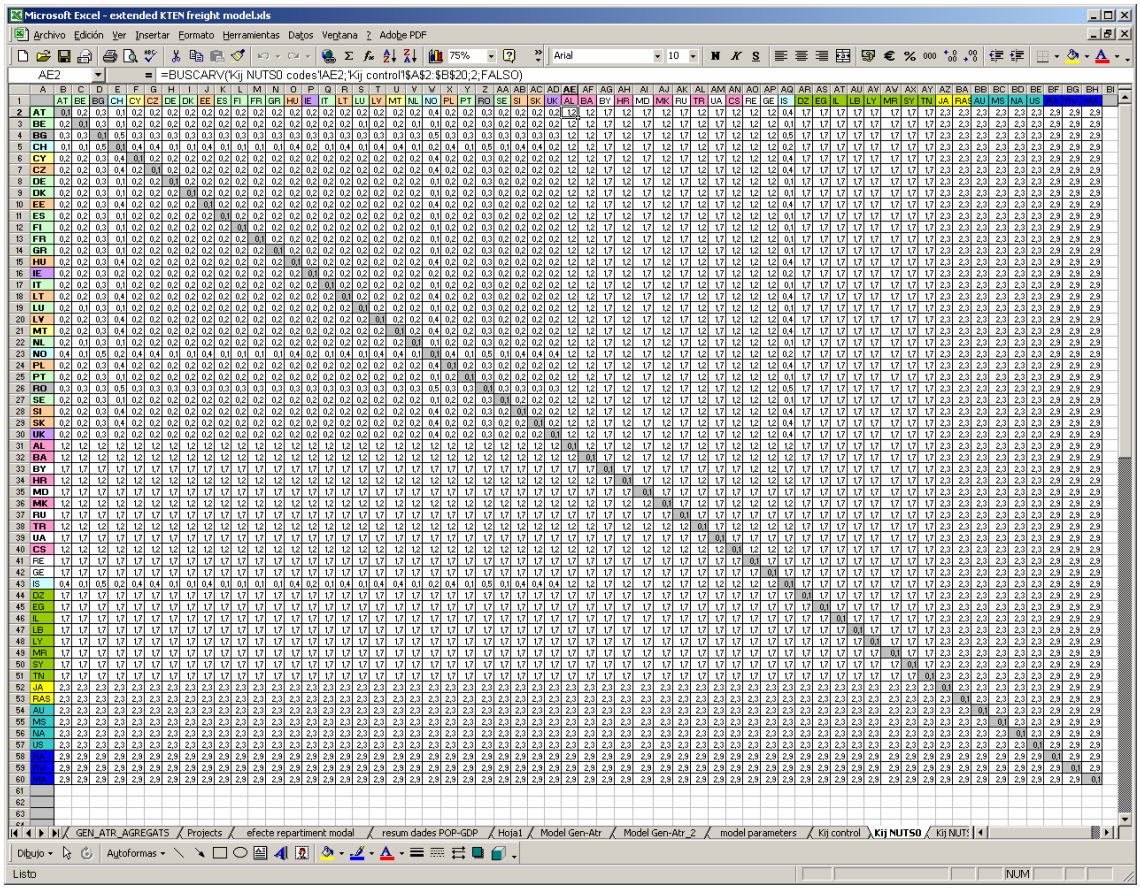

Figure 12 Dummy variable combination map

The possible categories and their adjusted K_{ij} values are shown in table 17. The values can be interpreted as a friction factor, i.e. a resistance to commercial exchanges, so the higher the K_{ij} the lesser the exchanges.

The next step is to compare the data and the model by means of cost distribution. The calibration allows obtaining a first approach to the data, but to ensure the network will behave similarly to one with the real flows, the model is tested comparing the distribution of costs of transport.
The O-D pairs are grouped according to their generalized cost in incremental groups of 100 cost units.

The following graphic shows the distribution of costs according to the number of tones transported versus cost of transport:

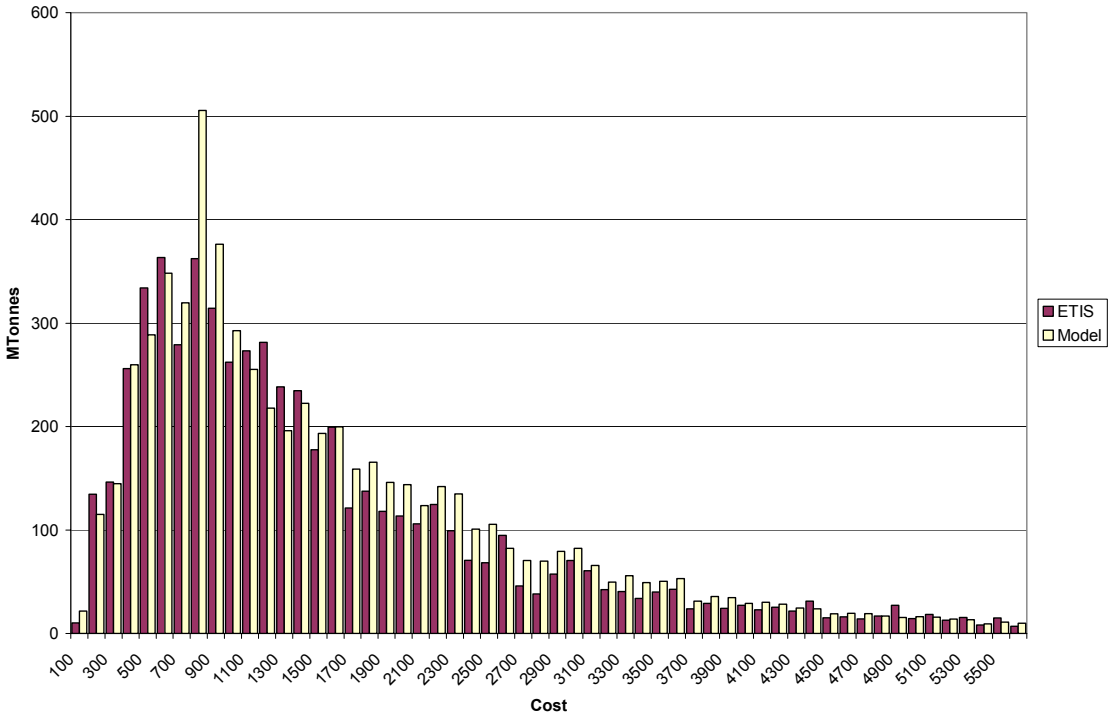

Figure 13 Calibration of developed model against ETIS matrix

The parameter values after calibration are the following:

α	-1,9357
β	0,4477
γ	0,8940
δ	0,0118
VT	10
OC	0,2

Number	Group 1	Group 2	Starting value	Calibrated value
0	All	Intracountry with cost<1000	1,1	0,05
1	All	Intracountry with cost>1000	1,1	0,09
2	EU-15 no island	EU-15 no island	1,2	0,3
3	EU-15 island	EU-15 island/no island	1,3	0,31
4	EU-25 no island	EU-25 no island	1,4	0,4
5	EU-25 island	EU-25 island/no island	1,5	0,5
6	EU-27 no island	EU-27 no island	1,6	0,6
7	EU-27 island	EU-27 island/no island	1,7	0,7
8	EFTA	EU-15 no island	1,15	0,2
9	EFTA	EU-15 island	1,25	0,33
10	EFTA	EU-25 no island	1,35	0,63
11	EFTA	EU-25 island	1,45	0,73

Number	Group 1	Group 2	Starting value	Calibrated value
12	EFTA	EU-27 no island	1,55	0,83
13	EFTA	EU-27 island	1,65	0,93
14	Possible members	EU-27 / EFTA	2	2
15	rest Europe	EU-27 / EFTA	2,5	3
16	Maghreb-Mediterranean	EU-27 / EFTA	3	3
17	Asia	EU-27 / EFTA	4	4
18	America-Australia	EU-27 / EFTA	4	4
19	Africa-Mid Asia	EU-27 / EFTA	4	5

Table 17 Model parameters after calibration

The correlation between data and model is ρ= 0,476

A careful inspection of the obtained values in comparison with the ETIS freight matrix shows a clear imbalance between long range traffic and short or middle range traffic. But nothing can be done to solve this given the structure of the proposed model, for when a segment of traffic is adjusted better the rest gets worse.

2.5.5 Incremental model

As the results of calibration are not satisfactory the calibrated model will then be used in an incremental form. This means that the model will not predict flows but variation of flows.

The model assumes ETIS base values for the year 2000 as initial flows. Using the calibrated gravitational model, future flows are predicted as increments of base flows:

$$V_{ij}^{MODELfut} = \left(K_{ij}^{fut}\right)^{\alpha} \cdot \left(1+\varepsilon_{GDP}\right) \cdot \left(GDP_{o}^{fut}\right)^{\beta} \cdot \left(1+\varepsilon_{POP}\right) \cdot \left(POP_{d}^{fut}\right)^{\gamma} \cdot e^{-\delta C_{ij}^{fut}}$$

$$V_{ij}^{fut} = V_{ij}^{ETIS2000} \cdot \left(\frac{V_{ij}^{MODELfut}}{V_{ij}^{MODEL2000}} \right)$$

Parameters are substituted by their future values according to the desired horizon year. The final flows are calculated as a product of the original ETIS flows and a growth factor, obtained from the predicted variation of flows in the model.

GDP and Population growths for EU-27 are taken from MASST model results. The rest of regions and countries are extracted from the Commission's paper 'European energy and transport trends to 2030', where we find predictions each five years until 2030.

K_{ij} country relation values can be changed to reflect the improvement of commercial relations. They have been separated in 6 groups: EU-15, EU-25, EU-27, EFTA, Future Candidates and Rest of the world. Any of these groups can be assigned a qualitative change: none, low improvement, middle improvement or high improvement. This translates numerically into changes of per year global freight growth, which allows simulating different trends and policies of traffic/economic growth decoupling.

The future costs of travel are estimated for three different scenarios and two time horizons yielding a total of six different infrastructure networks. Using network graph, travel costs are calculated for each pair O-D and for each transport mode.

The generalized cost applied is calculated after making a modal redistribution with the following formula:

$$\%A_{ij}^{fut} = \frac{\%A_{ij}^{act} \cdot \left(\frac{\left(C_{ij}^{A}\right)^{fut}}{\left(C_{ij}^{A}\right)^{act}} \right)^{-\mu}}{\sum_{n} \%n_{ij}^{act} \cdot \left(\frac{\left(C_{ij}^{n}\right)^{fut}}{\left(C_{ij}^{n}\right)^{act}} \right)^{-\mu}}$$

The formula calculates the future share of the n modes for each pair O-D ponderating with the cost variation of the mode to a power. The higher the power is, more redistribution is made, and so this parameter models the perception of users of the costs change.

The formula resembles the logit distribution model, but it uses the variation of costs as input and not the future costs, allowing to use original ETIS modal distribution as initial value.

Two more parameters can be changed in order to have more control to define the desired scenarios. GDP and POP values are affected by a coefficient (1+ε) that enhances or decreases their influence in the predicted flow.

The following image shows the provisional main model interface, where all parameters can be controlled:

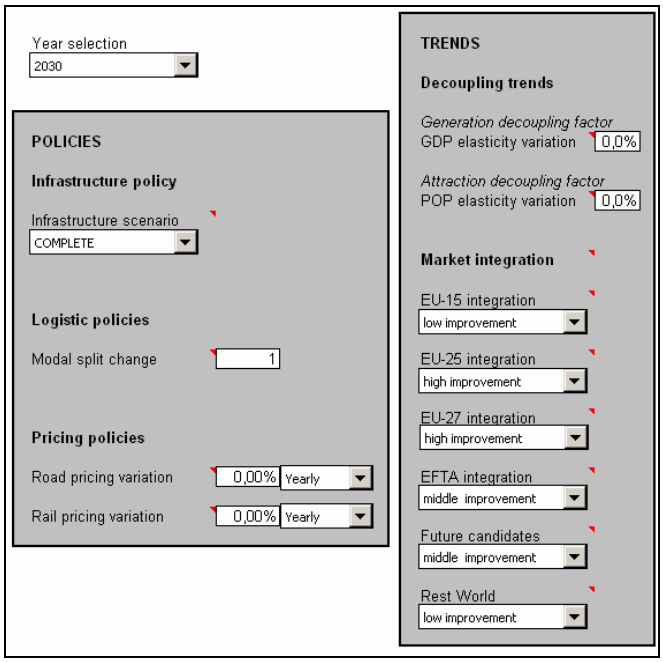

Figure 14 Main interface of KTEN freight module

2.6 Transport infrastructure graph

The basic cartographic pan-European multimodal transport networks used to support the KTEN model come from ASSEMBLING research (4th EU Framework Programme, DGTREN) (see Fig. 4). Other complementary geographic layers (mountains, rivers, administrative levels...) were produced by Mcrit in previous works and all are free from third parties copy-rights. While the inclusion of other databases (e.g. Administrative limits at NUTS V level, Nature2000, etc.) can be of interest, the existing databases mostly cover the current needs of KTEN.

The graph covers EU and Eastern European countries including Russia, as well as North of Africa and Middle East. It contains trans-European links (roads, rail, ports, airports, inland waterways). The transport network contains all existing and planned high speed, upgraded, conventional and main rail lines, and existing and planned motorways, expressways, main and regional road, local roads, streets, and roads connecting ports and airports to the rest of the network (61.000 road links and 30.000 rail links). The rail and road network database contains information on speed and TEN and TINA programmes.

Apart from the road and rail transport links, the cartography contains 749 airports separated in different levels of passengers per year, and 37 airlines. Concerning ports, it contains 842 seaports and 1.012 port lines, and 30 riverports, as well as 158 inland lines.

1.308 projects have been geo-referenced, 424 of which, mostly concerning transport projects, have been introduced with cartographic precision and graph structure (e.g. for road projects all sections are included and linked to the existing road network).

Regarding geo-referenced projects, they are classified as follows:

- 684 transport projects
- 283 water projects
- 165 urban projects
- 176 others (industrial, environment, etc.)

Regarding transport projects, these are represented as graphs, so as to enable network analysis:

- 240 road projects
- 34 railway projects
- 67 airports
- 47 ports
- 10 combined transport projects

The geographic scale of core networks is approximately 1: 500.000, with more detail in cities and around transport terminals.

2.7 Scenario definition results

The following maps show the CBA proxy analysis for the three scenarios (baseline, cohesive, competitive), to illustrate the first outcomes of the model.

2.7.1 Competitive scenario

The profitability of projects (lines) is higher when the colour is darker:

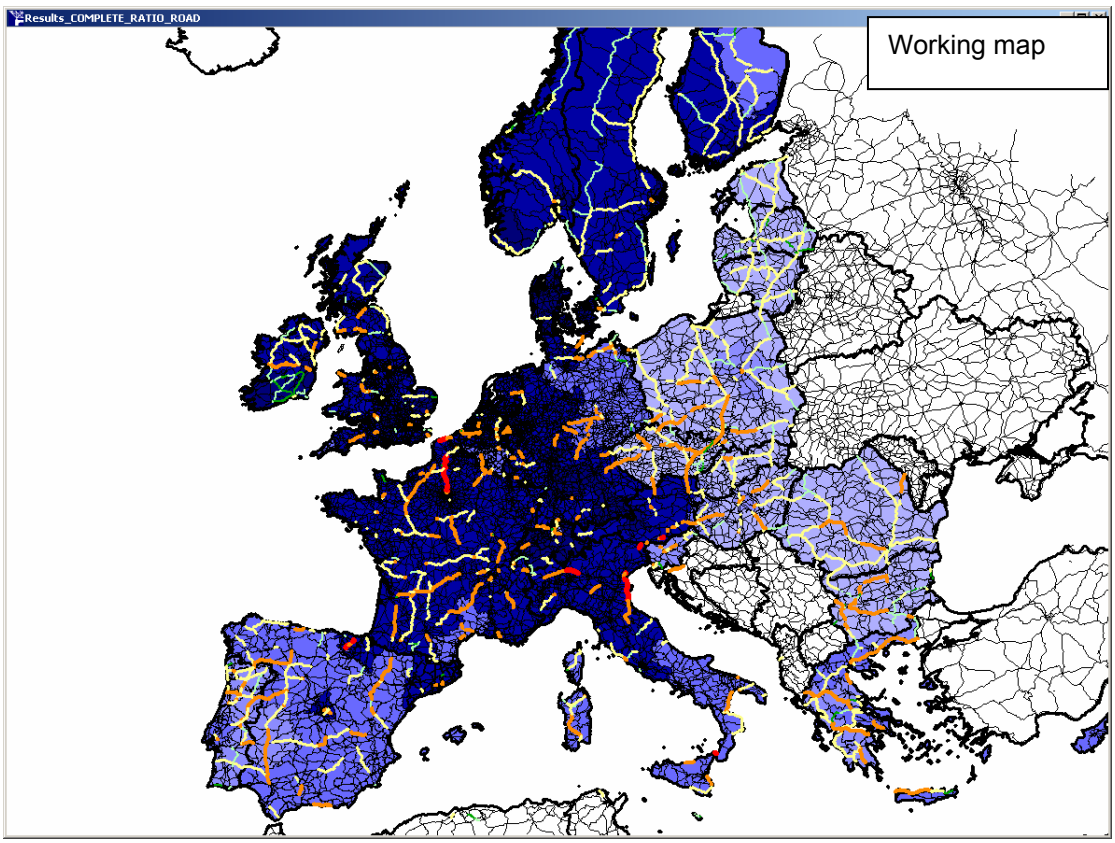

Figure 15 Road projects CBA proxy analysis for Competitive scenario

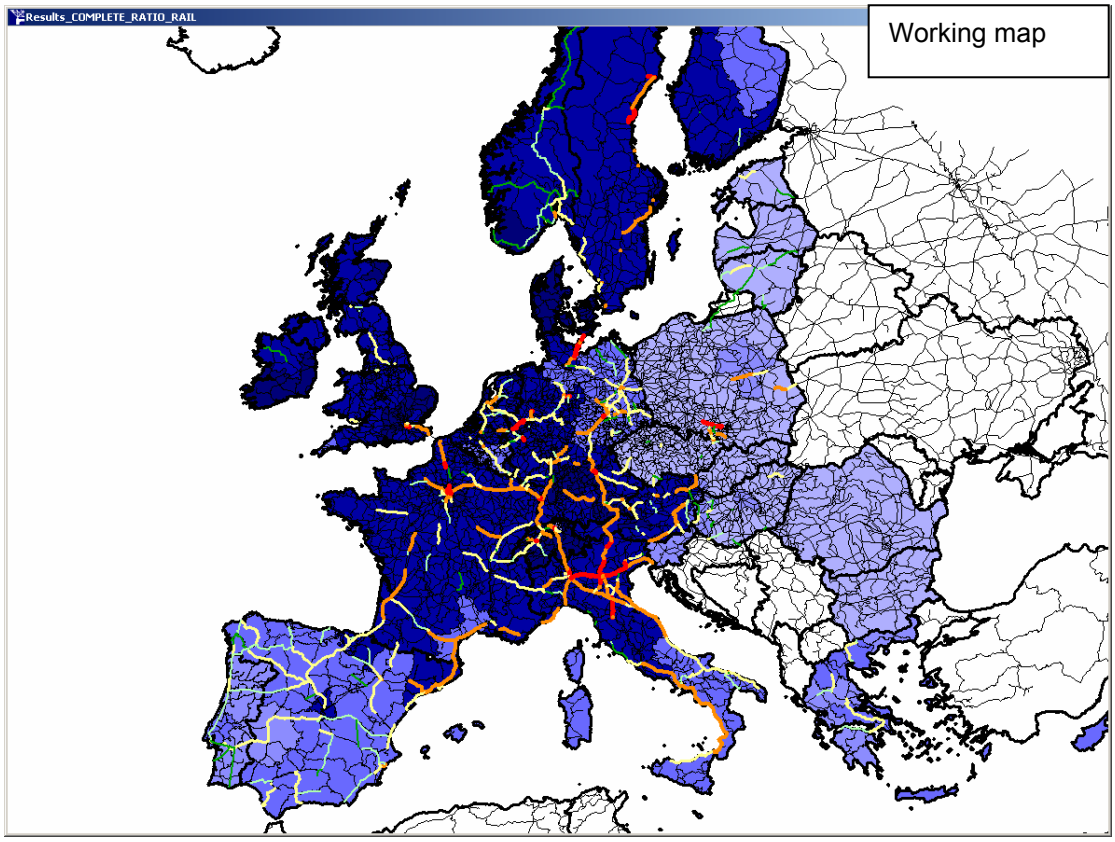

Figure 16 Rail projects CBA proxy analysis for Competitive scenario

2.7.2 Cohesive scenario

The profitability of projects (lines) is higher when the colour is darker while the gap in density of infrastructure (NUTS2 regions) is above 1 for dark blue regions and below 1 for light blue ones:

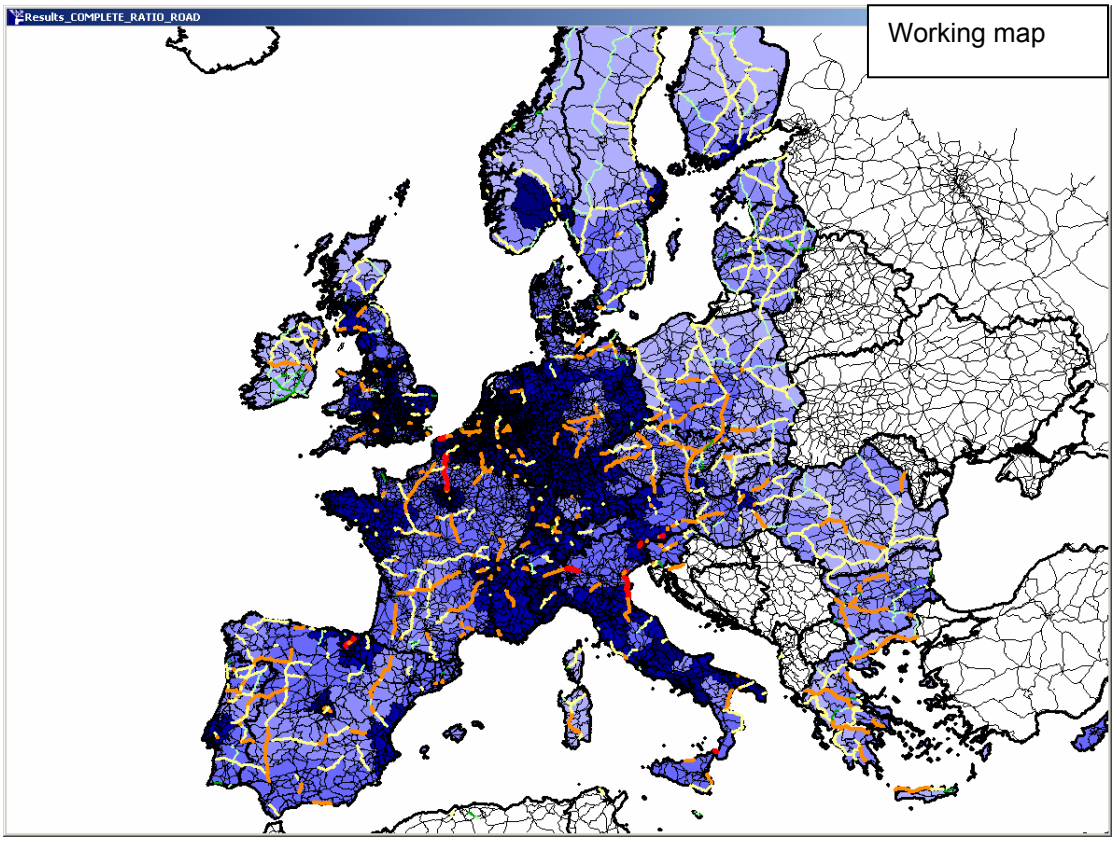

Figure 17 Road project evaluation for Cohesive scenario

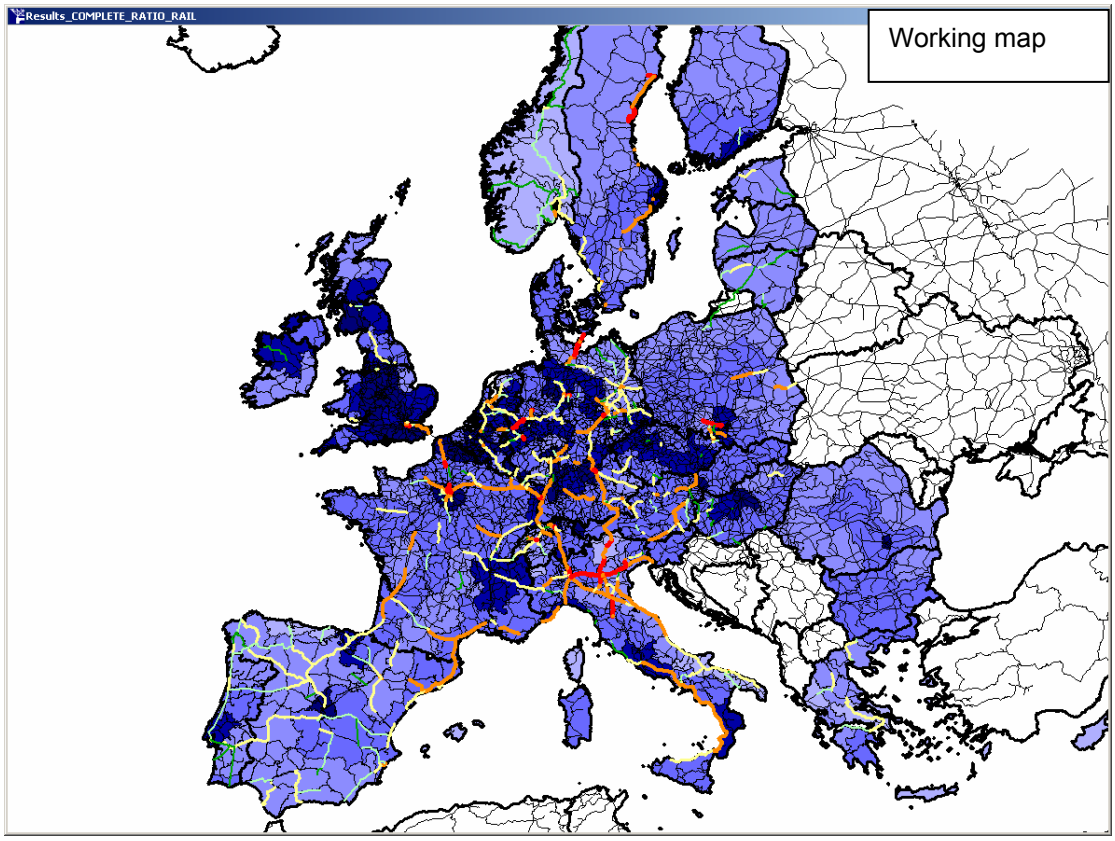

Figure 18 Rail project evaluation for Cohesive scenario

2.7.3 Baseline scenario

The profitability of projects (lines) is higher when the colour is darker while gap in GDP (NUTS2 regions) is above 1 for dark blue regions and below 1 for light blue ones:

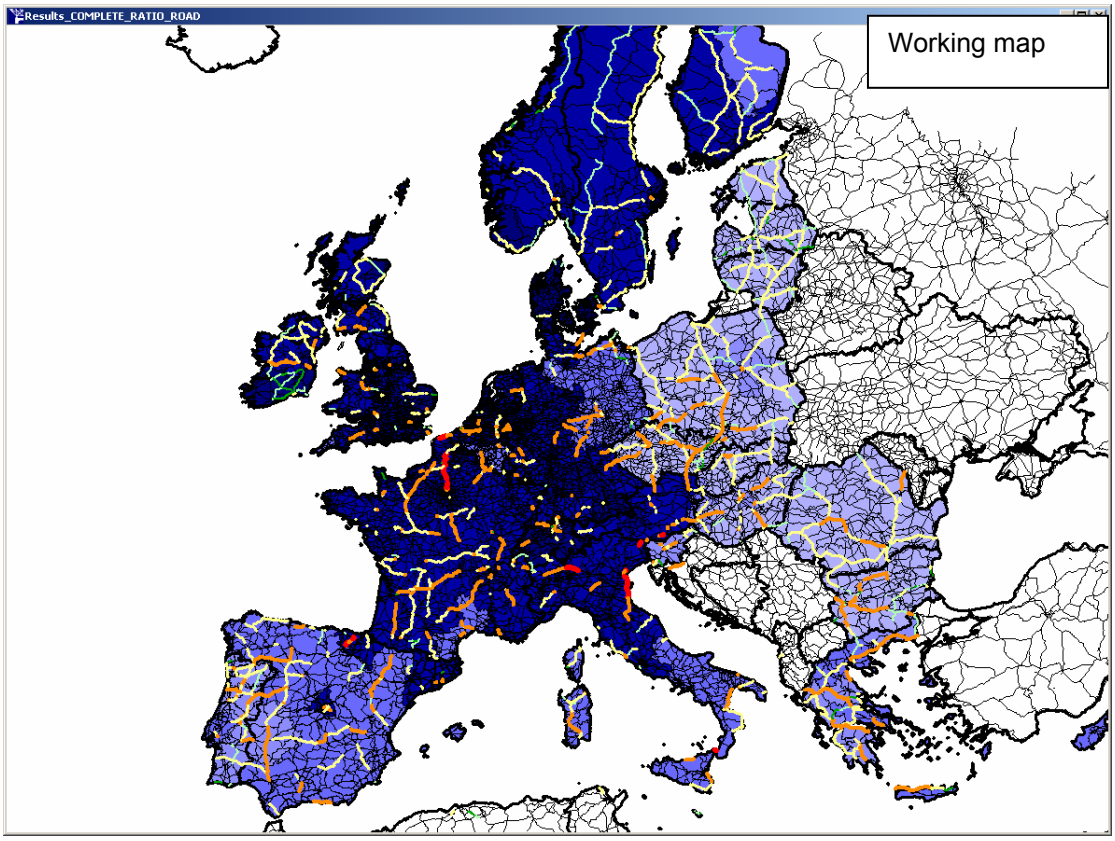

Figure 19 Road project evaluation for Baseline scenario

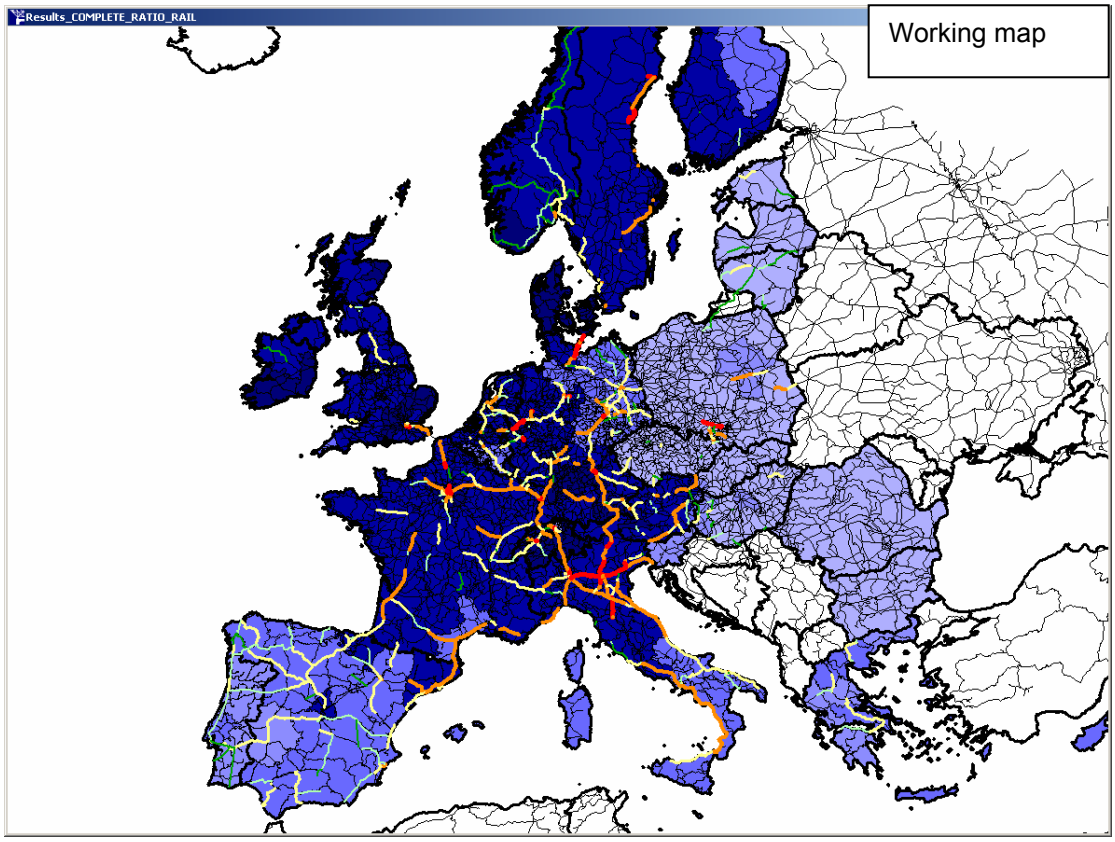

Figure 20 Rail project evaluation for Baseline scenario

3 ETCI - European Territorial Cohesion Index

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3.1 Introduction

The research which has yet been developed on the construction of a European Territorial Cohesion Index in the first and second interim report (FIR & SIR) of ESPON project 3.2 has lead to rather pessimistic results. Briefly said, we have yet established that:

- The construction of synthetic indexes introduces an obvious contradiction between political significance and scientific quality. The optimal solution is a compromise like the Human Development Index or Sustainable Development Indexes (FIR).

- ETCI was initially conceived as a synthetic tool for the evaluation of prospective scenario. But the growing importance of the concept of 'Territorial Cohesion' in European debates has introduced suspicion on the potential use of this index for operational policies like allocation of Structural Funds. We have underlined the danger of political manipulation of synthetic indexes as different formula of ETCI can produce different pictures of European territory and different allocation of funds (FIR)**.**

- As far as ESPON is concerned, ETCI should be based on the three dimensions of ESDP which are (1) Economic competitiveness, (2) Social Cohesion and (3) Sustainable Development. Unfortunately, the data available at regional level focus mainly on first dimension and there is an impressive lack of data on social and environmental dimension at regional level. This produces a vicious circle where availability of statistical data limits the possibilities of political action, except in the field of Lisbon Strategy in a narrow economic sense (SIR).

- It is certainly possible to improve the use of existing statistical material by a better use of spatial analysis tools (e.g. maps of discontinuities) but this improvement cannot replace the lack of data on social and environmental dimension. Indirect estimations are possible by dis-aggregation of national data at regional level but these solutions are not

fully convincing because they imply complicated procedures which are not sufficiently clear for political decision (FIR & SIR).

- Generally speaking, the concept of territorial cohesion as it is presented in political documents (3rd Cohesion Report, Ministerial Conference, Treaties …) implies an analysis of accessibility to services of general interest at local level which is impossible at NUTS2 or NUTS 3 level (SIR).

- Last but not least, the main interest of ETCI is to elaborate long term series at regional level for Europe, based on reconstitution of past trends (1980-2000) and estimation of future trends (2015 or 2030) which is not possible for most variables of the actual ESPON database which cover only a short period (1995-2002) and - as said before - only some topics of interest for a global evaluation of regional development (SIR).

Having established this important (despite negative) results, and taking into account the fact that other projects are concentrating their efforts on the production of synthetic indexes of ESPON results (2.4.2) and competitiveness (3.3), we have chosen to focus the effort of 3.2 on different priorities:

(1) Complete the quantitative evaluation of scenarios on a major dimension which is complementary to accessibility (KTEN) and economic competitiveness (MASST) models.

(2) Establish ground basis for the measure of territorial cohesion in the future ESPON II

(1) For the evaluation of political scenarios developed by ESPON project 3.2, **extending the use of demographic variables** to other dimensions than the one which has been yet analysed by ESPON project 1.1.4 ('Demographic Trends') is, in our opinion, the most promising way to secure a social dimension.

Indeed, ESPON project 1.1.4 on demography has focused on the evolution of labour force in Europe and the economic consequences of ageing and migration on the evolution of pensions (with the problem of increasing the period of work), but paid very few attention to social significance of demographic parameters like mortality. The report put in relief the demographic evolution in the light of the endogenous growth in order to stimulate competitiveness:

'This means that both the EU regional development policy as well as national policies must prioritise an economic and social policy (family policy) in order to stimulate a rise in TFR (Total Fertility Rate). This will be of utmost importance even in order to stimulate the preconditions for endogenous growth that probably will stimulate competitiveness at all levels. From a cohesion point of view this is of great importance if the risk for future concentration and social exclusion shall be avoided. As much of the social policy – including family policy – still is of national character, it is of utmost importance to coordinate these means within the EU in order to increase TFR and stimulate natural population development'[12]

In fact, the focus of project 1.1.4 on the question of population ageing is the direct confirmation that European policies consider demographic factors mainly as an economic issue rather than as a global social one:

1) In the ESDP, demographic change was presented as a statement of fact:

[12] Espon Project 1.1.4. 'The Spatial effects of demographic trends and migration', p. 29.

'(240) Three trends will dominate population development in the EU in the next 20 to 30 years: decline in population; migratory movements; and shifts in age profile.
(241) Natural population growth in the EU has been very low for years and is showing a declining trend. Without considerable changes in the birth rates of the EU 15, a shift from population growth to population decline could begin to appear around 2020. Against this background, international and interregional migratory movements are of increasing importance for EU population developments and its sub-areas'[13]

And according to the ESDP, these trends have many spatial effects such as polarization:

'The new requirements are being fully met with far-reaching spatial consequences. 'Pensioner towns' are thus also increasingly developing in Europe (as has been the case in the USA for a long time) in regions which are scenic and have a more favourable climate.'[14]

2) The Third Report on economic and social Cohesion, following some remarks from the Second Report[15], points to this fact:

'Demographic ageing in Europe is a particular challenge. The regional variations in this respect are considerable reflecting trends in fertility and mortality, and in migration.'.[16]

So demography is apprehended at the same time as a challenge at the national and the regional level. It appears like a policy challenge:

'In particular, Member States, regions and citizens (…) will also have to tackle the particular challenges that derive from an ageing population, growing immigration, labour shortages in key sectors and social inclusion problems.'[17]

3) At the intergovernmental level, discussion around territorial cohesion at Rotterdam meeting in November 2004 took into account the demographic challenges:

'The Ministers took note of the demographic, economic, social and environmental challenges facing the recently enlarged EU territory, especially those emerging or intensifying since the adoption of the ESDP'[18]

The Discussion paper for this EU informal ministerial meeting focused on the territorial consequences of a sharp rise in old-age dependency rates at EU level:

'The total population aged 65+ in the EU-25 will be 40% higher in 2025 than in 2000. One consequence will be a sharp rise in old-age dependency rates at EU-wide level. Metropolitan areas and highly urbanised regions are likely to experience higher population growth in future while regions with very low population densities are likely to continue to lose population, threatening their vitality. This change creates challenges for territorial development related, for example, to the emergence of specific needs and locational choices of retired people. Entire regions are specialising in the settling of retired people. Their economic base is becoming a residential one, progressively changing their productive base. The decreasing proportion of the population of people of working age is likely to strengthen competition between regions to attract young qualified manpower. In addition, there is an

[13] European Commission, 1999, *ESDP*, p. 57.
[14] *Ibid*., p. 59.
[15] European Commission, *Second Report on economic and social cohesion*, 2001, particularly pp. 41-47.
[16] European Commission, *Third Report on economic and social cohesion*, 2004, p. xxvi.
[17] European Commission, *Third Report on economic and social cohesion*, 2004, p. xxix.
[18] Dutch Presidency, 2004ba *EU informal ministerial on territorial cohesion Presidency conclusions*, Rotterdam, 29th of November 2004 (1.1).

increasing trend of cross-border retirement. The whole territory will be confronted by these challenges, to different degrees.'[19]

All these texts show the political attention paid to population ageing and related issues of dependency ratio, labour shortage and pensions. Here demography is not really seen in social features but essentially as a particular challenge (replacement of labour force, pensions, etc.). This parameter is indeed essential and we will see in this contribution that it will be taken into account in order to illustrate scenarios at regional level. But demography can also be used as a precious measure tool of social cohesion. It can be an alternative to the use of traditional indicators (GDP, unemployment rates…) that make international comparisons difficult. And the recent report on the role of territorial cohesion in regional development expresses the wish for having some new indicators in order to evaluate levels of regional development[20]. It is the same idea which appears for the next framework programme (2007-2013) dealing with socio-economic sciences and the humanities[21]: with a view to improving the use of indicators in policy making, the aim is to develop a more profound understanding of their use in policy development and implementation, and to propose improvements in indicators and methods for their use.

We will see in part 1 that demographic variables can be useful and complementary to econometric ones in order to measure territorial cohesion. In this aim, we will propose a 'remaining life' index taking into account population ageing, but also - to reflect the social dimension - life expectancy at birth. In fact, project 1.1.4. has already tackled life expectancy[22] but the perspective was only taken in the light of general factors which have contributed to the increase of life expectancy in whole Europe. There was no precise regional approach and the spatial analysis was extremely brief (only considering Eastern/Western general polarization)[23]. The project did not pay attention to the fact that this indicator is also likely to measure social cohesion and sustainable development, essential aspects of the Treaty[24]. Moreover, it forgets the crucial fact that population ageing is not only related to economic problems but to global change in society with huge social and political consequences and strong spatial reorganization at all scales. So what we propose here is to offer other views of the ESPON area than econometrical one, by considering important aspects of European political texts mentioned here (population ageing, social and human dimension).

(2) **Accessibility to services of general interest** is another essential aspect of the concept of territorial cohesion, which extends beyond the notion of economic and social cohesion. In policy terms, the objective is to help achieve a more balanced development by reducing existing disparities, preventing territorial imbalances and by making both sectoral policies which have a spatial impact and regional policy more coherent[25]. The objective of a more balanced development is at the heart of the ESDP approved in 1999. In this document, the Ministers responsible for the spatial development of the EU agreed on three policy guidelines for the spatial development of the EU, the development of a balanced and

[19] Dutch Presidency, 2004b, *Discussion paper for the EU informal ministerial meeting on territorial cohesion*, p. 3.
[20] European Parliament, 2005, *Report on the role of territorial cohesion in regional development*, pp. 7-8.
[21] See the link : ftp://ftp.cordis.lu/pub/citizens/docs/ssh_towards_fp7.pdf.
[22] Espon Projet 1.1.4. 'The Spatial effects of demographic trends and migration', pp. 93-95.
[23] *'People in West European countries have a higher life expectancy at birth than in East European countries. South European countries have improved their relative position amongst the countries in the EU29 area.'*, *Ibid*., p. 95
[24] As set out in the Treaty (Article 2), the goal of the European Union is 'to promote economic and social progress which is balanced and sustainable... through (among other things) the strengthening of economic and social cohesion'.
[25] According to the terms of the *Third Report on Economic and Social Cohesion*, 2004, p. 27.

polycentric urban system among others. Better accessibility is clearly defined as a precondition for polycentric development in the ESDP[26].

More recently, the issue of accessibility has been raised in the document endorsed for further development by the Ministers for Spatial Development and the European Commission at the informal ministerial meeting on regional policy and territorial cohesion in Luxembourg. Thus, by considering the ESDP principles in the perspective of the Lisbon aims, the improvement of accessibility was defined among the three identified strategic objectives for strengthening territorial cohesion[27]. The latest informal meeting on sustainable communities in Europe, under the UK presidency of the European Union, set out eight characteristics of a sustainable community[28]. The Bristol Accord identified good connectivity ('with good transport services and communication linking people to jobs, schools, health and other services') as one of the main characteristics.

It is important here to underline the distinction between *long distance accessibility* (TEN)- which is rather connected to economic competitiveness -, and *local accessibility* to services - which support rather social and territorial cohesion. Indeed, equal access to basic facilities, to what are termed 'Services of General Economic Interest' is recognized as a key condition for territorial cohesion[29]. The term 'services of general interest' does not appear in the Treaty itself. It is derived in Community practice from the term 'services of general economic interest'. If the term 'services of general economic interest' is not defined in the Treaty, in Community practice, there is a broad agreement that the term refers to 'services of an economic nature which the Member States or the Community subject to specific public service obligations by virtue of a general interest criterion'[30]. The term 'Public Service Obligations' refers to specific requirements that are imposed by public authorithies on the provider of the service in order to ensure that certain public interest objectives are met.
The nature of services of general economic interest is at the heart of territorial cohesion. For instance, the Treaty establishing the European Community focused, in the article 16, on 'the place occupied by services of general economic interest in the shared values of the Union as well as their role in promoting social and territorial cohesion'. More recently, the White Paper on services of general interest focused on the importance of these services for territorial cohesion:

'The access of all citizens and enterprises to affordable high-quality services of general interest throughout the territory of the Member States is essential for the promotion of social and territorial cohesion in the European Union, including the reduction of handicaps caused by the lack of accessibility of the outermost regions.'[31]

At a more sectoral level, the aim of the cohesion policy is precisely to facilitate access to general economic services:

'Cohesion policy contributes to strengthening economic and political integration through, for example, developing infrastructures networks and access to services of general interest,

[26] European Commission, 1999, ESDP, p. 35.
[27] Luxembourg Presidency, 2005, *Scoping document and summary of political messages for an assessment of the territorial state and perspectives of the European Union towards a stronger European territorial cohesion in the light of the Lisbon and Gothenburg ambitions*.
[28] Office of the Deputy Prime Minister, 2005, *Conclusions of Bristol Ministerial Informal Meeting on Sustainable Communities in Europe*.
[29] According to the terms of the *Third Report on Economic and Social Cohesion*, 2004, p. 33.
[30] European Commission, 2003, *Green Paper on Services of General Interest*.
[31] European Commission, 2004, *White Paper on Services of General Interest*.

raising the skills of the community's citizens, enhancing the accessibility of remote regions and promoting cooperation."[32]

However, it is essential, if we want to transpose accessibility to services of general interest into concrete political objectives, to be able to demonstrate that it is something that can be measured at European level. In this purpose, local accessibility to economic general interest services should be studied from a cross-border viewpoint. Indeed, from a European point of view and according to the subsidiarity principle, our analysis will focus more on the cross-border areas than at national level.

Considering all this, the contribution of ESPON to the future development of a European policy of territorial cohesion should integrate this question of accessibility to essential services and focus on the way to improve it in cross-border areas where increasing mobility gives possibilities for better spatial organization of these services. Basing us on a concrete example, we propose on part 2 a possible way to measure and analyse this crucial question and which European policies can be developed in concrete terms. The example we have chosen (accessibility to one kind of services in the *Grande Region* – France-Belgium-Luxembourg-Germany) is particularly interesting for this purpose as it is located in an area crossed by the major economic discontinuities of Western Europe.

[32] European Commission, 2005, *Cohesion policy in support of growth and jobs: Community strategic guidelines, 2007-2013*.

3.2 Demographic criteria and 'remaining life' index: a complementary solution for quantitative evaluation of scenarios

3.2.1 Scientific interests and limits of demographic criteria for the measure of territorial cohesion

3.2.1.1 Demography: the most reliable international indicators at regional level

Demographic indicators have been historically the first variables subject to international harmonisation, during 19th century in Europe[33]. On this period, the normalisation of demographic variable in Europe and their availability at various time and spatial scales have provided the basis of major research in the field of social sciences[34]. The extraordinary quality of the statistical system of the 19th century in the field of demography can be simply illustrated by the fact that it has been possible to produce map of fertility covering all Europe from 1871 to 1960 at a regional level equivalent to our actual NUTS2 and NUTS3 units (Coale, Ansley and Cotts Watkins, 1986). And it is possible to produce all equivalent classical demographic indexes on very long time period.

During the period of the cold war, when Europe was divided between East and West, the only statistical solution for analysing the international and interregional differences of socialist and capitalist countries was precisely the use of demographic variables because all economic and social criteria where based on statistical systems of data collection which were absolutely not comparable[35]. More generally, the majority of statistics produced by non democratic countries was suspected of manipulation. This was certainly also the case of demographic data (e.g. underestimation of infant mortality rate in Soviet Union) but in this particular case it was relatively easy to identify the manipulation because the demographic laws are relatively stable and some evolutions are simply impossible (Blum, Mespoulet, 2003).

After the fall of the iron curtain, the first regional atlas covering the whole future ESPON area was precisely the demographic atlas realised by the University of Brussels presenting

[33] In his major work sur *l'homme et le développement de ses facultés, essai d'une physique sociale* (1835), the Belgian mathematician Adolphe Quetelet presented his conception of the average man as the central value about which measurements of a human trait are grouped according to the normal curve. Quetelet organised the first international statistics conference in 1853 which was followed by the creation of international associations for the international harmonisation of statistics. The development of statistical methods was clearly linked to the development of harmonised collection of demographic data. For example, Galton's first insights about regression sprang from a two-dimensional diagram plotting the sizes of daughter peas against the sizes of mother peas. As described below, Galton used this representation of his data to illustrate basic foundations of what statisticians still call 'regression' despite the fact that Galton's work was related to racial theories of the decline of societies.

[34] For example in sociology with the research of Emile Durkheim on *Suicide* or in Geography with the *Political Geography* of Friedrich Ratzel, both published in 1897.

[35] For example, the notion of GDP/capita did not make sense in socialist countries where the contribution of services was underestimated. The division of activities in primary, secondary and tertiary sector was no more applicable in socialist countries because it was related to a capitalist view of the society established by an American, Colin Clark.

the demographic situation of Europe in 1960, 1980 and 1988 at NUTS2/NUTS3 level and including the European part of Russia (Decroly, Vanlaer, Grimmeau, Roelandts, Vandermotten, 1991). Demographic data provide the basis for the first research trying to compare the regional differences in all Europe, eastern and western, precisely because it was the only available and comparable information at regional level and in a long term perspective. That's why the elaboration of the first numerical maps of European regions (including Eastern Europe) and new spatial analysis tools (multiscalar territorial analysis, cartography of discontinuities) were based on the use of demographic indicators (Grasland, 1991; Decroly, 1994).

It is not by chance that demographic variables have always been used for the development of new methods of statistics and spatial analysis. It is because they are the most reliable and the most frequently available at various scales.

3.2.1.2 Availability in social, spatial and time dimensions

The fact that demographic data have been harmonised historically very early is not their only advantages compared to other criteria. Indeed, the fact that demographic parameters are related to all individuals through census (age structure, household structure) and civil services (birth, death, marriage) means that they can be used at very different spatial scales and in very different social contexts.

If we consider for example life expectancy at birth, we can easily measure spatial variations at different scales, from Europe to local authorities and even in smaller spatial units like blocks or street inside an urban area. Of course, the precision of the estimation is lower when the spatial aggregate concerns a population of small size, but it is always possible to compute estimated values with confidence intervals and therefore to observe social inequalities in a very detailed way. An equivalent multiscalar approach is fully impossible for economic variables because (1) GDP is generally measured only at NUTS2 level – and sometimes it is just an estimation based on the dis-agregation of national accounts (2) Incomes are theoretically available at household level but they are protected by secret in most statistical institutes and are provided only for large aggregates.

Moreover, when we try to combine the spatial and the social dimension, we can easily obtain demographic parameters by categorical variables like age, sex, social group, marital status and therefore explore dimensions which are not necessary visible at regional level. Two regions can apparently display the same level of life expectancy or ageing, but with important variations according to gender or social groups. And it is therefore crucial to distinguish the mean regional values according to social groups in order to evaluate the relative share of spatial and social inequalities. This distinction is possible with demographic parameters but is generally not available for economic ones as explained before. It is

always possible to obtain data about repartition of incomes at national level but the regional variation of incomes by social groups is not available in all states of the ESPON area and can not provide the basis for a systematic analysis of social-spatial differences.

In political terms, demographic variables make possible the development of policy recommendations which could nicely distinguish between social intervention (in favour of less favoured social groups, whatever their location) and spatial intervention (in favour of regions which are less advantaged, all things being equal with social structure).

3.2.1.3 Interaction of demography with all dimensions of social life

Taking into account all these advantages, we can really ask: Why have spatial planners in general and the ESPON program in particular not made a more important use of demographic variables in their studies?

The answer to this question is that demographic indexes are very complex, very difficult to use and to interpret because they interact with all dimensions of social life and it is not generally possible to define clearly what are the causes and consequences of a demographic situation. As will be discussed in point 1.2.1 about life expectancy at birth, demographic indicators are 'social sponges' which absorb social, political, economical, cultural, ecological effects in such a complex combination that it is never easy to identify a major determination and therefore to propose simple interpretation of the message that they deliver.

Moreover, the demographic parameters are also difficult to analyse because they link past, present and future trends in a very complex way. A typical example of this is provided by the measure of fertility which is very different if we measure it for a cohort (women born the same year) or for a specific year (women having child during a given year). In the first case, we obtain a longitudinal index that can only be measured for women that have achieved their period of childbearing, and is generally relatively stable in its evolution. In the second case, we have a transversal index which is a synthetic measure based on the fiction of what would happen if a woman would have during her life the fertility rate by age of the target year: such a transversal index is much more chaotic in its evolution because it is submitted to exceptional events of the year, without considering the fact that previous or subsequent years can modify the final number of children of each generation of women.

In other words, many demographic indicators are *de facto* synthetic indexes and the problem is not to combine them with other economic, social or ecological variable but to interpret which message they can deliver on the other dimensions of social life.

3.2.2 Life expectancy, population ageing and 'remaining life' index

3.2.2.1 The scientific interest of the combination of Life Expectancy and Median Age

a) Life expectancy: a good summary of social dimension[36]

Amongst all demographic indicators, life expectancy at birth is a classic used to measure the level of development of societies at world scale. Actually, as mentioned in the First Interim Report, it is one of the three components (with GDP/capita and instruction indicators) of the Human Development Index used by the United Nations Development Program to compare UN member states. Life expectancy at birth was introduced in 1990 by Mahbub Ul Haq and Amartya Sen to compensate the weakness of GDP/capita, indicator of economic production that does not estimate well global wealth by not taking into account capital and savings, and that does not give any indication about dispersion of wealth, and so about social cohesion (Kervasdoué, 2005). Another difficulty with GDP/capita is that, even converted in pps (which currently is only available at national, but not at regional level), it can under-estimate the wealth of different societies according to the structure of their economy and the nature (formal or informal) of their production, and in function of the value given to their internal services (Todd, 1998). More generally, GDP has the paradoxical characteristic of positively taking into account destructions, in the sense that they generate monetary flows (the best example is the recent tsunami in South Asia): for the calculation of GDP, cycles of destruction and reparation are more positive than prevention and preservation, which is a real problem in terms of the environment (Viveret, 2003). All these discussions about GDP explain why, in complement of econometric approaches, it seemed to us that it was necessary to introduce life expectancy at birth as an alternative indicator of reference to measure territorial cohesion in ESPON area.

Indeed, as a value calculated from mortality by age tables at a given moment[37], it reflects large parts of the social situation in a given country or region: it is generally recognized as a good indicator of health system efficiency, and thus of the social care provided for the population (OECD, 2005). But more generally, much more than GDP, it also gives indications about 'quality of life' or 'well being' of the population. Measuring quality of life in a quantitative way is by definition always risky and subject to debates (Gadrey, 2004). But life expectancy remains one of the less subjective parameter if we want to intent it, not only basing us on the trivial assumption that to live well, someone first needs to live: scientific studies on 'healthy life expectancy'[38] show that the general increase of life expectancy in developed countries corresponds to a similar - and sometimes faster - increase of healthy

[36] *See* Appendix III for a methodological discussion of the calculation of life expectancy.
[37] See Appendix II.1.
[38] Healthy life expectancy is generally defined as the number of years to be lived in good health based on the hypothesis of a stabilization of incapacity rates, internment rates and mortality by age: it correspond to life expectancy minus the number of years lived without incapacity and without internment.

life expectancy (cf. REVES[39] network or World Health Report 2004). And, as an indicator of mortality by age, life expectancy at birth is also much more than a health indicator concerning the old: it is also very sensible to premature deaths, and premature deaths generally express many aspects of general material and psychological conditions of life. This property of the indicator makes it very interesting to measure general social situation of different countries and regions. The correlation coefficients between life expectancy at birth and all social and economic development indicators are generally very strong at world scale. This is partly due to the huge differences between richer countries and less developed one exposed to extreme situations (war, famine, epidemics, etc.). Within more developed countries, the differences of life expectancy at birth can seem to be limited in comparison with world-scale differences. However, they remain significant, in particular at regional level and between social groups. Many scientific studies show regularly that the inequalities of life expectancy between social classes remain very significant in many of the richer countries in the world (Hatersley, 1999; Geronimus, 2001; NSUK, 2005). This situation is due to the sensitivity of this indicator to the social situation: even in countries with elevated and relatively fast growing GDP, the fragility of parts of the population can limit the progress in global life expectancy and increase the social and regional variability of the indicator (Ireland, United States), while prosperous and cohesive societies will have comparable values for all social class or regions, with a higher total value (Sweden, Japan).

This emerging property results from the fact that many social parameters influence directly or indirectly life expectancy at birth in developed countries : bad hygienic conditions of parts of the population (infant mortality), psychological diseases (suicides or risk conducts - alcohol, drugs, fast driving, etc.), difficult conditions of work (accidents), bad quality of infrastructures (accidents due to bad equipment or non respect of security norms), violence and criminality (homicides) are diverse factors reflecting the level of well-being and harmony of a society that are captured by the value of life expectancy at birth. Indirectly, they give indications about the capacity of a society to take care and preserve its population and environment, just like it is correlated to its level of global wealth (i.e. ESDP central aspects). So, as we can see - and as underlined previously (1.1.3) -, the problem of life expectancy at birth is maybe to be a too synthetic indicator by summarizing so many parameters: the same evolution of life expectancy in two different regions can have different causes, just like there can be, inside a same society, compensation effects between different types of mortality evolutions (for example an increase of work accidents linked with a degradation of conditions of work compensated by a decrease of car accident linked with a specific repressive policy on fast driving) or between different evolutions of mortality between social groups (increase of life expectancy in a specific group, decrease on another). However, this property is by definition common to every synthetic indicator. And as the goal of ETCI is precisely to be synthetic enough to offer a global measure of differences between regions on the level of the entire ESPON area, this aspect of life

[39] Réseau pour l'Espérance de Vie En bonne Santé - Healthy life expectancy network.

expectancy at birth is not a real handicap. And, just like all classic demographic indicators, its big advantage - in comparison with synthetic indexes built as a combination of various indicators - is its political transparency (free from suspicion of manipulation) and the availability of the data in all ESPON regions for a long term period. It is possible to manipulate GDP or unemployment rates, but this is much more difficult for mortality.

b) Median age: a major driving force for European societies

In the ESPON area, life expectancy at birth is now increasing everywhere and is expected to keep on increasing during the next decades. However, regional dynamics and starting points are not the same between different regions, and life expectancy value has not the same significance in function of the age structure of the populations considered. As mentioned in the introduction, ESPON project 1.1.4 has already underlined how much population ageing is an essential parameter, conditioning many of the future evolutions of European Societies, and European official texts give an increasing importance to the issue of demography and population ageing [40]. In fact, ageing and the increase of the age dependency ratio appear to be a real potential bottleneck for the development of many European regions in the next decades. Currently, projections about evolution of age structure of population are predicting an increase of the difference between 'young' metropolitan and 'old' rural regions, and more generally between, on the one hand, the north-western and, on the other hand, the southern and eastern parts of Europe. More generally, scientific works describe a 'second demographic transition', insisting on the multiple quantitative and qualitative effects of population ageing (Van de Kaa, 1987; Cliquet, 1991), and some more precisely on territorial cohesion and its link with polycentrism (Champion, 2001). All these aspects led us to introduce the parameter of median age[41] together with life expectancy at birth to measure cohesion between territories. The combination of these two variables has already been used in recent scientific works to show that average remaining lifetime can increase at the same time as a population's age (Sanderson, Scherbov, 2005). And as the regional differences of age of the population will be increasing in the future in Europe, the question of solidarity between generations (pensions) will also be a question of solidarity between regions, and the age parameter will be each time more important in terms of territorial cohesion.

c) Combination Life Expectancy - Median Age and 'Remaining Life' index

Both dimensions of the demographic profile of European societies put forward here (life expectancy at birth and median age) can be combined, in order to define bold trajectories in time of different countries and regions. This combination produces a bi-dimensional index of 'remaining life' that permit to evaluate and compare the diversity of situations and evolutions across ESPON area.

[40] See also Appendix I.
[41] See Appendix II.2.

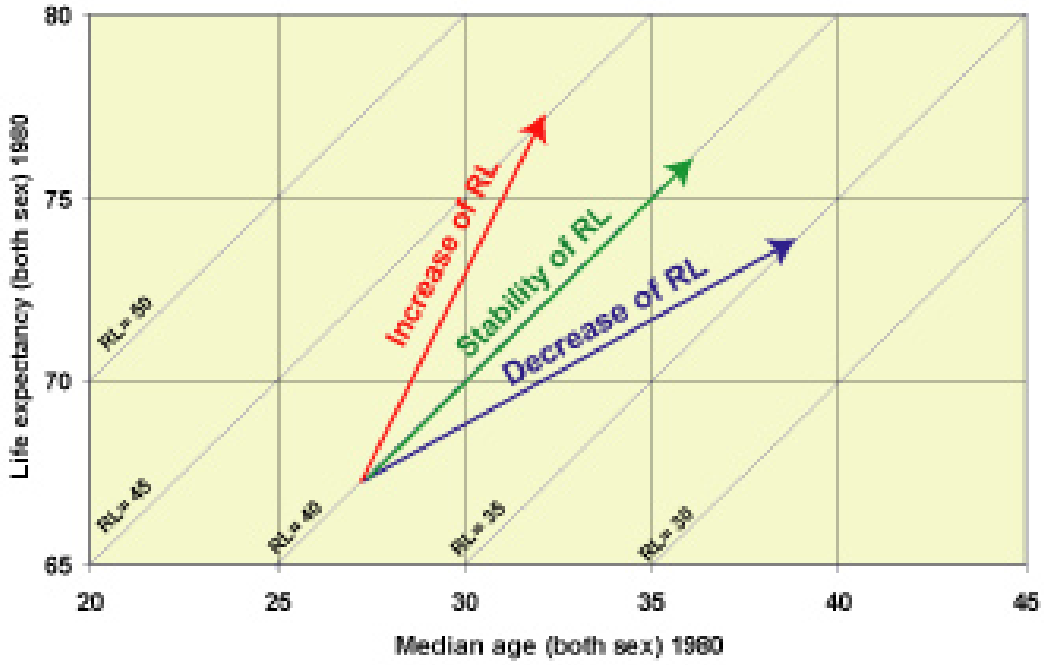


Figure 21 Typical trajectories

Both median age and life expectancy have been increasing during the last 20 years and are expected to keep on increasing everywhere in ESPON area during the next decades. However, the dynamics are not the same everywhere. In *Figure 20* three typical trajectories of this bi-dimensional 'remaining life' index are represented. The first one (red) represents the type of trajectory of spatial units with faster increase of life expectancy than median age, and thus an increasing 'remaining life' index; In the second configuration (green), there is an equal increase of both indicators, and so a stable 'remaining life' index; third trajectory (blue) shows a slower increase of life expectancy at birth than median age. At first glance, the first type of curve can be considered as the more positive, corresponding to a limited population ageing combined to a high life expectancy reflecting a high level of human well-being. On the contrary, the third one seems to correspond to the less advantageous situation, with an ageing population and a low life expectancy.

It is also possible to convert this bi-dimensional index into a uni-dimensional one by subtracting median age from life expectancy, in order to obtain an indication about remaining lifetime of the population. The values given by such a subtraction are not properly the averages of remaining life of living populations at time *t* in the studied areas (which is only possible to calculate for extinct generations), neither life expectancy at median age (conceptually possible to calculate but technically not realizable because of lack of data)[42]. Considering this, our uni-dimensional indicator must be used very carefully: its value doesn't have a concrete significance, it is just an indication about the age structure

[42] See Appendix II.1. and II.3.

and mortality dynamics of a given population in order to make comparisons between spatial units and between periods[43]. Another limit of the uni-dimensional version of the index is that it can take the same value in very different situations[44], even if in the ESPON area this problem is much less important than at world scale.

All these limitations of the uni-dimensional indicator have invited us to focus more on its bi-dimensional version to measure territorial cohesion in the ESPON area and make comparisons in time (past, present, future) and space (state and regional level).

3.2.2.2 Demographic trajectories of European states as compare to the world

All data used here at state level are derived from the 2004 revised United Nations Population Prospect (UNPP) data base[45]. Data taken into account here to represent future values of the index are those corresponding to the UNPP medium hypothesis. *Figure 21* gives a general reference permitting to observe the evolution of the values during the world's demographic transition (fast increasing 'remaining life' until 1980) and the parallel increase of its two components after 1980, with a stability of remaining life index around 38 years.

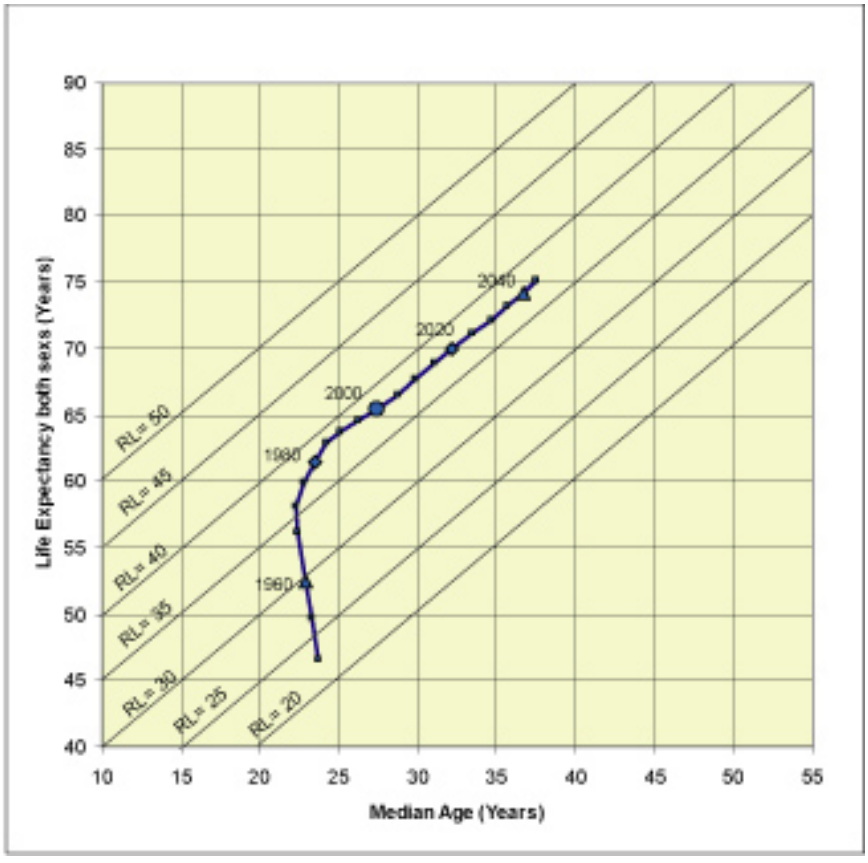


Figure 22 World demographic trajectory.

[43] See Appendix II.3.
[44] For example spatial unit with a life expectancy of 80 and a median age of 50 will have the same 'remaining life' index than another one with a life expectancy of 50 and a median age of 20.
[45] In partnership with project 3.4.1. – 'Europe in the world'.

This general stabilization of the world's 'remaining life' index during the 1980-2050 period corresponds to very diverse local situations. On *Figure 22*, we can see that the ESPON area is facing a slow decrease of 'remaining life' since the 1980's and especially after 2000 due to its fast median age increase not compensated by the amelioration of its life expectancy at birth. Japan presents the same kind of trend, but with a higher life expectancy and much faster population ageing, while the United States are characterized by a slow increase of both indicators. The most spectacular evolution is China's, whose broken trajectory after 1970 reflects the huge demographic challenge the People's Republic will have to face in the next decades.

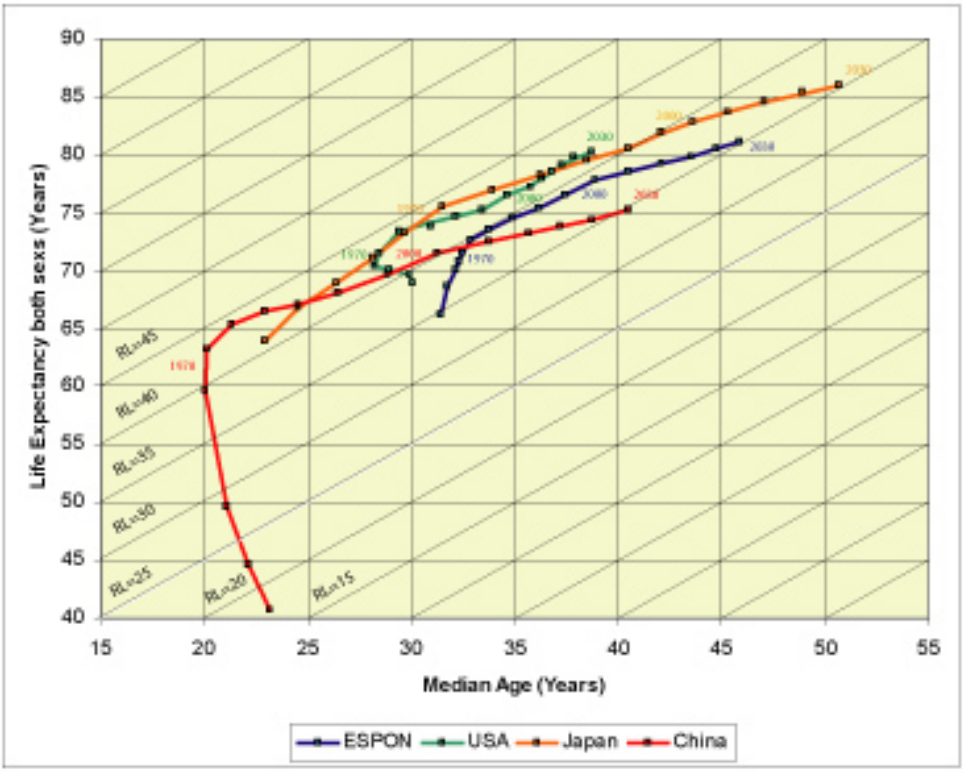


Figure 23 ESPON area's trajectory compared to United States, Japan and China's.

If we compare the ESPON area to its eastern and southern neighbourhood, the differences of trajectories are even more spectacular (*Figure 23*). The former Soviet Union countries' chaotic trajectory shows how much the index is influenced by social crisis, with the break of the curve from the 1970's to the 1990's. In the case of the Southern Mediterranean countries (including Turkey), the concave trajectory shows the progressive change of demographic regime between 1950 and 2030, with an inflexion point at the end of XXth century before an evolution parallel to the world's average, but with a much higher 'remaining life' value due to its current extremely young population[46]. In fact, the

[46] In an anthropological point of view, these trajectories suggest that demographic behaviours reflect social and cultural structures, but they also condition them in a way: the irregular trajectory of the former Soviet Union and the fast change of South Mediterranean countries can be associated to the tumultuous social and political situations during the last period in those regions, as well as a cause of social political instability (South Mediterranea) than as

comparison between the trajectories of the ESPON area and the Southern Mediterranean countries illustrates nicely the debate about current and future enlargement of the EU, neighbourhood policy and the opening/closing of borders: the huge differences between northern and southern countries across Mediterranean Sea shows at the same time the opposition and the complementarity of their demographic characteristics.

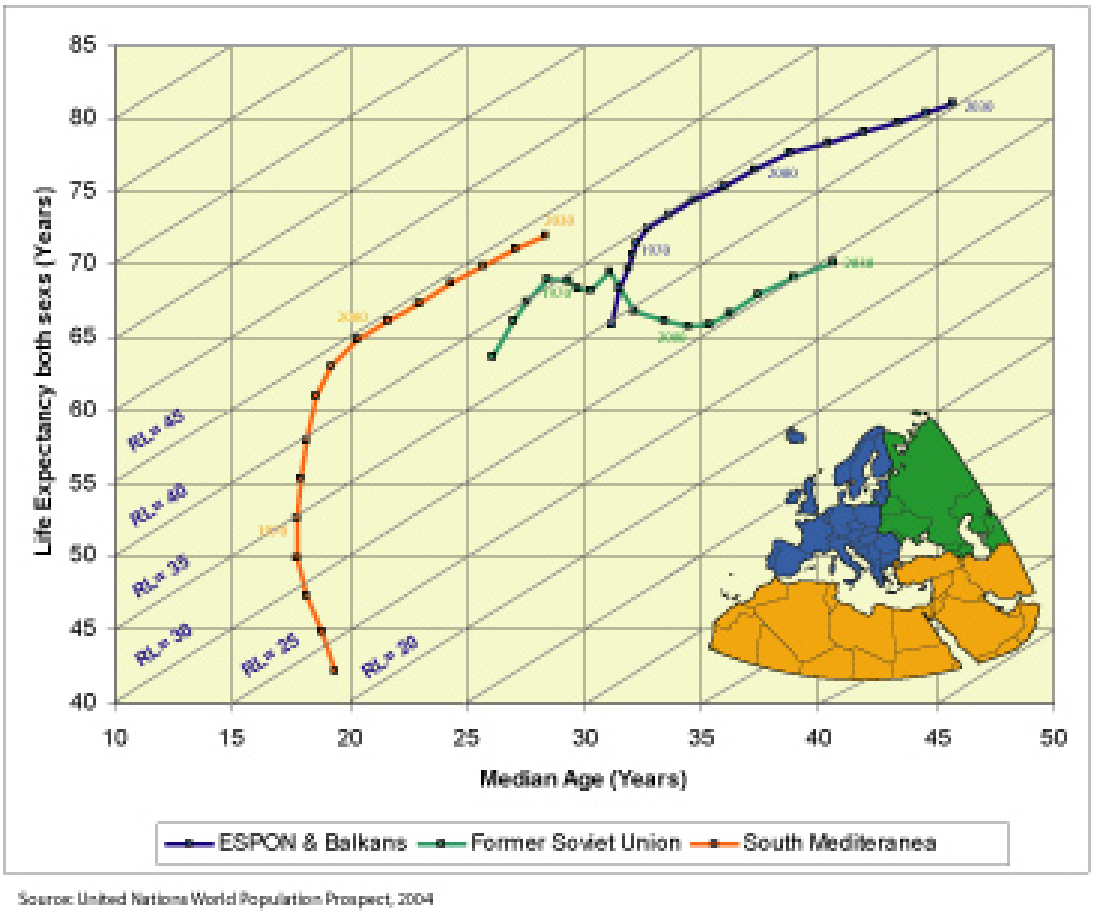


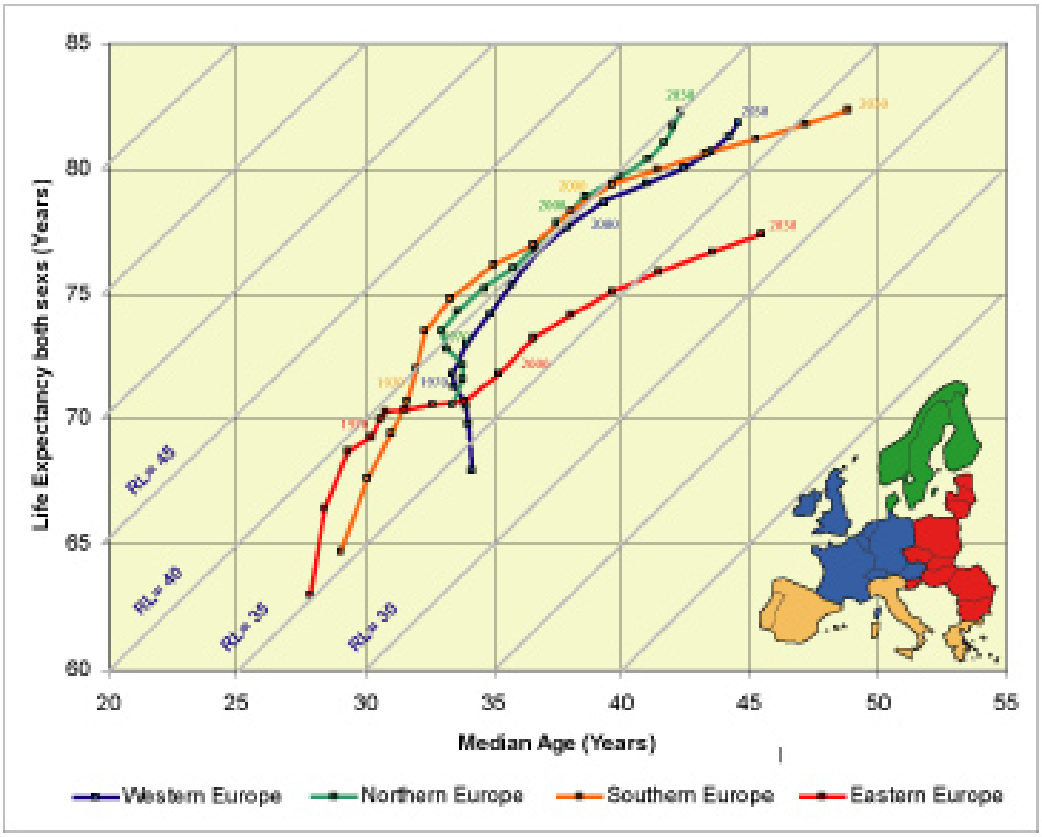
Figure 24 ESPON area[47] and neighbourhoods trajectories.

Inside the ESPON area, we also observe different kind of trajectories. Observing each country's profile one by one between 1950 and 2030 [48], and considering social and spatial proximities to aggregate them, we can define 4 big regions inside ESPON area. Northern Europe is characterized by a more stable 'remaining life' index, due to its slower increase of median age. Western and - even more - southern Europe will face a slow decrease during between 2000 and 2030 because of its relatively fast population ageing. But the most challenging demographic situation is observed in eastern Europe, characterized by a fast

a consequence (Soviet Union). On the contrary, the peaceful and 'conservative' characteristics of Europe might be put in relation with its regular trajectory and its population ageing.

[47] ESPON29 + Iceland and Balkans.
[48] See Appendix III.

population ageing not compensated sufficiently by the increase of life expectancy during the next period. Just like in the case of the former Soviet Union, we can observe on this curve the effects of the economical and political crisis of the socialist system in the 1980's and 1990's: it has produced a stagnation of life expectancy at birth, an exceptional phenomena in Europe during the period 1950-2030.



Source: United Nations World Population Prospect, 2004

Figure 25 ESPON 4 big regions trajectories.

3.2.2.3 Toward regional statistics

At regional level, we don't have data equivalent to the UNPP state database for past, present and future. Regional data for Life Expectancy and Median Age are available in 1980 and 1988 (Decroly & Vanlaer, 1991). Other sources have to be explored on next steps (IIASA[49] data base, INED[50] European network, etc.). But for the moment, around 2000, ESPON and EUROSTAT databases don't give the values of these demographic indicators. And we need these data to build estimations of remaining life index trajectories until 2015 and 2030. Median Age is easily deductible from the age pyramid[51], and Life Expectancy can be estimated with regression methods using total mortality, mortality by regions, age structure of population and a table of mortality by age of reference (Swanson, 1989;

[49] International Institute for Applied System Analysis, Austria.
[50] Institut National des Etudes Démographiques, France.
[51] See Appendix II.2.

Poulain, 1990). However, the choice of a unique table of mortality of reference for the entire ESPON area would be problematic because of its size and heterogeneity[52], and preliminary verification of the accuracy of mortality data in all the area is necessary before estimating Life Expectancy in all ESPON area. These difficulties explain why we decided first to work at NUTS2 level only on countries where regional Life Expectancy data are available in 2000, before covering all ESPON area.

[52] Different structures of mortality by age due to different repartition of deaths by causes.

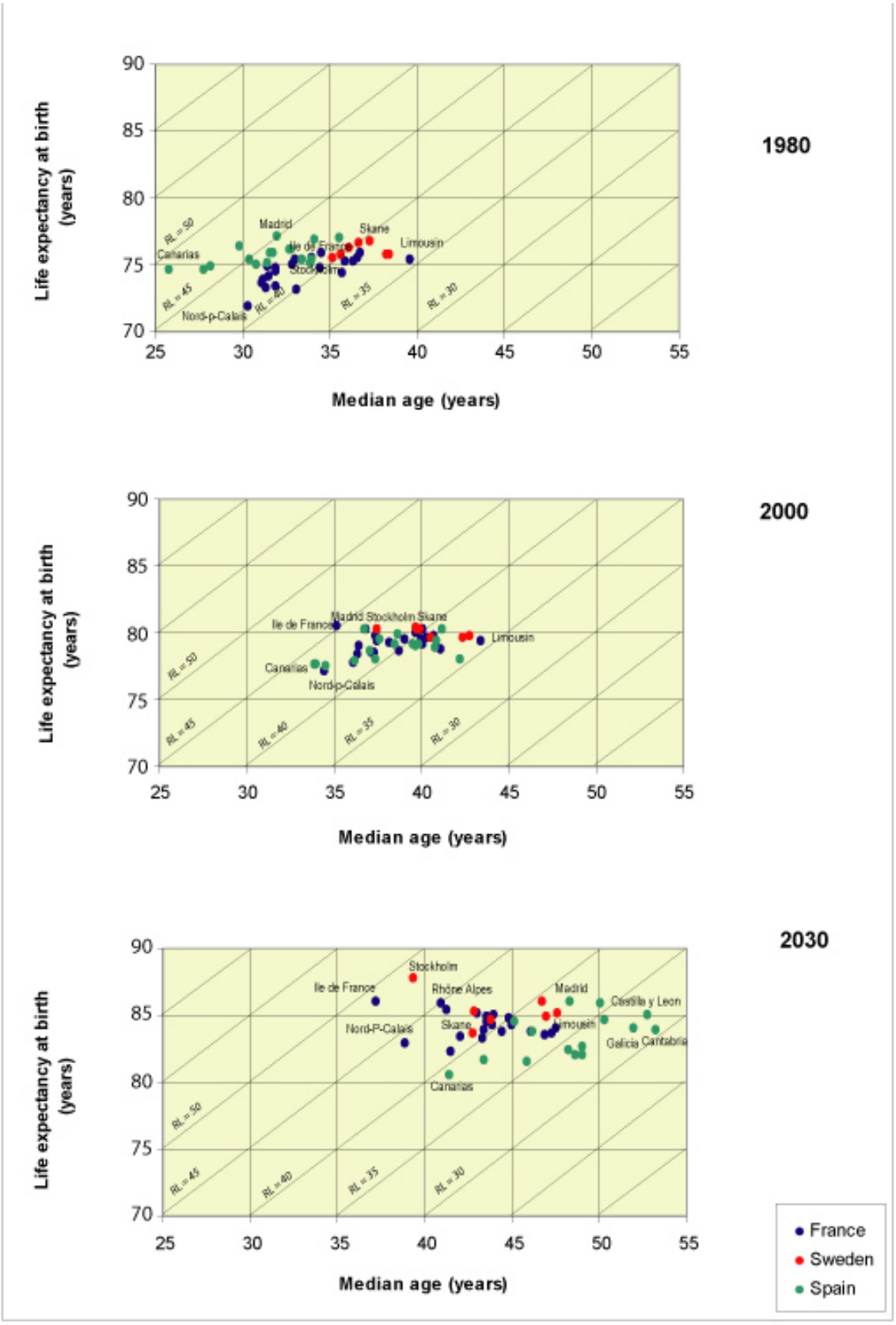


Figure 26 'Remaining life' index in France, Spain and Sweden NUTS2 regions in 1980, 2000 and 2030

Another problem for the analysis of 'remaining life' trajectories is the modifications of the limits of geographical units since 1980. The Long Term Database team is working on the realization of compatibles map kits and data bases (see the chapter on the LTDB). But for the moment, we can only study 1980-2000 evolutions basing us on the 'smallest common spatial denominator' of the 1980 and 2000 regional geographic delimitations. And, as many countries have partly - or completely (Poland) - changed their NUTS2 delimitations during this period, NUTS2 'smallest common denominator' delimitation is often not satisfactory to analyse precisely regional evolutions.

All these constraints led us to select only 3 sample countries in this first study on regional trajectories of the 'remaining life' index: France, Spain and Sweden. Those countries are coming from the western, southern and northern parts of the ESPON area, have sufficient size to make pertinent analyses at NUTS 2 level, had few 1980-2000 changes in their regional delimitations[53] and have available data for life expectancy in 2000[54].

Basing us on these data, we have calculated estimated values for 2015 and 2030 considering 2015 and 2030 UNPP national values for each country (medium hypothesis), and disaggregating them taking into account the part of each region in national growth during the period 1980-2000.

So the estimations for 2015 and 2030 are based on the hypothesis of the extension of 1980-2000 regional trends and 2000-2015-2030 UNPP's prediction about national trends. They permit to see what will be the evolution for these regions if there is no major change in terms of migrations and fertility. Figure 25 shows the positions of 43 regions in 1980, 2000 and 2030.

The first observation is that if the current trends continue, there will be a growing demographic divergence between the different regions studied. While metropolitan regions like Paris (Ile de France) and Stockholm were in the center of the scatter of points in 1980, they are characterized by a faster increase of life expectancy and a lower increase of Median age between 1980 and 2030. In 2030, the regions with highest 'remaining life' uni-dimensional values are all metropolitan regions (Ile-de-France, Stockholm, Nord-Pas-de-Calais, Rhone-Alpes). On the contrary, the regions with the lowest values are belonging to the less urbanized ones (Castilla y Leon, Cantabria, Galicia). This situation can be explained by 2 main factors:

1) Attraction of national youth and international immigrants (with higher fertility) in metropolitan regions contains the increase of median age in the urban areas, and accelerates it in more rural regions. This phenomenon is reinforced by migration of old people from metropolitan to rural and touristic coastal regions (Casado Diaz, Kaiser, Warnes, 2004).

2) Higher incomes and better accessibility to health and social services for people living in metropolitan areas that accelerates the increase of their life expectancy at birth, and on the contrary relative impoverishment and less accessibility to services in rural areas.

[53] Only two regions aggregated, in Sweden.
[54] France : Institut National de Statistique et d'Etudes Economiques ; Spain : Instituto Nacional de Estadistica ; Sweden : Statistika Centralbyran.

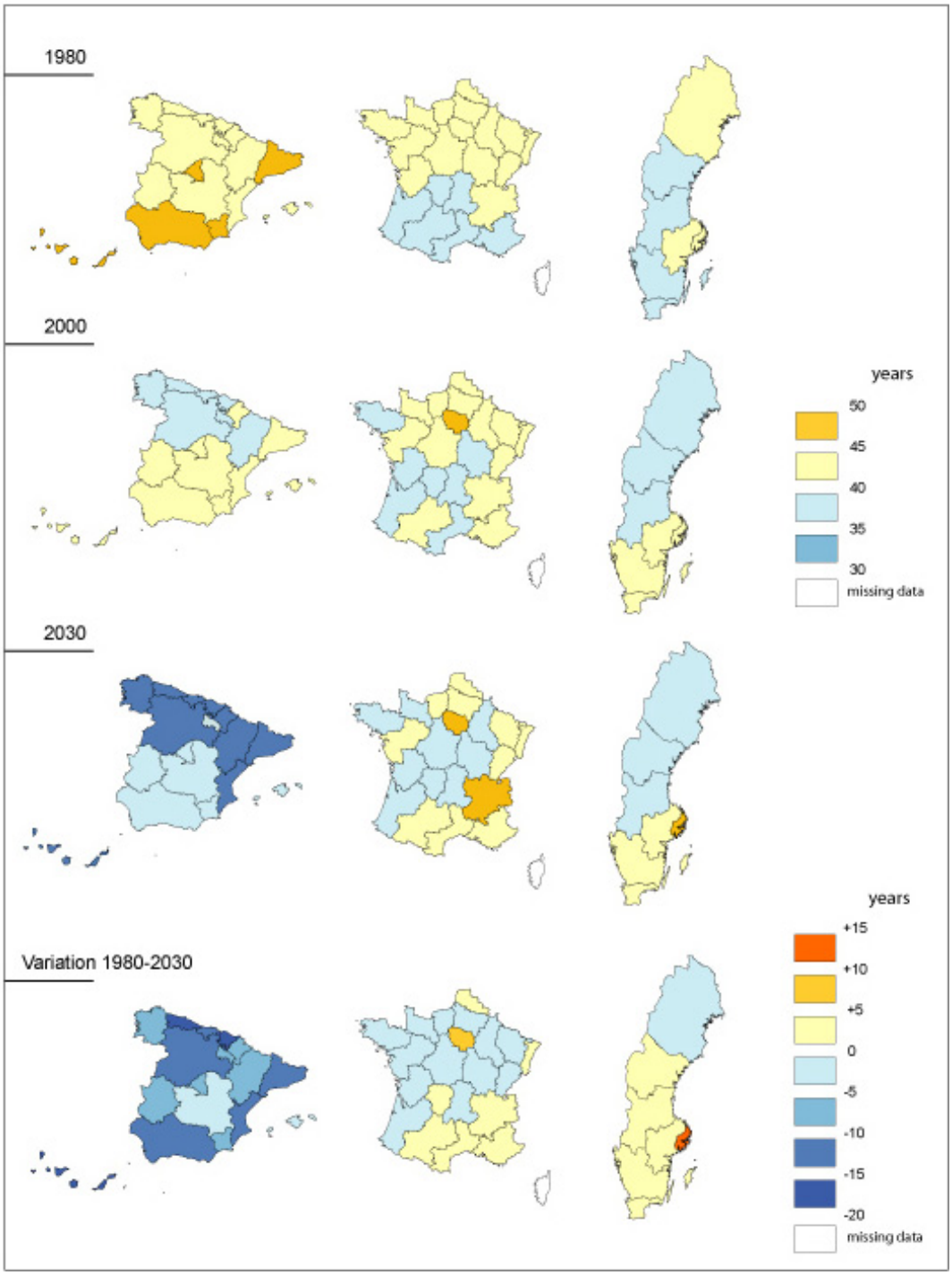


Figure 27 Difference between life expectancy at birth and median age ('remaining life' index) in France Spain and Sweden (NUTS2, 1980-2000-2030).

In Figure 26, this phenomenon appears clearly. The maps show the favourable situation of France and Sweden's biggest urban areas, but also the generally stable trend of Swedish regions and the strong tendency to decrease of 'remaining life' index values in Spain, reflecting the situation in many southern European countries. French regions like Limousin or Nord-Pas-de-Calais, that had the 'worst' situation respectively for Median Age and Life Expectancy in 1980, are joined and surpassed by many Spanish regions during 1980-2030's period.

Anyway, this first study of a 'remaining life' index at regional level, just like previous comparisons at state level, show the interest of this simple indicator for measuring territorial cohesion inside the ESPON area. The calculation of its value at NUTS2 for the entire ESPON area during the next step and the development of the Long Term Data Base will provide many possibilities of application of spatial analysis tools to measure the evolution of discontinuities and territorial cohesion.

3.3 The influence of scale and accessibility on territorial cohesion

The concept of territorial cohesion deals not only with the issue of regional disparities, previously tackled with the demographic indicator of 'remaining life' in order to complement the usual economic variables. It also deals with the question of accessibility to 'essential services and basic facilities', according to the latest European political documents like the 3rd Report on Cohesion. Addressing this topic requires a new kind of methodology adapted to the new geographical scale considered.

The elaboration of an indicator of accessibility to basic services will take into account the research done by the TPG ESPON 1.4.2 on the social dimension[55]. In fact one of the four key fields that the TPG 1.4.2 has to study, following the Terms of Reference, is related to 'Access to social services, services of general economic interest, mechanisms of public transfers'. By emphasizing the possible contradictions between regional and local levels, our aim is to be complementary with the TPG1.4.2 to pave the way for future integrated projects on the social factors in ESPON2.

3.3.1 Accessibility to Basic Services: Challenges for a reproducible method in the ESPON space, at local level

As far as accessibility to basic services is concerned, the reliability of results is a matter of scale. The more precise level of analysis adopted in ESPON projects, i.e. NUTS3, looks inappropriate: the mean size of NUTS3 units is around 50 km from one side to the other, while the question of access to services concerns lower distances. For instance, within the same NUTS3 the distance to the nearest hospital may vary from 0 to 40 km, and this situation cannot be summarized without considering the internal structure of the NUTS3. Such differences within a given NUTS3 have been proved in a Belgian preliminary research whose purpose was to combine the distance to the closest hospital and older people's mortality rates. The study considers hospitals having emergency services, and shows that the mortality rates significantly increase when the distance to the hospital exceeds six kilometres[56].

[55] Project 1.4.2: *Preparatory Study on Social aspects of EU territorial development*. The Interim Report will be delivered at the end of February 2006.

[56] Research done by Alice Romainville (IGEAT / ULB), as a part of the 'Demography' volume of the Belgium National Atlas.

This situation raises three challenges:

1. Which territorial local units must be considered? The LAU2 is not harmonised across the 29 ESPON countries (for instance the French LAU2 are five times smaller than the Belgian ones), and this situation cannot always be solved by a combination of LAU1 and 2 (eight EU countries, including France and Belgium, have no LAU1 partition). This work will be conducted in close connection with the TPG 3.4.3 on the Modifiable Area Unit Problem.
2. Which data can be used? The current ESPON database does not comprise data at lower levels than NUTS3. One of the only databases existing at LAU has been made out for the purpose of the 'Mountain study' (project achieved for the European Commission by a consortium led by Nordregio, and completed later to cover the entire ESPON space). This database is here tested in the context of the specific needs of our research.
3. Which method must be set out? The method must be robust enough to be used in a context of scarcity of data. Our aim is to allow the method to be *reproducible*, i.e. applicable to any regions thanks to *the limited set of data required*.

Particular attention also has to be paid to the situation along national borders. As the basic facilities and essential services are framed within the national contexts, borders are important discontinuity lines in terms of provision and organisation of services. Recently several, mainly bottom-up, cross border initiatives took place to better coordinate services such health. The evaluation of these services is not easy as it is frequently said that each border is typical and the situation cannot be explored except by monographs. Our intention here is to adopt a more top-down approach, through a reproducible method whatever the border context is.

The ETCI task cannot answer all these challenges but can prepare the future studies on territorial cohesion at this scale, in the perspective of ESPON2, by proposing a methodology and by experimenting it. We have tested the method in the so-called 'Grande Region' or 'Gross Region'. It has been chosen for three reasons:

1. This trans-national area comprises four countries (Belgium, France, Germany, Luxembourg), so it is an interesting place to compare the availability and to initiate the work of harmonisation[57];
2. The density of borders is interesting in this region as a way of regarding the eventual complementarities between countries. Moreover, as there is a political will in the *Grande Région* to foster the cooperation between regional authorities, it makes sense to define influence areas of services across the border.
3. The borders between Luxembourg and neighbouring countries are the major economic discontinuities in Western Europe[58]. The disparities of GDP/capita levels in absolute terms are extreme. Important flows of workers converge towards Luxembourg; this leads to enlarge the potential attractiveness of public services.

[57] Our participation in previous and ongoing Interreg projects in the Region was the opportunity to gain some knowledge on the territorial trends in this transnational area.
- de Ruffray S., Meddahi D., Moron E., 2004, /Contribution à la situation économique de la Grande Région, /Report and atlas made for the Conseil Economique et Social de la Grande Région
- de Ruffray S., Meddahi D., Moron E., Smits F., 2005, /A method to delimit cross border labour market: The example of the 'Great Region'/, Paper presented at the 14th European Colloquium on Theorical and Quantitative Geography, Tomar, 9^th -13 th September 2005

[58] See the Annex A of the ESPON3.1 Third Interim Report, 'Multiscalar Territorial analysis'

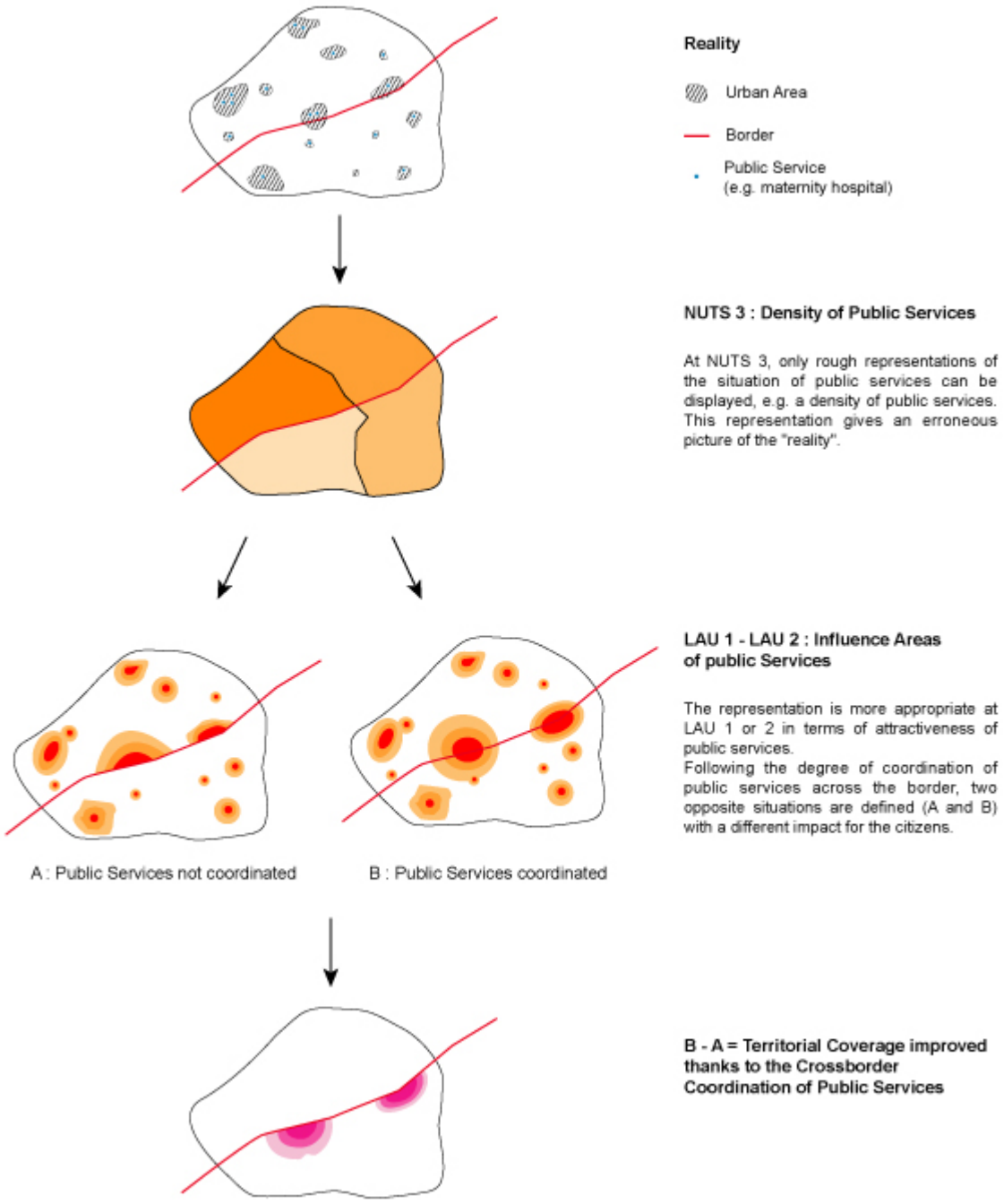


Figure 28 The relevance of LAU 1/2 levels to represent the accessibility to public services

3.3.2 Empirical Test: the Accessibility to Maternity Hospitals in the Grande Region

Among the 'the basic facilities and essential services', the maternity hospitals are considered in this empirical test. Given the high diversity in fecundity rates between the countries, especially here between Germany and its neighbours, it was interesting to focus on maternity hospitals in order to assess our results according to the different national trends.

The achievement of the study required the choice of a mixture of LAU1, LAU2 and sometimes other partition. Belgium and Saarland have the larger LAU2 in the Region, and do not have any LAU1 partition. So the territorial template cannot be more precise than this level. The corresponding units in size are, in France, the 'cantons' (aggregation of French LAU2), in Luxembourg the 'cantons' (LAU1) and in Rheinland-Pfalz the 'Verwaltungsgemeinschaften' (LAU1).

Our methodology consists in taking into account the maternity hospitals of the Region, and to combine the capacity (number of beds in each maternity hospital) and the demand (number of births in each LAU) with the accessibility to each maternity hospitals. In total there are 146 maternity hospitals in the Grande Région. The empirical test concerns only seven of them, because our aim is not to give an exhaustive view of reality but to present the added value of the method.

3.3.2.1 Conceptual and mathematical Foundations

The idea is that there are no strict limits between the influence areas of maternity hospitals. On the contrary, the LAU can be attracted at the same time by several maternities.
Three main parameters form the conceptual foundations of the delimitation method, designing graduated limits around the maternity hospitals.
They take into account:

- The accessibility in terms of the required time to reach the maternity hospital from each LAU. A threshold of 60 minutes has been empirically decided: when the distance between a LAU and a maternity hospital exceeds 60 minutes, we consider that it cannot be attracted by the maternity hospital and its value is zero. This parameter brings a time-distance constraint to the maternity hospital area delimitation[59].
- The capacity that represents the ability of the maternity hospital to attract the women of the LAU is based on both the number of beds offered and the number of births in LAU where the maternity hospital is located.
- The demand that represents the lack of beds of the LAU is based on both the number of beds offered and the number of births in LAU.

The method is based on an application of fuzzy sets theory and possibility theory. These theories are adapted to study and formalise spaces which are not strictly delimited, or which are only poorly delimited. For each LAU, a membership value to an influence area is obtained, and for each maternity hospital a membership profile is built. Hence, it is possible to establish the large and small influence areas to which a LAU contributes.

An influence area is a geographical space defined by such characteristics as accessibility, capacity, and demand which differentially affect it. The membership to an influence area may be very high for some places, much less important for another or non existent for others. The influence area is imprecise since each spatial unit contributes to it at various levels.

[59] The network is made of the different strands

3.3.2.2 Steps of delimitation method

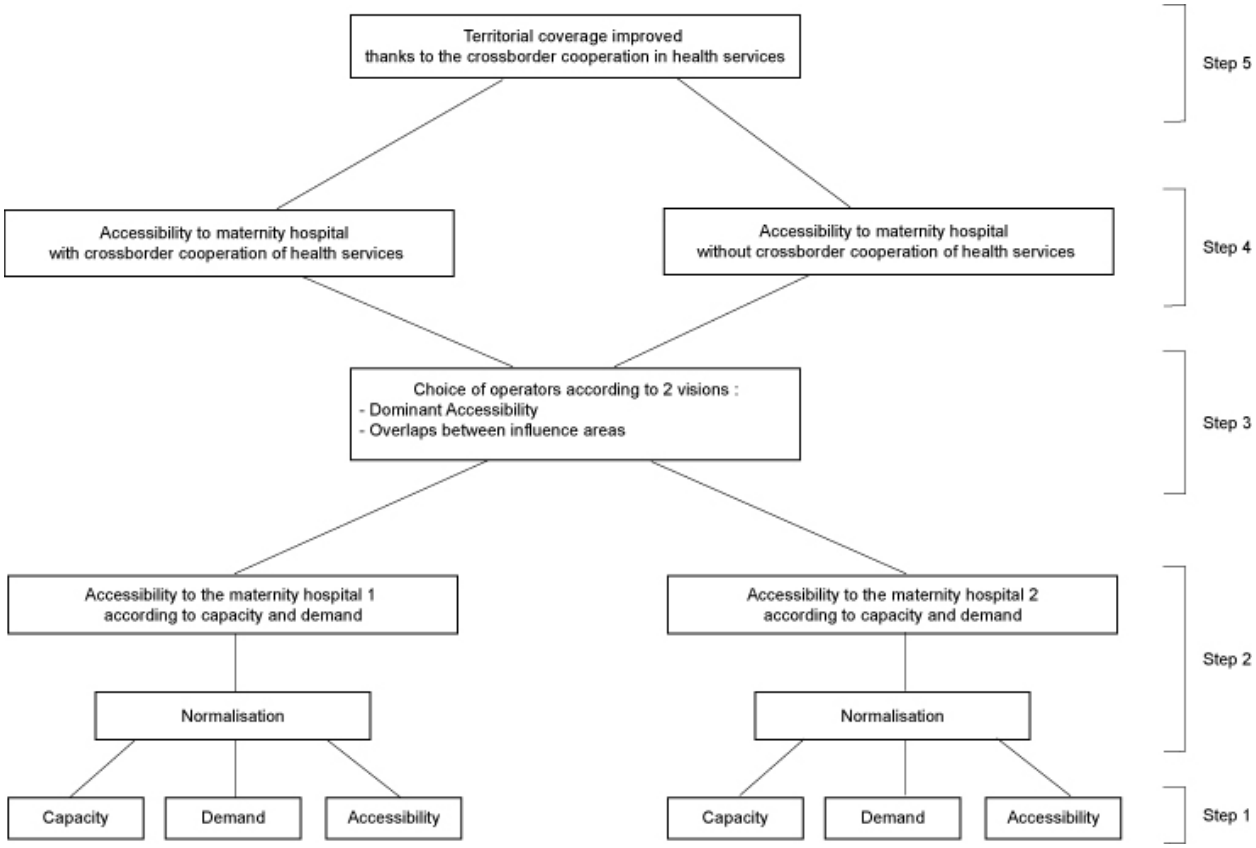


Figure 29 A delimitation method in 5 steps

Step 1: Parameters

Once the maternity hospitals have been selected, it is necessary to delimit and to map their influence area. Step 1 of the method takes into account three parameters to achieve that objective.

- The accessibility in terms of the required time (under 60 minutes only) to reach the maternity hospital from each LAU. This parameter brings a time-distance constraint to the maternity hospital area delimitation. The more travel time to reach a maternity hospital, the less chance that the LAU will belong to its influence area. Taking into account various legal speed limits, time is measured for a car travel in optimum conditions without any stop constraint.

- The capacity represents the ability of a maternity to attract the women of other LAU. It depends on the number of beds and the number of births, per year.

- The demand represents the need in terms of maternity beds of the LAU. This is based on both the number of beds offered and the number of births in the LAU

Step 2: Accessibility to the maternity hospital according to capacity and demand

The second step consists in the calculation of the influence areas around each maternity hospital. The three previous parameters values are calculated for each LAU, and are then combined and normalised[60]. The result is the accessibility to the maternity hospital according to capacity and demand.

The combined value of accessibility and attractiveness of each maternity hospital increases from 0 (no accessibility) to 100 (the best accessibility).

The value 0 corresponds to:

- a LAU having a maternity (thus not potentially attracted by the considered maternity hospital);
- or a LAU located sixty minutes away from the considered maternity hospital;
- or a LAU without births.

The value 100 corresponds to the LAU where the considered maternity hospital is located.

Between 0 and 100, a high value means that the LAU is located close to the maternity hospital and/or there is a high need in the LAU (a lot of births).

Step 3 : Choice of operators to represent the influence areas

The possibility of a LAU to be attracted by several different maternity hospitals at the same time allows different visions. These visions consist in various aspects of the same reality and are intrinsic parts of its complexity. Displaying this complexity may help policy makers in their choices.

The first vision is the more obvious one. For each LAU, we choose the highest membership value amongst the possible memberships to all maternity hospitals. In other terms, the focus is put on the dominant maternity hospital attractiveness. This representation has the interests to locate the areas without problems (highest values), but also to point the areas facing difficulties: located far away from any maternity hospital although there is an existing demand.

Besides this dominant attractiveness, it is significant to take into account the case of multi-belonging, i.e. when a LAU lies within the influence areas of several maternity hospitals, or right between two maternity hospitals in a rural area. We consider together all the maternity hospitals, and for each LAU we combine several membership values. The idea is to display the interstitial areas which lie at a certain distance from several maternity hospitals, whose influence areas overlap each other. Pointing out these areas is essential for policy makers in terms of service reallocation, especially when the purpose is to close a service: it may be important in rural areas to keep the possibility of choice.

[60] See Appendix IV

Taking a biologic metaphor, while the first vision focuses on the dominant gene, the second one reveals the recessive gene, i.e. the 'hidden' influence areas. Both visions show two complementary aspects of the reality.

Step 4: Accessibility to maternity hospital with or without crossborder cooperation of health services

The results take into account the situation of borders, in terms of cross border coordination of health services or not. Here, the map represents an empirical test with a selection of the seven maternity hospitals closed to the inner borders of the Grande Region. This corresponds to the dominant accessibility. At the current step of the research, the 'overlap' vision has still not been designed.
Individual LAUs of the Grande Region have a membership value to influence area of maternity hospital ranging from 0 to 100. A LAU does not depend on an influence area if its value is 0. Indeed, the higher the membership value is, the higher the possibility that the LAU belongs to the influence area of maternity hospital.

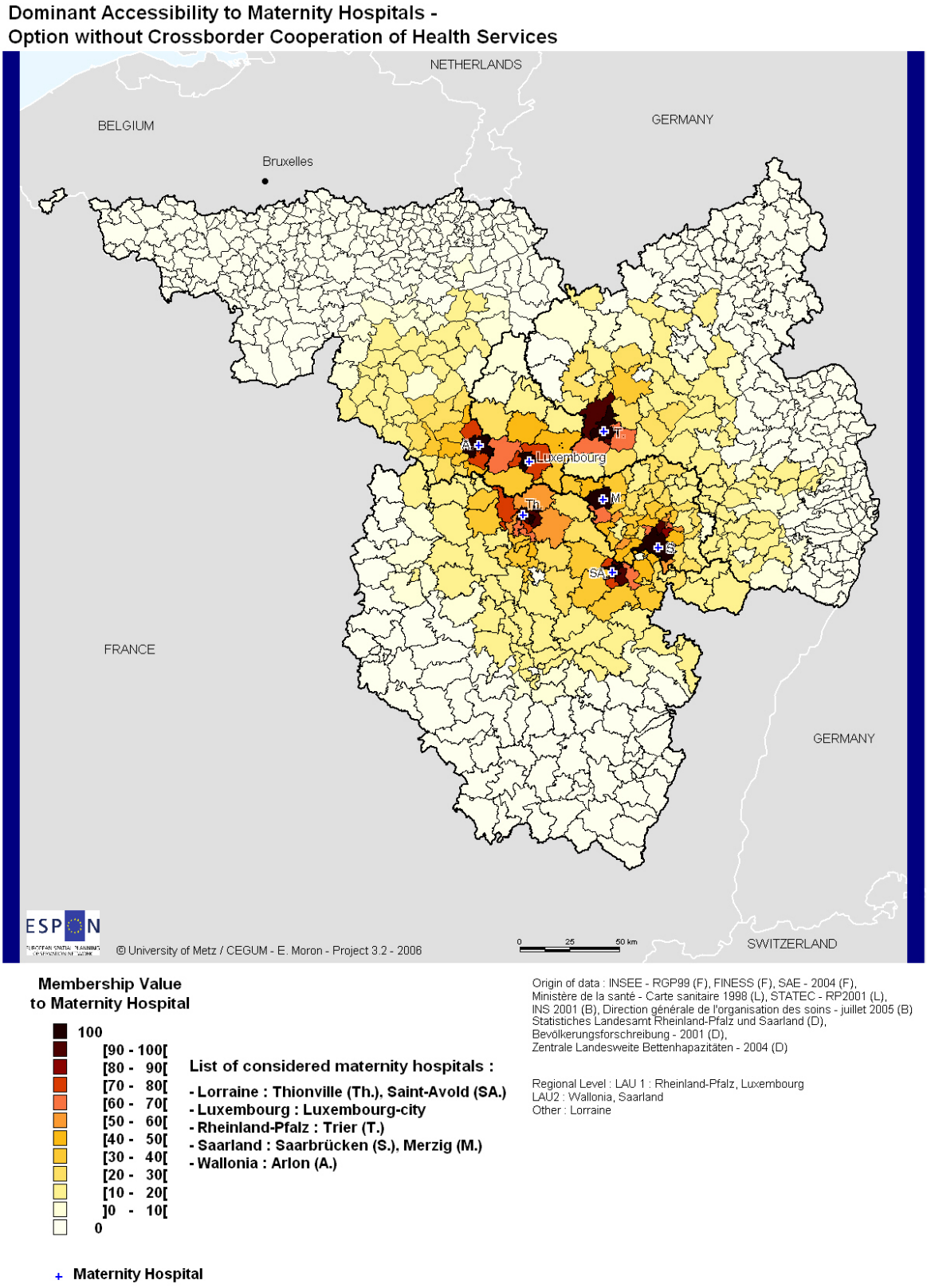


Figure 30 Accessibility to maternity hospitals. Option without cross border cooperation of health services

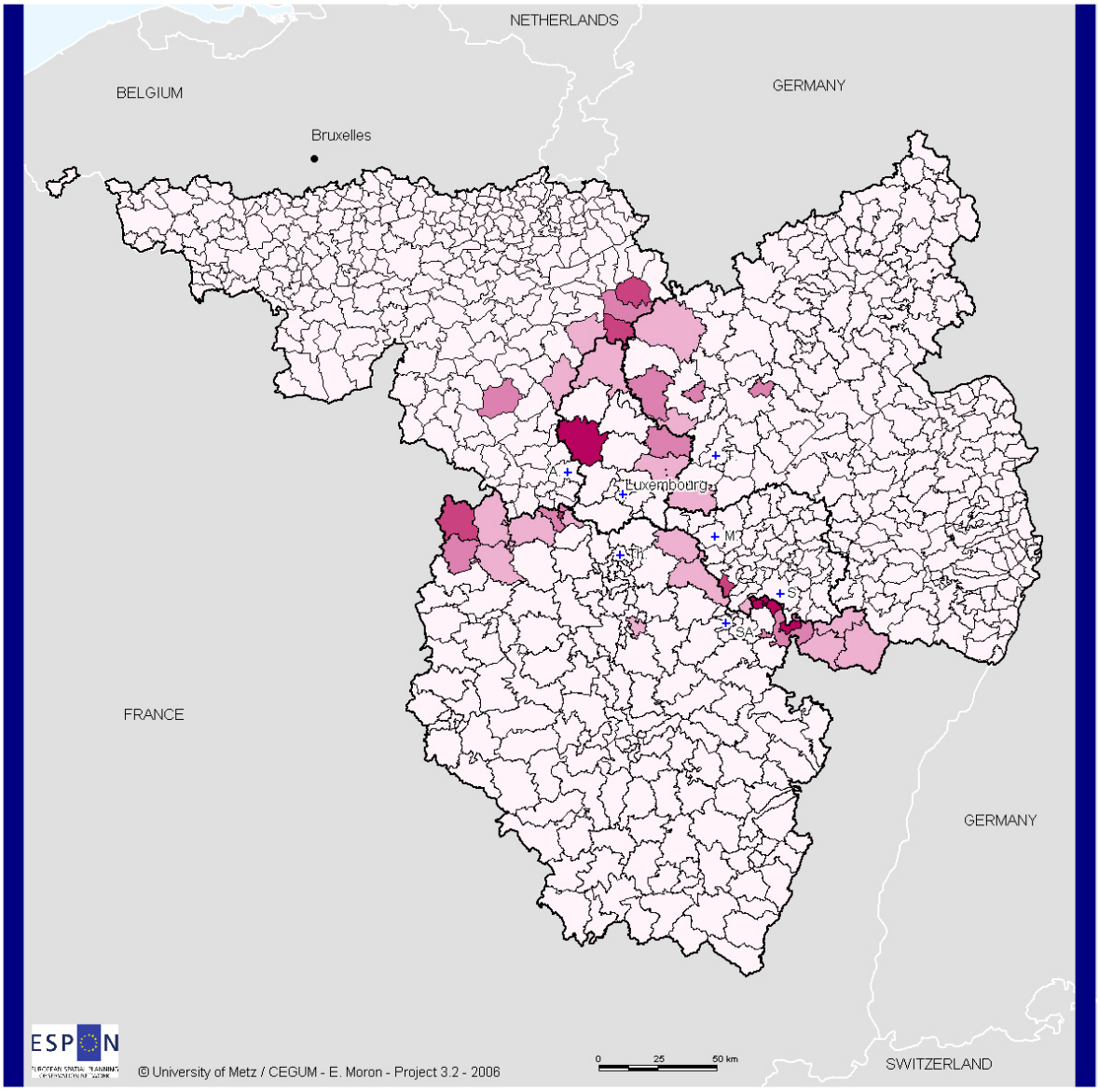
Step 5: Territorial coverage improved thanks to the crossborder cooperation in health services

The map is the result of a difference between the values of the cross-border cooperation of health services option and the values of the non cross-border one. The map shows that the cross-border cooperation improves the territorial coverage of health services. This map is preliminary, and his purpose is only to illustrate the methodology.

By cross border cooperation we mean a thorough coordination of health services, not limited as it is today to parsimonious projects between isolated health providers[61]. This requires the harmonisation of Social Security systems.

[61] For the moment, health cross border cooperation usually deals only with emergency services and social protection of borderers. There are numerous other projects on benchmarking, but no global view.
See the research-action Interreg IIIA project 'Offre de soins et mobilité à l'intérieur de l'espace transfrontalier Lorraine - Grand-Duché de Luxembourg - Province de Luxembourg', 2004, http://www.santetransfrontaliere.org/luxlorsan/main.htm
Mission Opérationnelle Transfrontalière , 2001, An assessment of cross border cooperation between hospitals, France - Belgium - Luxembourg - Germany - Italy - Spain - Great Britain - Switzerland
http://www.espaces-transfrontaliers.org/en/studies/santeanglais.pdf
Mission Opérationnelle Transfrontalière, 2004, La coopération transfrontalière sanitaire. *Les Cahiers de la MOT,* 4, http://www.espaces-transfrontaliers.org/document/cahier_Mot_4.pdf

Difference Between Membership Values of LAU 1 and 2 Territories to Maternity Hospitals (Cross Border Cooperation Values Minus Non Cooperation Values)



Difference between Membership Values

- >= 15
- [10 - 15[
- [5 - 10[
-]0 - 5[
- 0

\+ Maternity Hospital

List of considered maternity hospitals :

- Lorraine : Thionville (Th.), Saint-Avold (SA.)
- Luxembourg : Luxembourg-city
- Rheinland-Pfalz : Trier (T.)
- Saarland : Saarbrücken (S.), Merzig (M.)
- Wallonia : Arlon (A.)

Origin of data : INSEE - RGP99 (F), FINESS (F), SAE - 2004 (F), Ministère de la santé - Carte sanitaire 1998 (L), STATEC - RP2001 (L), INS 2001 (B), Direction générale de l'organisation des soins - juillet 2005 (B) Statistiches Landesamt Rheinland-Pfalz und Saarland (D), Bevölkerungsforschreibung - 2001 (D), Zentrale Landesweite Bettenhapazitäten - 2004 (D)

Regional Level : LAU 1 : Rheinland-Pfalz, Luxembourg
LAU2 : Wallonia, Saarland
Other : Lorraine

Figure 31 Gains for the citizens in the case of coordination of maternity hospitals

Conclusion on the empirical test

As accessibility to basic facilities and essential services is an inherent component of territorial cohesion, and given the difficulty to achieve reliable results at LAU level across the ESPON area, the proposed method proves several interests. Firstly, it is based on a very small set of data: the number of births in the LAU, available for example in the EC 'Mountain Study'; the number of beds in each maternity hospitals, provided by the national health services; the accessibility between maternity hospitals and LAUs. This ensures the reproducible stake. Secondly, the fuzzy operators look interesting as regards the political meaning of 'accessibility to essential services': on the one hand, the choice of operators determines different visions of accessibility particularly when citizens belong to the influence areas of several services; on the other hand, influence areas have no strict delimitations in reality, and fuzzy operators allow taking this reality into account.

It would be interesting in the context of ESPON2 to launch new studies on accessibility at this local level, in all the ESPON space, based on such a method. This would ensure a better representation of territorial cohesion in EU25+2+2 countries, and this would answer to the sorrows regularly expressed that the territorial level (NUTS3) of ESPON studies is too rough (see e.g. the ECP report 'Compiling1', 2005). The methodology could be adopted to other fields than health, such as training (accessibility to universities) or public transportation (accessibility to stations).

The future of the ETCI activities at this level depends on the MC expectations and assessment of the work done so far. If the method is considered useful to display accessibility patterns, it can be further tested in the Grande Region in order to prepare the new strands of research on this topic in ESPON2. If no more work is required regarding the question of accessibility before a new TPG addresses the question in ESPON2, the local level can still been considered in the ETCI, for example to test the 'remaining life' index at precise scales to measure intra-NUTS2 or 3 discontinuities.

3.4 Conclusion

«Nous savons pas mettre la main sur quelque chose qui serait à mesurer avant de l'avoir mesuré. »
Leon Brunschwig, 1922

Even if it is more and more used by European policy makers since the 2nd Economic and Social Cohesion Report, territorial cohesion concept remains not well defined scientifically. The two orientations of the work on European Territorial Cohesion Index (measure of territorial cohesion between regions with 'remaining life' index, and measure of local accessibility to services) must be considered as a different approach of works on 'Territorial Efficiency Quality Identity Layered Assessment (TEQUILA)' model. While the methodology for Territorial Impact Assessment proposes a deductive approach in order to define in theory which indicators should be selected to measure territorial cohesion, the works on ETCI propose on the contrary an inductive approach, from measure to theory, in order to produce concrete results able to illustrate the scenarios, but can also be a basis for the development of future researches on territorial cohesion measure at regional level. So the aim of the works on ETCI is not to provide *a priori* a conceptual definition of the notion of territorial cohesion, but to use existing data to propose some elements that permit regional comparisons in space and time. For this purpose, demographic indicators appear like a reasonable way to evaluate quantitatively in long term territorial cohesion in order to

illustrate scenarios: the availability of data permits to produce maps and make territorial comparisons at an international, national and a regional level. In complement, measure of accessibility to services of general economic interest (SIEG) opens opportunities for future researches at very local level in concrete terms. For the final report, studies at NUTS2 level in all ESPON area 1980-2000-2015-2030 in collaboration with Long term Data Base work will permit to give a contribution to the illustration of the scenarios, to provide a quantitative measure of the evolution of discontinuities between European regions and to test empirically the hypotheses formulated on this contribution.

APPENDIXES

I. SELECTED POLITICAL DOCUMENTS RELATED TO DEMOGRAPHY

II. DEFINITION AND PROPERTIES OF 'REMAINING LIFE' INDEX

III. RL STATE GRAPHICS (ESPON + Croatia, Turkey and Ukraine)

IV. DELIMITATION OF INFLUENCE AREAS AROUND MATERNITY HOSPITALS

V. BIBLIOGRAPHY

APPENDIX I: SELECTED POLITICAL DOCUMENTS RELATED TO DEMOGRAPHY

- *Third report on economic and social cohesion: 'A new partnership for cohesion. Convergence, competitiveness, cooperation' - 2004*

'Population of working age will begin falling over the present decade in all four southern Member States, Germany and most of the accession countries. In the next decade, the fall will spread to all countries, apart from Ireland, Luxembourg and Cyprus. On the latest projections, the number of people aged to 15 to 64 is projected to be 4% smaller in the EU15 in 2025 than in 2000 and in the accession countries, 10% smaller.
The decline will be accompanied by substantial growth in the number of people of 65 and over. By 2025, there will be 40 % more people than now beyond retirement age in both the present EU15 and the accession countries, implying a ratio of under three people of working-age for everyone aged 65 and over as opposed to a ratio of over four to one at present. Other things being equal, the ageing of population will lead to a gradual contradiction of the EU's force and is likely to have implications for growth potential.'

p. x (*executive summary*)

'Liberalising the markets for transports, telecommunications and energy has led to increased efficiency and lower prices. It has also, however, involved a threat to particular social groups or regions of being excluded from access to essential services. Public service obligations have, therefore, been established to ensure that everyone can obtain essential services – or 'services of general economic interest' – of reasonable quality and at affordable prices, as required by the EU Treaty (Article 16). Community funds have been made available to help ensure that these obligations are respected across the EU.'

p. xvi (*executive summary*)

'Demographic ageing in Europe is a particular challenge. The regional variations in this respect are considerable reflecting trends in fertility and mortality, and immigration. Addressing the problems is not simply a question of coping with a rise in the dependent population. It also requires ensuring that national and regional development strategies are adapted to demographic circumstances and are able, in particular, to promote active ageing policies and to exploit the often underused potential of the older population.'

p. xxvi (*conclusions: a proposal for a reformed cohesion policy*)

'In particular, Member States, regions and citizens will have to adapt to a world experiencing rapid economic and social change and restructuring, trade globalisation and a move towards a knowledge-based economy and society. They will also have to tackle the particular challenges that derives from an ageing population, growing immigration, labour shortages in key sectors and social inclusion problems.'

p. xxix (*conclusions: a proposal for a reformed cohesion policy*)

- *Second report on economic and social cohesion 'Unity, solidarity, diversity for Europe, its people and its territory' - 2001*

'Population in the EU is ageing rapidly. With low birth rates, the proportion of young people under 15 has declined for a number of years and is projected to continue to do so in the future, falling from 17% in 1998 to 14.5% in 2025. By contrast, the proportion of those aged 65 and over is rising significantly and is set to increase even faster after 2010 as the

baby-boom generation begins to reach this age. Accordingly, the proportion is projected to increase from around 16% of total population in 1998 to 22% by 2025. Moreover, with this, the relative number of people of 80 and older is rising faster still.
These trends will have important consequences for social welfare and taxation systems across the EU. In particular, the prospect is for a growing number of people above retirement age who will need to be supported by those in employment. All Member States will experience an increase in the old-age dependency rate (the number aged 65 and over relative to those of working-age, taken here as 15 to 64), but the extent of this is likely to vary significantly between them. The most marked increases are expected to be in Italy, Sweden, Finland and Germany and the smallest in Ireland, Portugal and Luxembourg.'

p. 42 (*Factors determining real convergence*)

- *First Cohesion Report - 1996*

'Years of work on indicators to measure the quality of life in the broader sense, and the more recent reflections in the Union on the 'greening' of national accounts, have identified the limitations of conventional income measures such as GDP, even if as yet there is no operationnally viable alternative. Overcoming these limitations would allow due account to be taken of environmental effets, and more broadly of the sustainability of economic development.'

p. 6 (*executive summary*)

- *European Spatial Development Perspective (ESDP) - 1999*

'(240) Three trends will dominate population development in the EU in the next 20 to 30 years:
- decline in population
- migratory movements
- shifs in age profile.

(241) Natural population growth in the EU has been very low for years and is showing a declining trend. Without considerable changes in the birth rates of the EU fifteen, a shift from population growth to population decline could begin to appear around 2020. Against this background, international and interregional migratory movements are of increasing importance for EU population development and its sub-areas.'

p. 57 (*Part B-1.2. Demographic trends*)

- *Report on Territorial Cohesion, European Parliament - 2005*

'De nouveaux critères et indicateurs territoriaux, à côté du PIB, devraient être créés pour mesurer le développement d'une région et les obstacles à ce développement, tels les handicaps territoriaux spécifiques, l'indice de décentrement et d'accessibilité, la dotation en infrastructures et en transport, le niveau d'activité en recherche et innovation, en éducation et formation, le niveau de diversification de la productivité dans la zone.'

p. 9

- *EU informal ministerial meeting on territorial cohesion Presidency conclusions in Luxembourg, 20/21.05.2005*

'They [The Ministers] noted that the proposals of the European commission to strengthen the Lisbon Strategy ('Working Together for Growth and Jobs. A New Start for the Lisbon

Strategy') endorsed by the European Spring Council incorporate a territorial dimension in four ways: a) innovation poles linking regional centres, universities and business; b) national Lisbon action plans; c) attractiveness of areas to business and daily life; and d) the requirement to involve regional and local actors (multi-scale approach). They expressed the view that further consideration of the territorial dimension in EU policies could add value to the implementation of the Lisbon Strategy'

Presidency Conclusions (2.3)

- *EU informal ministerial meeting on territorial cohesion Presidency conclusions Rotterdam, 29.11.2004*

'The Ministers took note of the demographic, economic, social and environmental challenges facing the recently enlarged EU territory, especially those emerging or intensifying since the adoption of the ESDP, including the effects of climate change, global competitiveness and high energy prices. They stressed, once again, the importance of territorial cohesion, both in strengthening competitiveness and reducing disparities within the cohesion framework, and the key role that cities play in this concern.'

Presidency Conclusions (1.1)

'The Ministers recognised that territorial cohesion adds to the concept of economic and social cohesion by translating the fundamental EU goal of balanced and sustainable development into a territorial setting. They recognised that is both a multi-sectoral and a multi-level concept that can be implemented at regional/national, transnational and European levels. They acknowledged that it adds an integrated and long-term approach to the process of exploiting territorial potentials'

Presidency Conclusions (2.1)

'They recognized the important role of ESPON in enabling a coherent approach to the development of the EU territory. They considered the continual observation of European territorial trends and developments a highly important instrument of support in pursuing territorial cohesion'

Presidency Conclusions (4.3)

'Although migration patterns offer various challenges for Europe, falling population is a feature of many regions of the EU. This is due particularly to natural demographic factors. Population of working age in the enlarged EU is likely to begin falling earlier than the total, while a large and continous increase in the proportion of the population aged 65 and over will occur. The total population aged 65+ in the EU-25 will be 40% higher in 2025 than in 2000. One consequence will be a sharp rise in old-age depedency rates at EU-wide level. Metropolitan areas and highly urbanised regions are likely to experience higher population growth in future while regions with very low population densities are likely to continue to lose population, threatening their vitality. This change creates challenges for territorial developement related, for example, to the emergence of specific needs and locational choices of retired people. Entire regions are specialising in the settling of retired people. Their economic base is becoming a residential one, progressively changing their productive base. The decreasing proportion of the population of people of working age is likely to strenghten competition between regions to attract young qualified manpower. In addition, there is an increasing trend of cross-border retirement. The whole territory will be confronted by these challenges, to different degrees.'

Discussion paper for the EU informal ministerial meeting on territorial cohesion, p. 3

'The report proposes that future cohesion policy should focus on investment in a limited number of Community priorities, reflecting the Lisbon agenda, encapsulated in these key themes: innovation and the knowledge economy; environment and risk prevention; accessibility and services of general economic interest. All of these themes are fundamental to the balanced and sustainable development of the EU territory and its is essential that they are addressed in an integrated, coherent way. The priority themes will be addressed under three objectives: convergence, regional competitiveness and employment, and territorial co-operation.'

Discussion paper for the EU informal ministerial meeting on territorial cohesion, pp. 7-8

APPENDIX II : DEFINITION AND PROPERTIES OF 'REMAINING LIFE' INDEX

1. Life expectancy at birth

Life expectancy at age x of an extinct generation ($LEEG(x)$) is very easy to calculate: it is the arithmetic average of remaining duration of life at age x of a population born in an area A at time t. If a_i is the age of death of individual i and n the total population of P,

$$LEEG(x) = (\sum a_i - x) / n$$

So life expectancy at birth of an extinct generation is simply $LEEG(0) = \sum a_i / n$.

However, life expectancy is generally calculated for living population, which age of death is obviously unknown. This makes its calculation more complex. To calculate life expectancy at a present time, a life table of crude death rates by age must be used. This table permits to calculate probability of surviving at each age [62]. If probability of surviving from age x to age $x + n$ is denoted ${}_nP_x$, the life expectancy at age x, denoted $LE(x)$, is calculated by adding up the probabilities at every age[63]:

$$LE(x) = \sum_{t=1}^{\infty} t\, P_x$$

Life expectancy at birth $LE(0)$ is then obtained integrating all the probabilities of surviving at every age (from 0 to the maximum age). We must note here that the calcultaion doesn't take into account changes of life expectancy in the future. So life expectancy is usually calculated with no allowance for expected future changes. This means that life expectancy as it is calculated here is not generally appropriate for calculating how long any given individual of a particular age is expected to live, as it assume that current death rates will be "frozen" and not change in the future. This property is essential to understand the difficulty to measure real 'remaining life' of a given population (see paragraph 3).

2. Median age

Median age of a population P is the age value that parts it in 2 groups of equal size: a median age of m_p means that half of the population is younger than m_p and the other half is older. It is a good indicator of population ageing, easily deductible from pyramid of ages (size of population by age). However, data about age structure of the population is generally only available by age groups of 5 years, which make only possible to identify median age group (the age group $[x ; x + 5 [$ where parts of the population aged less than x and aged more than $x + 5$ are both inferior to 50 %). To estimate precise median age values at state and regional level, we have considered here that the trend inside median age group is linear. If a_p is the proportion of population P younger than x and b_p is the proportion of population P older than $x + 5$,

$$m_p = x + 5 \,.\, [\ (1/2 - a_p) / (b_p - a_p)\ ]$$

Mean age – calculated as the arithmetic average of the living population at time t - is another good and simple indicator of population ageing. However, its deduction from pyramid of ages is generally more complicated because of the age groups aggregations usually realized on their top[64]. And the differences between median age and mean age are

[62] For example, if one observed a group of people who were alive at their 60th birthday, and 5 % of them were dead by their 61st birthday, then the crude death rate at age 60 would be 5 %.

[63] Because the age is rounded down to the last birthday, on average, it can be expected that people live half a year beyond their final birthday, and half a year is added to calculate total life expectancy.

[64] « 65 years and more » or « 80 years and more » age group.

so limited in ESPON area that this technical problem led us to choose the first indicator to measure population ageing and build 'remaining life' index.

3. 'Remaining life' index

The uni-dimensional version of « remaining life » index of a population *P* is calculated as the simple subtraction of the median age to the life expectancy at birth of this population:

$$RL_P = LE(0)_P - m_P$$

Considering the properties of its two components, this uni-dimensional index compares data about different generations: median age at date *t* is an instantaneous value concerning all the living generations on *t*, whereas life expectancy at birth at date *t* only reflects mortality by age on *t*. So life expectancy at birth on *t* gives more information about mean duration of life of disappearing generations[65] than about life's duration of baby that were born on *t*. For example, it is probable that the lifetime of the children that were born in 2000 in Europe will be superior to life expectancy at birth in 2000 in Europe (because of health progress and increase of security), but it is impossible to calculate precisely this mean lifetime before the extinction of this generation. The fact that life expectancy 'at birth' at date *t* is paradoxically calculated with the deaths at this date, while median age takes into account all the living population on *t*, is a limit for the use of the uni-dimensional 'remaining life' index: in theory, it could for example have negative values (median age superior to life expectancy at birth), even if this kind of situation is practically impossible.

Anyway, the aim of 'remaining life' index is not to furnish a value of 'mean remaining duration of life' (*MRDL*) of the population. Such a value of *MRDL* could be calculated, as the weight average of life expectancies by age. For $x = 0, 1, \ldots, p$,

$$MRDL = (\Sigma\, n_x \,.\, LE(x)) \,/\, N$$

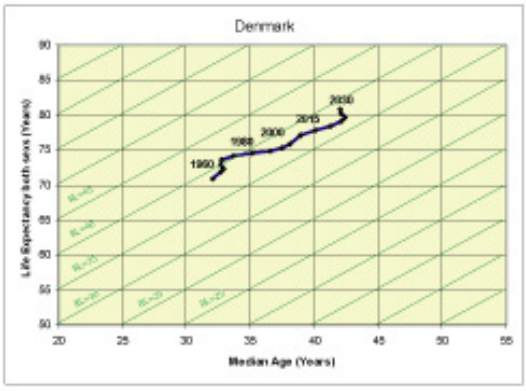
p = age of the older individual
n_x = number of individual aged x
$LE(x)$ = life expectancy at age x
N = total population

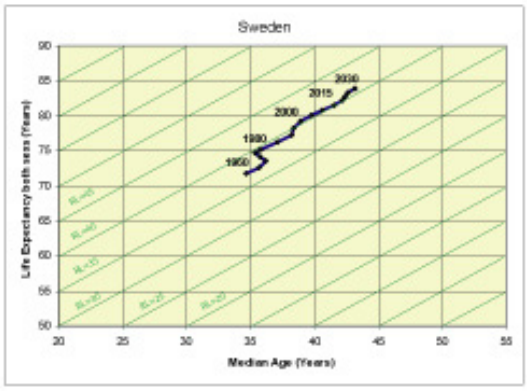
However, the lack of data about mortality by age at ESPON regional levels makes impossible the calculation of life expectancies by age. And the *MRDL* value would anyway remain only an indicator, always because of the impossibility of measuring the duration of life of a population before its extinction. Life expectancy at median age ($LE(m_P) = \Sigma\, t\, P_{mp}$) could be another solution, but it presents the same limits (lack of data, and indicative value without real significance in itself), and it doesn't take into account people that has died before median age: life expectancy at median age is always superior to the uni-dimensional 'remaining life' index proposed here ($LE(m_P) > LE(0) - m_p$), but it 'forgets' very premature deaths, that are also an important information.

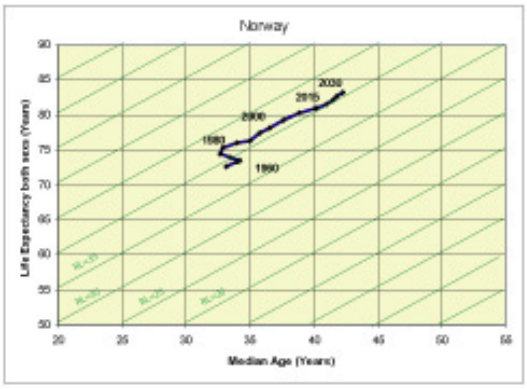
Considering all this, the advantage of the 'remaining life' index proposed here is its simplicity of calculation and interpretation, and the possibility of representation in its both dimensions. Just like any synthetic index, the values of the its uni-dimensional version have not a real significance by themselves, but their main interest is to permit comparisons between different periods and areas. This characteristic explains why the expression has been systematically put in quotation marks in the text: just like life expectancy at birth, it just gives indications about duration of life and its function is only to be used for comparisons in the aim of measuring territorial cohesion.

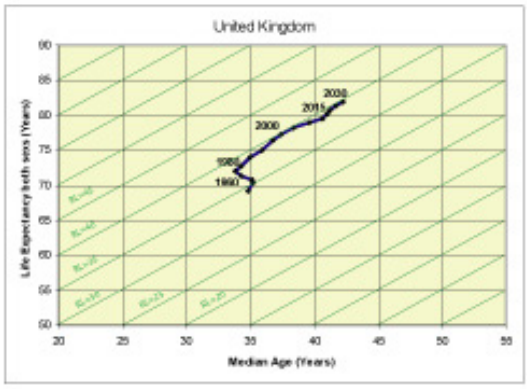
[65] For example in 2000 generations that were born t the beginning of XXth century.

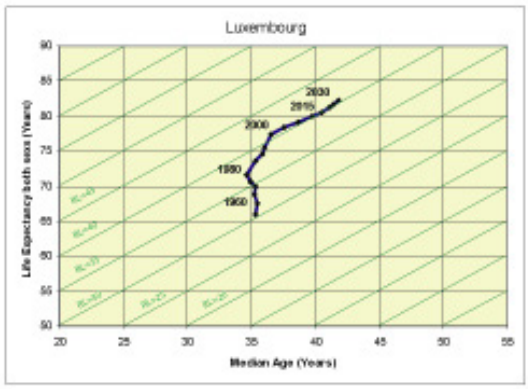
APPENDIX III : RL STATE GRAPHICS (ESPON + Croatia, Turkey and Ukraine)

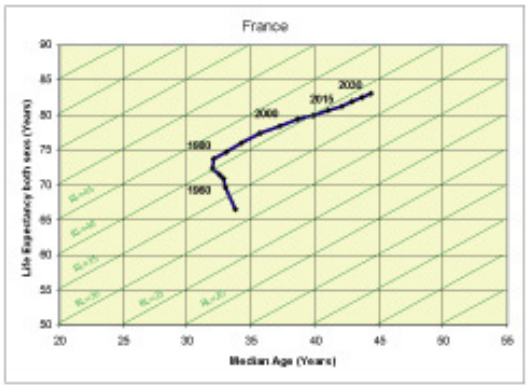


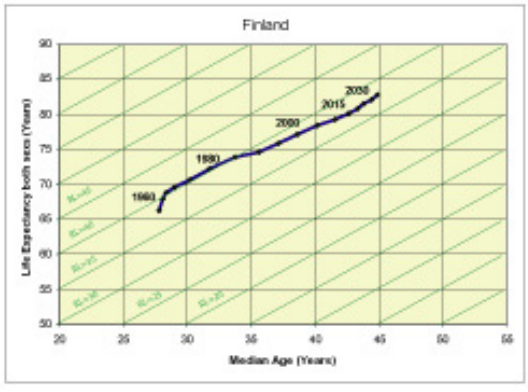


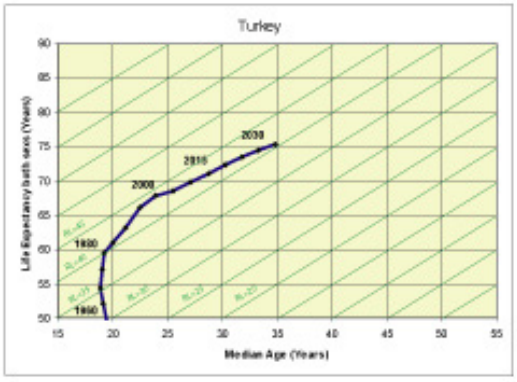


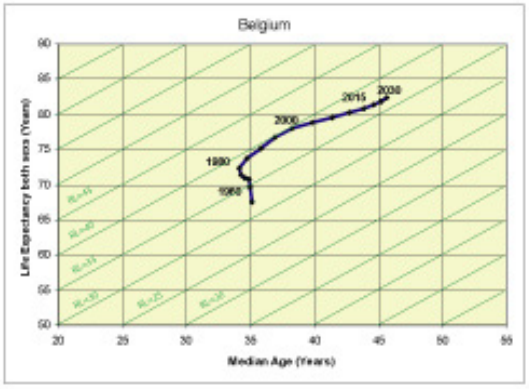


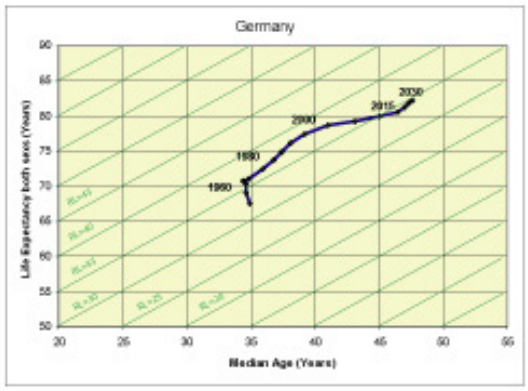









Belgium
Life Expectancy both sexes (Years)
Median Age (Years)
1960
1980
2000
2015
2030


Germany
Life Expectancy both sexes (Years)
Median Age (Years)
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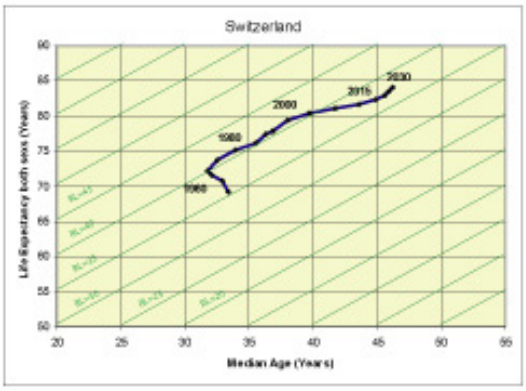
Switzerland
Life Expectancy both sexes (Years)
Median Age (Years)
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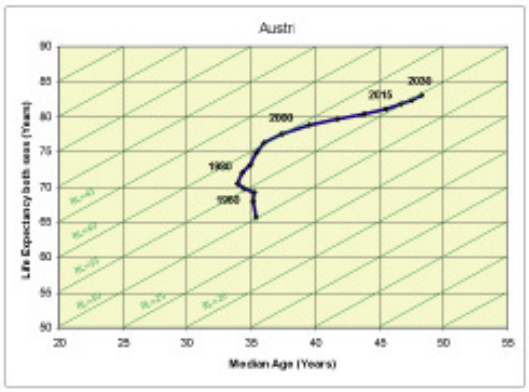
Austri
Life Expectancy both sexes (Years)
Median Age (Years)
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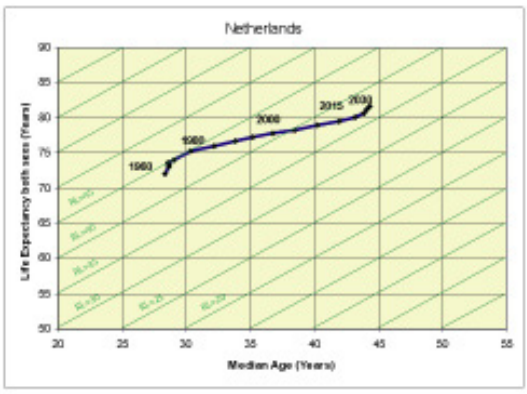
Netherlands
Life Expectancy both sexes (Years)
Median Age (Years)
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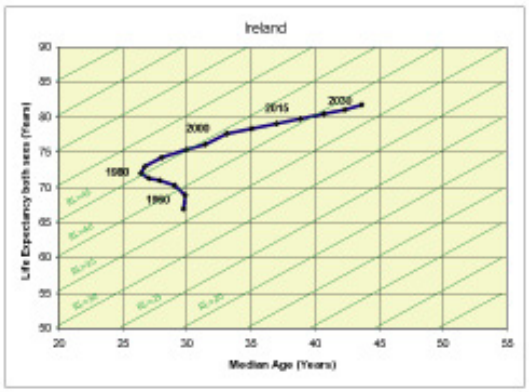
Ireland
Life Expectancy both sexes (Years)
Median Age (Years)
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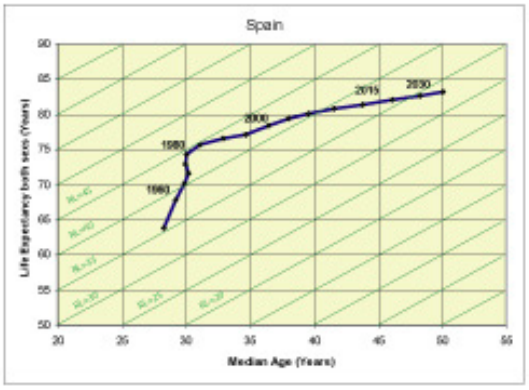
Spain
Life Expectancy both sexes (Years)
Median Age (Years)
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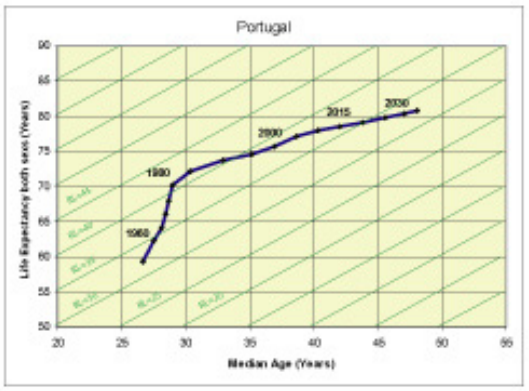
Portugal
Life Expectancy both sexes (Years)
Median Age (Years)
1960
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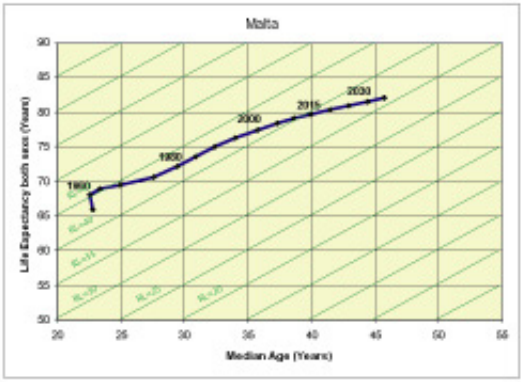
Malta
Life Expectancy both sexs (Years)
Median Age (Years)
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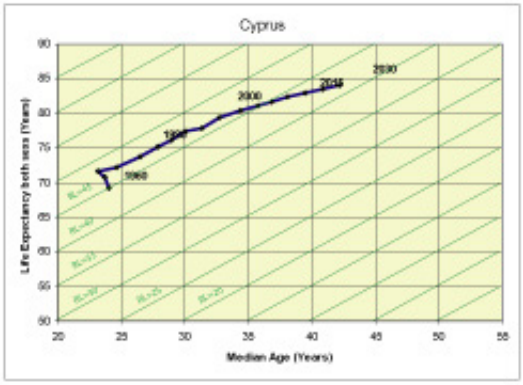
Cyprus
Life Expectancy both sexs (Years)
Median Age (Years)
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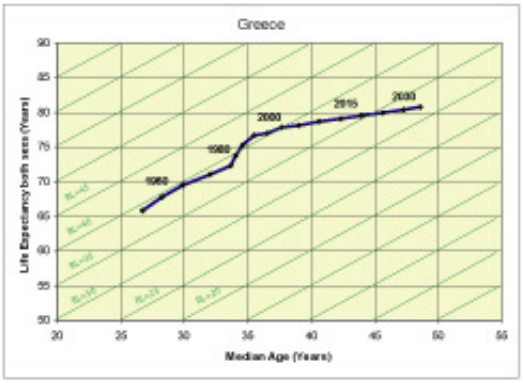
Greece
Life Expectancy both sexs (Years)
Median Age (Years)
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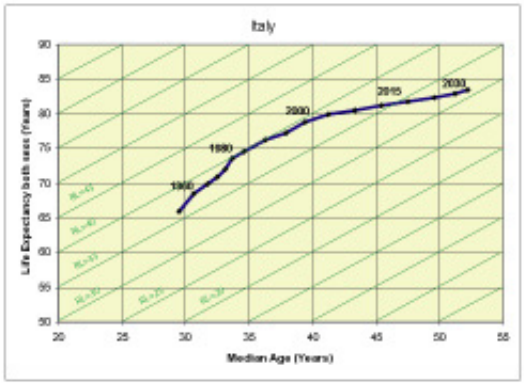
Italy
Life Expectancy both sexs (Years)
Median Age (Years)
1960
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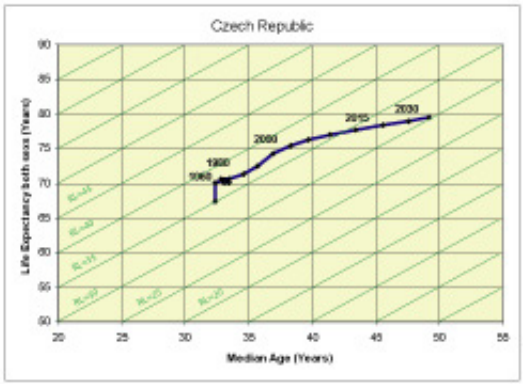
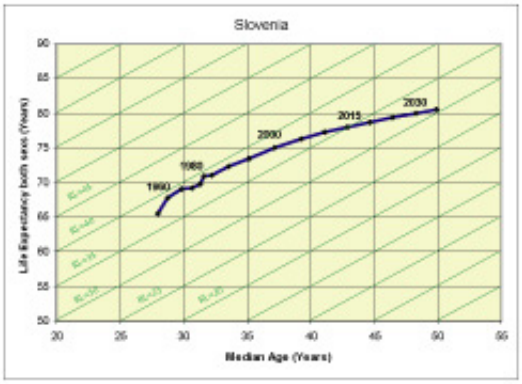

Czech Republic
Life Expectancy both sexs (Years)
Median Age (Years)
1960
1980
2000
2015
2030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Life Expectancy both sexs (Years)
Median Age (Years)
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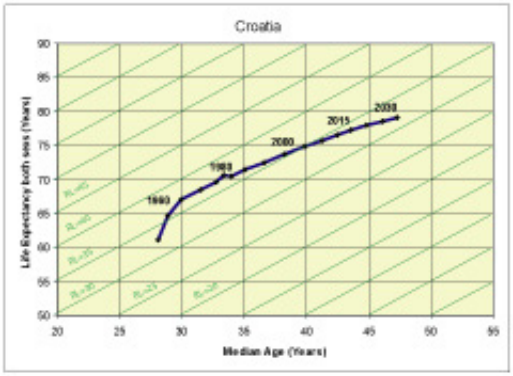
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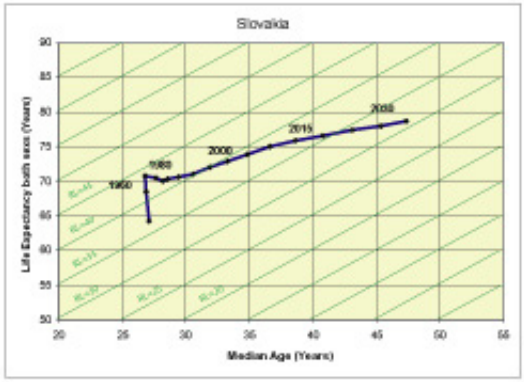
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Median Age (Years)
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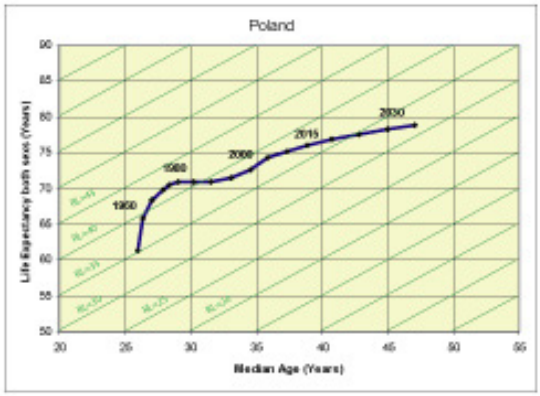
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Median Age (Years)
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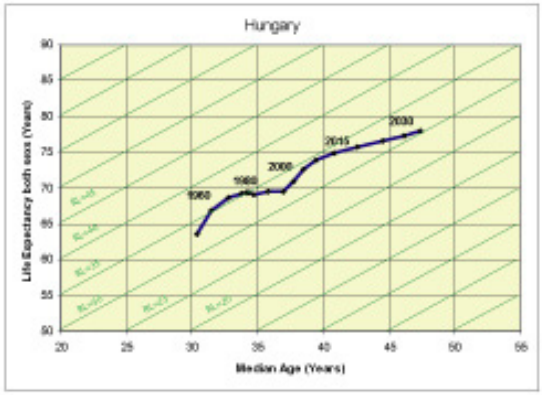
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Median Age (Years)
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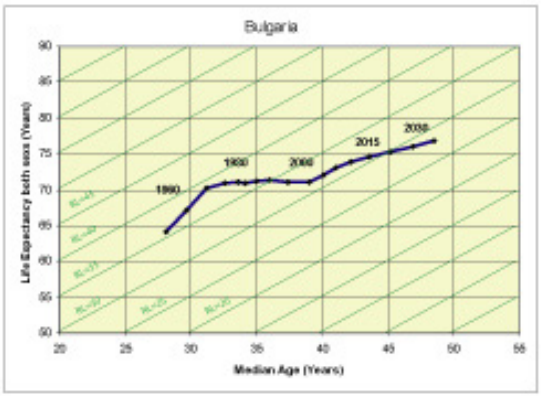
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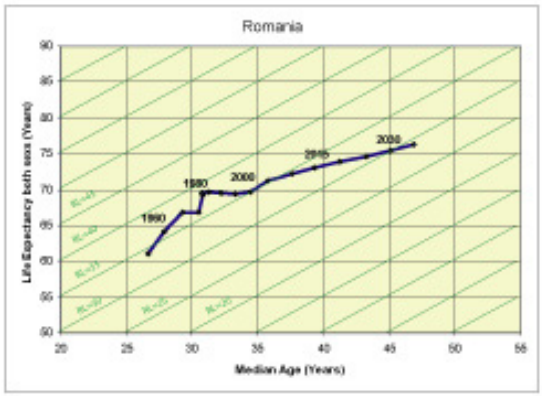
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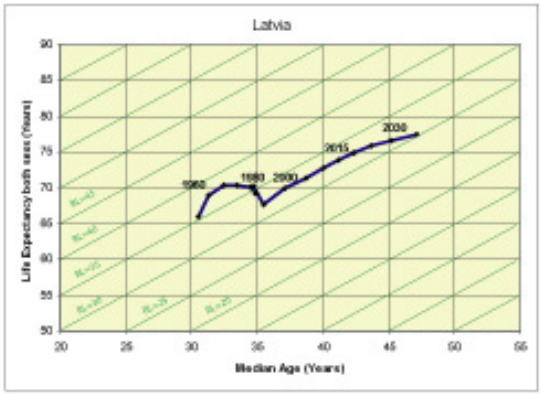
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Median Age (Years)
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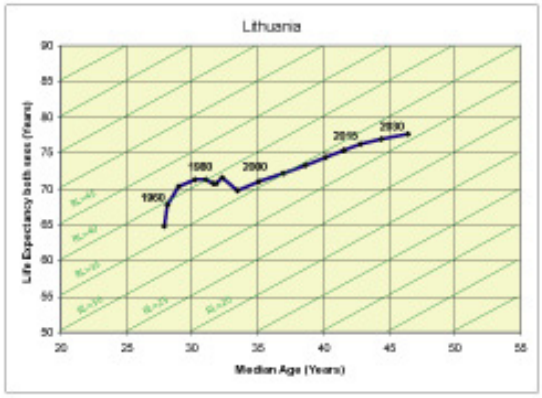
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Life Expectancy both sexes (Years)
Median Age (Years)
1960
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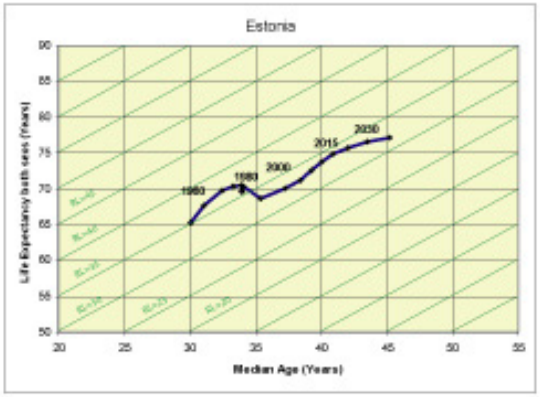
Estonia
Life Expectancy both sexes (Years)
Median Age (Years)
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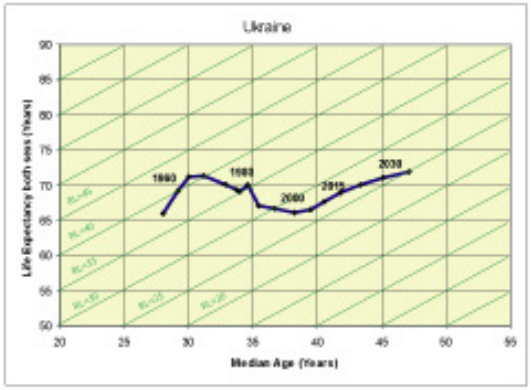
Ukraine
Life Expectancy both sexes (Years)
Median Age (Years)
1980
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APPENDIX IV : DELIMITATION OF INFLUENCE AREAS AROUND MATERNITY HOSPITALS

1) Calculation of the influence areas

The maternity hospitals' influence areas are defined according to three different parameters:

1. *the accessibility*, in terms of the required time to reach the maternity hospital from each LAU;
2. *the capacity*, in terms of the ability of a maternity hospital to attract the women from other LAU;
3. *the demand*, in terms of the need of maternity beds according to the number of births in each LAU.

As regards the accessibility, we consider the network of highways, multi-lane roads, national roads, regional and main infra-regional roads. The time-distance is calculated on the basis of the LAU centroids. This raises the methodological problem that maternity hospitals are not in general located at the centroid. But this problem is reduced by having designed our LAU template as harmonised in size as possible (the median size of the LAU is 70 km²).

The capacity is calculated for each maternity hospital. For $i = 0, 1, \ldots, n$,

$$C_i = (NB_i * 365/6 - NN_i)$$

C_i = capacity of the maternity hospital
NB_i = number of beds for the maternity hospital
365 = number of days per year
6 = mean length of a stay in maternity hospital (days)
NN_i = number of births in the LAU where the maternity hospital is located

The demand is calculated for each LAU. For $j = 0, 1, \ldots, p$,

$$D_j = (NB_j * 365/6 - NN_j)$$

D_j = demand of the LAU
NB_j = number of beds for the LAU
365 = number of days per year
6 = mean length of a stay in maternity hospital (days)
NN_j = number of births in the LAU

D_j is equivalent to C_i if i=j, or n other terms if the maternity hospital is located in the LAU.

These three parameters are combined and normalised to represent the accessibility to the maternity hospitals according to the capacity and the demand.

For the maternity hospital i, with $i = 0, 1, \ldots, n$, and for the LAU j, with $j = 0, 1, \ldots, p$,

$$AM_j = (C_i - D_j)/ A_j$$

AM_j = accessibility to the maternity hospital according to capacity and demand of each LAU
C_i = capacity of each maternity hospital
D_j = capacity of each LAU
A_j = accessibility for each LAU to reach maternity hospital

The normalised value is the result of :

$AM_j = ((AM_j * 100)/ \max (AM_j))$

2. Choice of an operator to represent the influence areas

Two different visions can be represented thanks to the possibility and fuzzy set theories.
The operators which answer to these visions are:

- For the dominant vision (best accessibility), the best operator is the Zadeh T-conorm. The Zadeh t-conorm[66] allows the combination of all LAU membership values with all the accessibility to the maternity hospital. It then reveals the spatial organization generated by the influence area. The Zadeh t-conorm is part of the triangular conorm (or t-conorm) which is one of the major function families. The t-conorm is adapted to the definition of operations which are close to the union operation sets. The parameters are combined in an additional way.
- For the 'overlap' vision (accessibility to several maternity hospitals), the best operator is a t-norm. This function allows the selection of the highest intersection value between two components and tends to eliminate the smallest membership value.

[66] Zadeh t-conorm : max (x,y)

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4 LTDB – Long-term Database

4.1 Introduction

The Long-Term Database (here referred to as LTDB) as part of the ESPON 3.2 project is an application designed to fulfill two main purposes:

- *The LTDB should provide a framework for **long-term storage of thematic and geometric data** for territorial units of the European area, at different resolution levels (ranging from the state level (NUTS 0) to the communes level (NUTS 5)). The long term storage of data implies tackling several issues:*

  - **Evolutivity issues**: the LTDB should rely on a flexible schema, so that new data (e.g. indicator values) and new types of data (e.g. new types of indicators) can be easily added. This should allow scientists (geographers, economists, statisticians, etc.) to use the LTDB for an extended period of time and to keep it up to date, without having to build a new database for each new application.

  - **Data quality issues**: the LTDB should keep track of the quality of the data it contains. This implies keeping track of the validation of the data by organisms of statistics, of the genealogy of the data sets (information about what database these data come from, the processes by which they have been computed) and producing some mechanisms for an automatic detection of data inconsistencies.

  - **Usability issues**: the LTDB should be usable by other people than its designers, possibly as a shared resource. For that, the application should help the users in easily understanding which data are available (by using thematic and geographic ontologies), while semi-automated data acquisition mechanisms should allow to easily update the data while preserving the overall coherence of the structure. Last, but not least, the application should be designed so that performance parameters are respected even for very large data sets (as the available quantities of data are very large and grow fast), by avoiding redundancies and using performance enhancing techniques (caching, indexing, etc.).

- *The LTDB should provide a framework for a **reliable estimation of missing indicator values**, either for filling informational gaps or for the purpose of simulation of past or future hypothetical situations.* In order to provide this, several components should be designed:

  - A set of **generalized estimation methods** should be created in order to make it possible to estimate unknown indicator values from the available information in the database. These methods should take into account the available information at different moments in time, for different territorial units or for different indicator types, or a combination of these (for an improved accuracy).

  - A set of **generalized estimation strategies** should be provided in order to be able to choose the most appropriate estimation method for a given situation, based on the knowledge of thematic experts.

- A **mechanism for evaluating the quality of the estimated data,** by taking into account the accuracy of the method and the quality of the data used for estimation. The mechanism could rely on statistical observations, on an operational application of expert knowledge or on a combination of both.

Our approach in the design of the LTDB is modular and incremental. This allows, on the one hand, the building of **independent modules**, which can be developed and can evolve independently from each other, and, on the other hand, the **development of basic functionalities** first, with the option of adding the more advanced ones later in the development of the application.

4.2 Structure of the application

4.2.1 Modular architecture

The LTDB is composed of three modules (see figure 32):

- **The application management** module provides the interface between the users and the application. It controls the execution of all the functionalities of the application.

- **The estimation module** controls the application of estimation methods whenever data gaps are detected.

- **The data management module** contains the database itself.

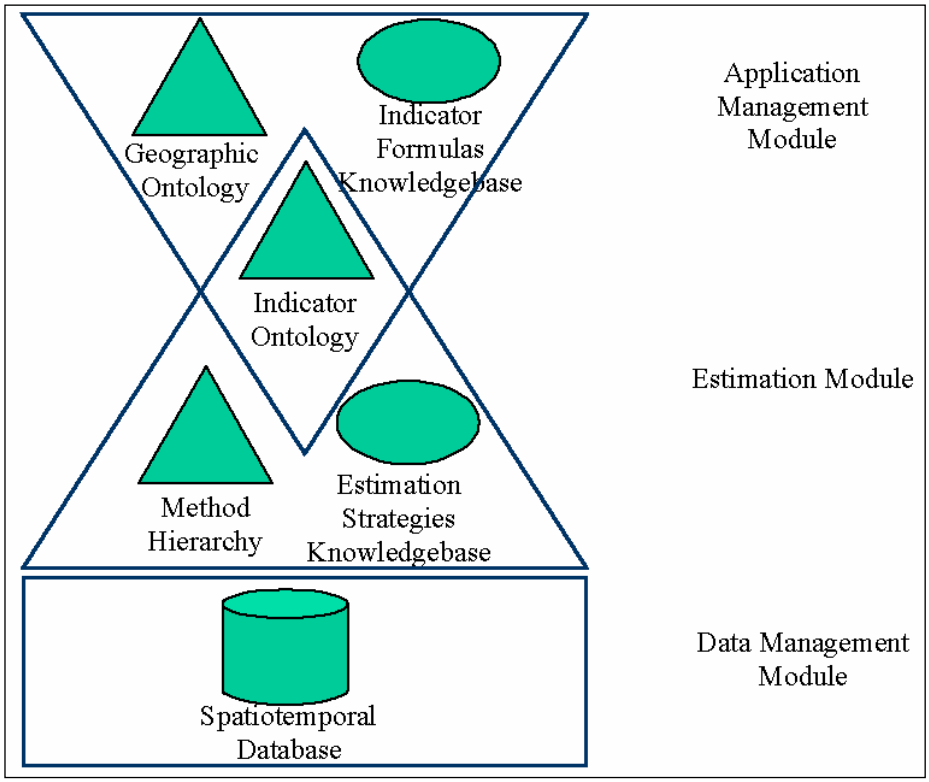


Figure 32 The general structure of the application

Below is given a brief description of each component of the application:

M1 : application management module

1. **The geographic ontology** is a gazetteer containing the hierarchy of geographic entities with their names in different languages and some relations between them. The most important relations described by the ontology are the spatial and semantic inclusion ones, which lead to the hierarchical structure of geographic entities (offering support for spatial estimation methods). Genealogy relations allow tracing back the origins of geographic entities (offering support for more efficient temporal estimation methods). Another function of the geographic ontology is the support for eliminating ambiguities in spatial queries, by detecting exactly to which geographic entity a query refers to (operates like a dictionary of geographic entities). Last, but not least, it ensures the maintenance of data consistency of the database whenever updates are done.

2. **The indicator ontology** is a hierarchy of themes and indicators that can be found in the database, with some relations that hold between them (aggregation, broader term, etc.). The indicators contained in this ontology are considered as basic ones, the stocks from which other, more complex indicators can be computed. Its main functionalities consist in eliminating ambiguities for thematic queries and maintaining data consistency on updates.

M2 : estimation module

3. **The indicator formulas knowledge base** is a set of complex indicators, together with the algebraic formulas allowing to compute them from other indicators stored in the database (stocks) or in the knowledge base. The constructed indicators range from simple ratios of stocks (e.g. GDP/population) to more complex indicators like the remaining life index or the ETCI. It is important to notice that this knowledge base also has a normative aspect, as it contains only indicators that are meaningful for statistical and spatial analysis; constructed indicators like 'life expectancy at birth/surface' will not be allowed. The main functionalities of this knowledge base consist in eliminating ambiguities for thematic queries and calculating constructed indicators.

4. **The hierarchy of methods** is a classification hierarchy of estimation methods, together with their code. The estimation methods can be either one-dimensional (based on only one information dimension - spatial, temporal or thematic) or composite, consisting of successive applications of one-dimensional methods. The functionalities of this component are limited to computing estimated indicators starting from 'real' indicators existing in the database.

5. **The estimation strategy knowledge base** is an expert system based on a set of rules allowing the system to choose the most appropriate estimation method for a given situation. The choice of the method depends on the indicator type and on the richness and density of available data. The rules contained in the knowledge base are derived from the expertise of the thematic specialists (geographers, demographers…) and from statistical tests.

M3 : data management module

6. **The spatiotemporal database** is a relational database containing the whole set of geographic entities with their known indicator values.

4.3 Spatiotemporal database schema

The structure of the database is designed in order to support a long-term storage of spatial and thematic data concerning geographic units. That is why everything concerning the structure of the geographical units can change in time: their name, their spatial representation, their position in the administrative hierarchy, their codename and their thematic part: the indicators.
The main components of the data schema are:

1. *Geographic unit*, the central class of the schema that contains the identity of the geographic units (an internal identifier generated by the system) Another important attribute is its lifespan, because the existence of geographic units may be limited in time (e.g. Western and Eastern Germany).

2. *GU Spatial Representation* contains the geometrical shape corresponding to the footprint of the geographic unit (attribute *geom Obj*). It can change in time (attribute *validity interval*).

3. GU Name contains the official name of the geographic unit (attribute Name *Value*) generally accepted at a given moment : this name can change with time (attribute *validity interval*).

4. *Code nomenclature* is a class containing the codes of the geographic units. The code depends on a nomenclature (e.g. the NUTS 2000 territorial unit code system) and it is stored because for most databases the code of the territorial units is used as an identifier rather than its name.

5. *Nomenclature* is a class representing the different code systems that are used to identify territorial units in statistical databases. Nomenclatures are temporal (attribute *validity interval*) and are issued by well-known organisms of statistics like Eurostat (attribute *Institute*).

6. The *Composition* class represents the composition relations between geographic units, related to a certain hierarchy. The attribute *Level* defines the level of the composing geographic units in the respective hierarchy.

7. The *Hierarchy* class defines the set of composition relations existing between the geographic units on a certain territory for a given period of time. It can change in time (attribute *validity interval*) and it has a certain number of levels (attribute *level count*).

8. The *Similarity* association class defines different kinds of similarity/proximity measure that might be needed for a more advanced phase of the application.

9. The *Evolved from* relation allows storing genealogy relations between geographic units, necessary for some estimation methods.

10. *Indicator* is the class that defines a thematic part of the geographic units.

11. The *Value* association class allows storing the value of a certain indicator for a certain geographic unit and for a certain period (attribute *validity interval*). Other attributes of the class allow keeping track of the production moment (attribute *Measure production date*) and of other metadata necessary for assessing the quality of the data (attribute *Meta Info*).

12. The *Source* class allows keeping track of the genealogy of the data stored in the database. The attribute *Code source* defines the code of the database from which the data were retrieved or of the process by which the data were produced.

13. The *Provider* class represents the statistical organisms from which the data were retrieved.

14. The *Validation* class allows storing information about the confirmation of the quality of the data issued by trustworthy statistics organisms.

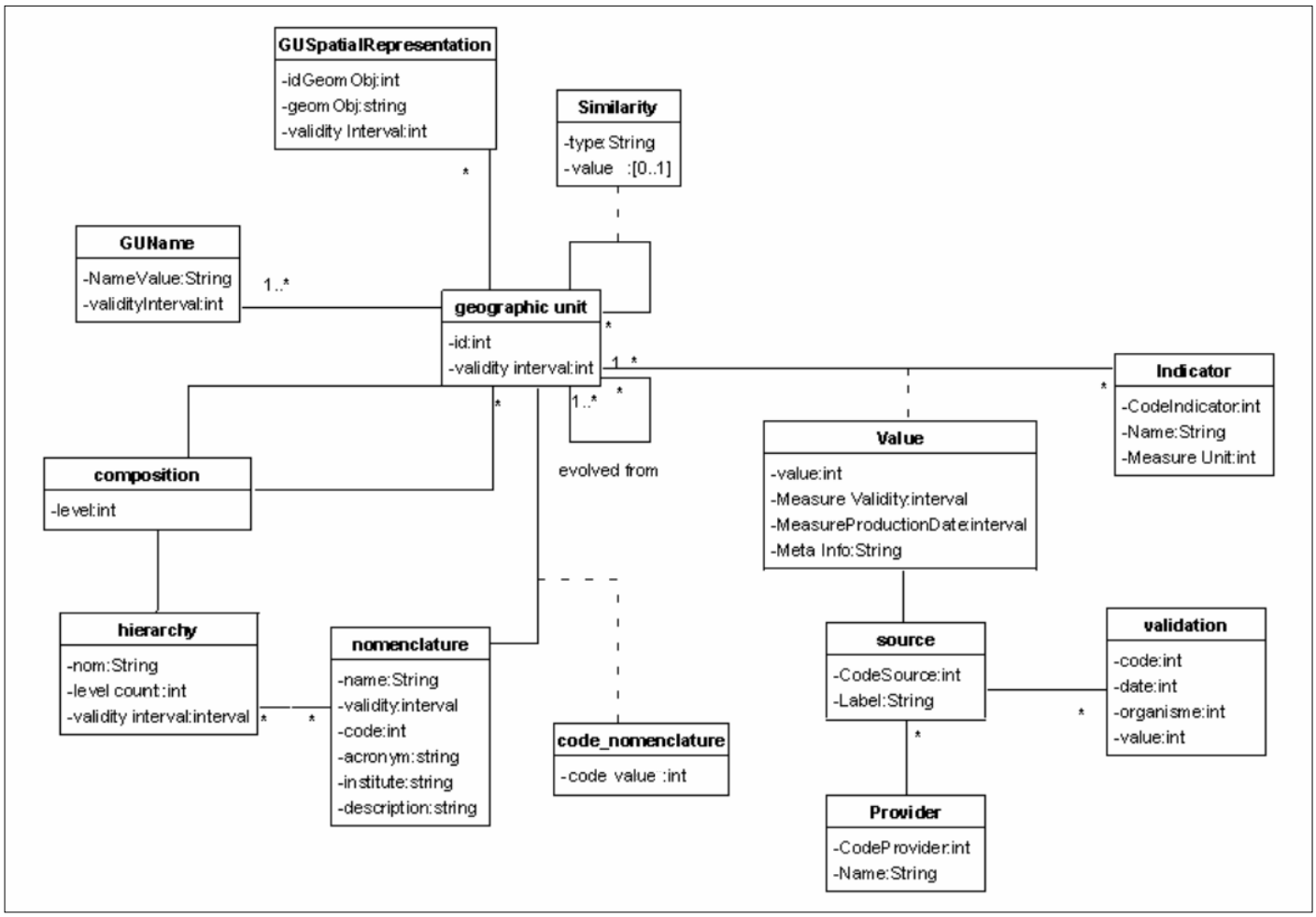


Figure 33 The data scheme of the database

4.4 Estimation methods for missing values

A ccording to the data schema, data in the LTDB can be characterized according to four dimensions *E*, *S*, *T* and *I* where:

(*E*) represents the spatial dimension and refers to one or several territorial units;

(*S*) represents the source dimension and refers to one or several organism of statistics;

(*T*) represents the time dimension and refers to one or several instants or/and periods of time;

(*I*) represents the thematic dimension and refers to one or several indicators.

For instance, the value 83859 could be the result of a query where *E*='Austria', *S*='EUROSTAT', *T*='1999' and *I*='Area in km^2'.

Although the query is answered a lot of implicit assumptions are made here:

- Regarding the *E* dimension, the query is supposed to refer to the territorial unit whose shape corresponds to the "official" delimitation of Austria.
- Regarding the *T* dimension, the value returned corresponds to the value provided by the 'EUROSTAT' for the period ranging from 01/01/99 to 31/12/99.
- Regarding the *I* dimension, areas of lakes and rivers in Austria are supposed to be included…

In order to help LTDB users, those implicit assumptions should be made explicit through some guide lines or help on line mechanism in the future interface.

In the previous example, a value is returned for the corresponding value of *E*, *S*, *T* and *I*, namely the tuple ('Austria', 'EUROSTAT', '1999', 'Area in km^2'). It should be noted that values of *E*, *S*, *T* or *I*, or a combination of them might be missing when formulating the query. By default, such a missing value in one or more dimensions handled by the query, should be considered equivalent to a wildcard operator "*" meaning "all values".

However, unavoidable incompleteness in the LTDB will lead to unanswered queries. This occurs when, no value is present in the LTDB, for a given tuple of values (including the wildcard "*"). The objective is to overcome this case of a missing value by proposing one or several estimation methods in order to compute the most probable (although not measured or sure) value and return it as an answer to the query. LTDB users should be warned when the returned value is a computed estimated value replacing a missing one.

Then, information in the LTDB can be represented as a four-dimensional hypercube with holes corresponding to missing values. Estimation methods help in filling-up these holes by considering information provided by the neighborhood of these holes.

Below a formalization of the principles of some of the estimation methods implemented in the LTDB is described.

Notations

Let $X(e,s,t,i)$ be a value, possibly missing (not known or not defined) in the hypercube where *e* describes one territorial unit, *s* describes one source, *t* describes one instant, and *i* describes one indicator.

For the sake of simplicity, only this elementary case is considered here. However, it can be shown that more complex cases, where *e*,*s*,*t*, and *i* are each described by set of values, can be decomposed in elementary ones.

For a missing value $X(e,s,t,i)$, estimation methods exploit known values $X(e',s',t',i')$ in the neighbourhood of $X(e,s,t,i)$. This neighbourhood can be defined according to one or more dimension among *E*, *S*, *T* and *I*. Some one and two-dimensional estimation methods are described below.

Let *child* be the operator which for a spatial unit e returns the set of all the spatial units $e_1,e_2,\ldots,e_n$ which are spatially included in *e*, at the first level of spatial inclusion.

Let *desc* be the operator which for a spatial unit *e* returns the set of all the spatial units e_1, e_2, …, e_n which are spatially included in e, at any level of spatial inclusion (transitive closure of *child*).
Let *parent* be the operator which for a spatial unit e returns the spatial units *p* which includes *e*, at the first level of spatial inclusion.
Let *ancest* be the operator which for a spatial unit e returns the set of all the spatial units $p_1,p_2,\ldots,p_n$ which are spatially include *e*, at any level of spatial inclusion (transitive closure of *parent*).

One-dimensional estimation methods

a) Estimation methods based on the spatial dimension (*E*)

I n this case, for a missing value *X*(*e*,*s*,*t*,*i*), *s*,*t*,and *i* being fixed, the idea is to use spatial units *e*' being at an upper, lower or same hierarchical spatial level as *e*, and for which *X*(*e*',*s*,*t*,*i*) is known, in order to obtain information on the missing value.

Different cases are to be considered:

Case 1) if *X*(*parent*(*e*),*s*,*t*,*i*) is known and if *X*(*e*',*s*,*t*,*i*) is known for all *e*' so that *parent(e') = parent(e)* and *e*' ≠ *e* (*e*' is at the same hierarchical level as *e* and has the same parent as *e*), then

$$X(e,s,t,i) = X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i)$$

Case 2) if *X*(*parent*(*e*),*s*,*t*,*i*) is known and if there exists at least one *e*' so that *parent(e') = parent(e)* and *e*' ≠ *e* (*e*' is at the same hierarchical level as e and has the same parent as e), and *X*(*e*',*s*,*t*,*i*) is not defined then three methods can be used.

Case 2.1) Min-max

$$X(e,s,t,i) = X(parent(e),s,t,i) - \left(\frac{\sum_{e''=child(e)} X(e'',s,t,i) + X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i)}{2} \right)$$

Case 2.2) Average of children (where *e*'' is so that *e* = *parent*(*e*'') and *X*(*e*'',*s*,*t*,*i*) is defined)

$$X(e,s,t,i) = \frac{|child(e)|}{\left|\bigcup_{e''}\{e''\}\right|} \sum_{e''} X(e'',s,t,i)$$

Case 2.3) Average of the values of spatial units of the same hierarchical level (where e' so that *parent(e') = parent(e)* and *e*' ≠ *e* and *X*(*e*',*s*,*t*,*i*) is defined),

$$X(e,s,t,i) = \frac{\left(X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i) \right)}{|child(parent(e))| - \left|\bigcup_{e'}\{e'\}\right|}$$

b) Estimation methods based on the source dimension (*S*)

Alternative sources of information can be used when the main source does not provide the target information. The idea here is to replace the missing value $X(e,s,t,i)$ by a known value $X(e,s',t,i)$ where s' is another organism of statistics. $X(e,s,t,i) = \alpha\, X(e,s',t,i)$ where α is a correlation factor empirically fixed.

c) Estimation methods based on the temporal dimension (*T*)

Various time interpolation methods using linear or non-linear assumption, prospective or retrospective computations of tendency can be used. Three of them are described here. The idea here is to estimate the missing value $X(e,s,t,i)$ by using two known values $X(e,s,t_1,i)$ and $X(e,s,t_2,i)$.

Case 1) Interpolation 1-1 method (where $t_1 < t < t_2$)
This method uses the two closest neighbours placed in time *before* and *after* t.

$$X(e,s,t,i) = \frac{\left(X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i) \right)}{\left| child(parent(e)) \right| - \left| \bigcup_{e'} \{e'\} \right|}$$

Case 2) Retrospective 2 method (where $t < t_1 < t_2$)
This method uses the two closest neighbours placed in time *after t*.

$$X(e,s,t,i) = \frac{\left(X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i) \right)}{\left| child(parent(e)) \right| - \left| \bigcup_{e'} \{e'\} \right|}$$

Case 3) Prospective 2 method (where $t_1 < t_2 < t$)
This method uses the two closest neighbours placed in time *before t*.

$$X(e,s,t,i) = \frac{\left(X(parent(e),s,t,i) - \sum_{e'} X(e',s,t,i) \right)}{\left| child(parent(e)) \right| - \left| \bigcup_{e'} \{e'\} \right|}$$

d) Estimation methods based on the thematic dimension (*I*)

Alternative indicator(s) can be a value is missing for the given indicator. The idea here is to replace the missing value $X(e,s,t,i)$ by a known value $X(e,s,t,i')$ where i' is another indicator. $X(e,s,t,i) = \alpha\, X(e,s,t,i')$ where α is a correlation factor empirically fixed.

Multi-dimensional estimation methods

Multi-dimensional estimation methods are result from the combination of two or more one-dimensional methods. Generally they are more accurate and capitalize on more information

Estimation method (*ET*)

This method is based on a combination of a spatial estimation method (*E*) with a temporal estimation method (*T*)
Let us suppose that the value $X(e,s,t,i)$ is not known while the value $X(parent(e),s,t,i)$ is known, as well as are known the values $X(e,s,t_1,i)$ and $X(e,s,t_2,i)$of the two closest neighbours placed in time *before* and *after* t ($t_1 < t < t_2$).

We compose a spatial estimation method

$$X(e,s,t,i) = X(parent(e),s,t,i) \times Freq(e,s,t,i)$$

where $$Freq(e,s,t,i) = X(e,s,t,i) \Big/ X(parent(e),s,t,i)$$

Yet, $X(e,s,t,i)$ is not known for computing $Freq(e,s,t,i)$but $X(e,s,t,i)$can be at its turn estimated using a temporal estimation method (interpolation 1-1)

$$Freq(e,s,t,i) = X(e,s,t,i) \Big/ X(parent(e),s,t,i)$$

4.5 Dataset for validation of the LTDB

4.5.1 Selected principles

In order to allow a first series of tests natural size of the LTDB, we will initially stick to a whole of simple indicators answering a certain number of essential characteristics for this phase:

(E) represents the spatial dimension and refers to one or several territorial units;
(S) represents the source dimension and refers to one or several organism of statistics;
(T) represents the time dimension and refers to one or several instants or/and periods of time;
(I) represents the thematic dimension and refers to one or several indicators.

- *E* : The geographic unit of observation are made compatible, either on the level of the original data, or on the level of derived information (ratios, disintegration...). The level noted initially is the Nuts hierarchy , level 2, in its geometry of 2000, compatible with

the various works in progress of the Espon project. The data available for 1980 should be brought back in the compatible geometry "2000". The estimations could be calculated through multiscaling, with national and intra-national levels for example : it could be possible to desagregate state's level, according to the knowledge on the regional's area in the past.

- *S* : The variety of the sources allows a stepping and a cross validation,
- *T* : The dataset has two dates available : 1980 and 2000 ; and we could estimate some indicators for the prospective period 2015-2030.
- *I* : The sets of themes selected are based on a restricted number of simple indicators : demography, the economy and environment.

4.5.2 First indicators to be implemented

- *Economic Situation*: the indicator selected is the GNP per capita.
- *Demographic Data* :

Several sources enable us to test the richness of the LTDB: we have a harmonized whole of about fifteen demographic indicators, brought back in NUTS 2-3 of 1980, for years 1960/80/88 (Decroly database). The ratios are derived from national stocks which should be recoverable. Moreover, we would have the population pyramid for the period 1997-2002, for the level NUTS 2 (Eurostat); pyramid which one can be compared to the population pyramid for the state's level at the periods 1995-2000 and 2000-2005 (United Nations). The population is complete on the level of Nuts 5 per 1990.

- *Environmental indicator* :

An indicator of the occupation type of the ground makes possible to estimate the state and the dynamics of the environment. The ratio of forest per geographical unit seems particularly suitable being given the very great inertia of this indicator through time. This indicator gives a good idea of the "green" framework of life of Europeans. If possible, we will use Corine Land Cover data at the two available dates (whole or part).

- *Mortality and births*:

- Death: we will aim the period 1998-2002 to allow to frame the population pyramid of 2000 and to smooth a little the accidents (crises medical, epidemics, e.g. France, August 2004...). Information is rather lacunar on the level of Nuts 3 and often round to the thousands: they will be thus difficult to work on the smallest units. The dataset will be restored on the level of the NUTS2 and NUTS 2-3, and it would be useful for the calculation of "remaining life index" at regional level (see ETCI chapter).
- Births: difficult also to obtain, but the mesh to be retained will be that of NUTS 2 (or NUTS 3)

EXAMPLE OF APPLICATION OF LONG-TERM DATABASE ESTIMATION METHODS: CONSTRUCTION OF MAP OF POPULATION IN EUROPE IN 2030

The estimation of population of regional units of ESPON area in 2030 gives an illustration of the utility of (*E*, *S*, *T*, *I*) methods for the manipulation of thematic and geometric data in long term. In order to calculate regional values in 2030 for the illustration of scenarios, 1980-2000 regional and 2000-2030 national trends are available, so an estimation method by extrapolation and dis-aggragtion can be used. However, the changes of the limits of territorial units between the two dates have also to be taken into account, and another difficulty is that data are coming from various bases: different sources are taken into account (ESPON data base for 2000 regional data, UNPP 2004 for 2000-2030 data and Decroly & Vanlaer, 1991 for 1980 regional data). So in this example estimation methods based on spatial (*E*), source (S) and temporal (*T*) dimensions must be used together to provide 2030 estimated values.

Practically, the application management module of LTDB must contain the 1980 and 2000 values of data (population by territorial unit) and the correspondence system between 1980 and 2000 regional delimitation in order to make 1980-2000 growth rate calculations possible (1), while the estimation module contains the algebric formula that permits to calculate estimated values after 2000 (2).

(1) There are various methods possible in order to build a correspondence system between 1980 and 2000 regional delimitations. The more secure one consists in building a NUTS2 "smallest common denominator" between 1980 and 2000 regional delimitations by successively aggregating areas (and corresponding stock values of data considered) until reaching a territorial unit – or a group of territorial units - that have not changed (*Figure 34*). The result is a map of ESPON area that is less precise that NUTS2 1999 or 2003. Indeed, in countries where there have been a lot of changes of regional delimitations, the aggregations reduce the number of regions, and in the particular case of Poland - where all delimitations have changed - the "smallest common denominator" is the entire country. However, this method is the only one that permits to produce "real data" and not uncertain estimations[67].

[67] It could for example be possible to keep the original 1980 or 1999 more precise units by taking into account their surfaces and considering that their population is equally distributed in the area, but such a method would only be an estimation and in some case (urban areas concentrating a big part of the population but situated on regional border area) it could produce important mistakes. To make such a correspondence system, an important study case by case of the intra-NUTS2 repartition of the population would be necessary.

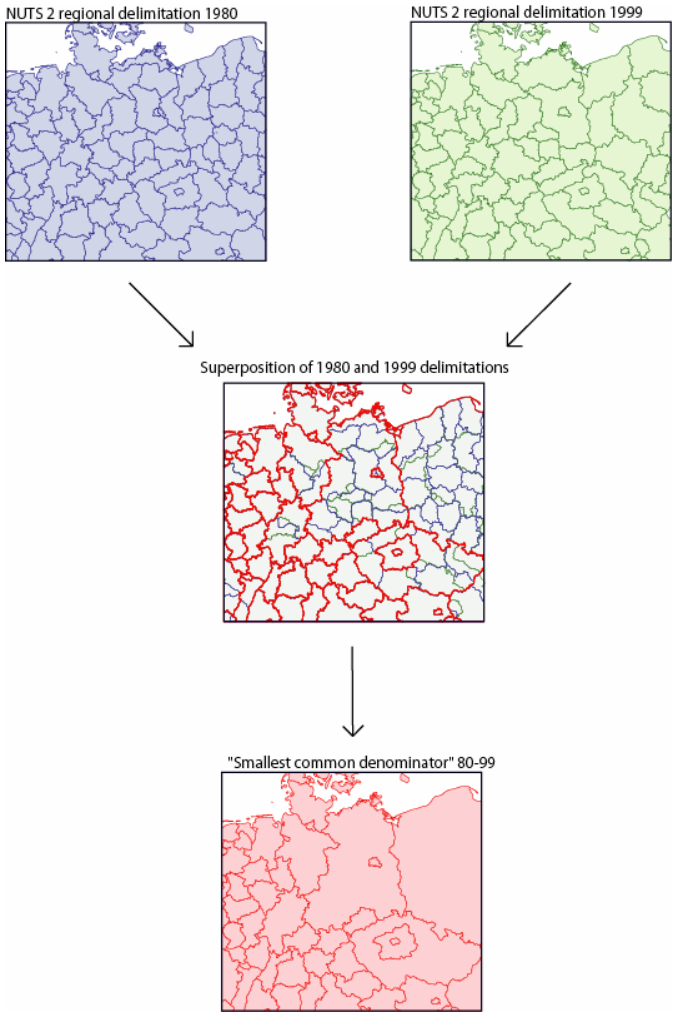


Figure 34 Example of the application of 'smallest common denominator' delimitation method (central Europe)

(2) The algebric formula used to calculate estimated values of population in regional units until 2030 depends of the scenario considered. For the illustration the baseline scenario, the hypothesis of prolongation of 1980-2000 regional trends has been chosen, applying 1980-2000 annual growth rates trends of the regions to the 2000-2030 period and considering UNPP 2000-2030 national trends (intermediate estimation of United Nations based on the hypothesis of no major changes in fertility and migrations).

With this example, we can see that the flexibility of the application permits to use at various scales data from different sources, and to apply different algebric formula in function of data available and hypothesis chosen. It also permits to introduce other geographical units, like neighbourhood countries (NUTS0). For the illustration of the other scenarios ("cohesive" and "competitiveness"), it could also be possible to introduce other formula, taking into account for example variation of migration flows and urban concentration.

On *Figure 35* are represented the estimated values of population of each NUTS2 "smallest common denominator" in 2030, and the corresponding 2000-2030 annual growth rate[68].

[68] For Finland and Poland, the regional delimitations are not the smallest common denominator but NUTS2-1999, and data has not been calculated from 1980-2000 trends but only 1995-2000 trends (ESPON data base 2005).

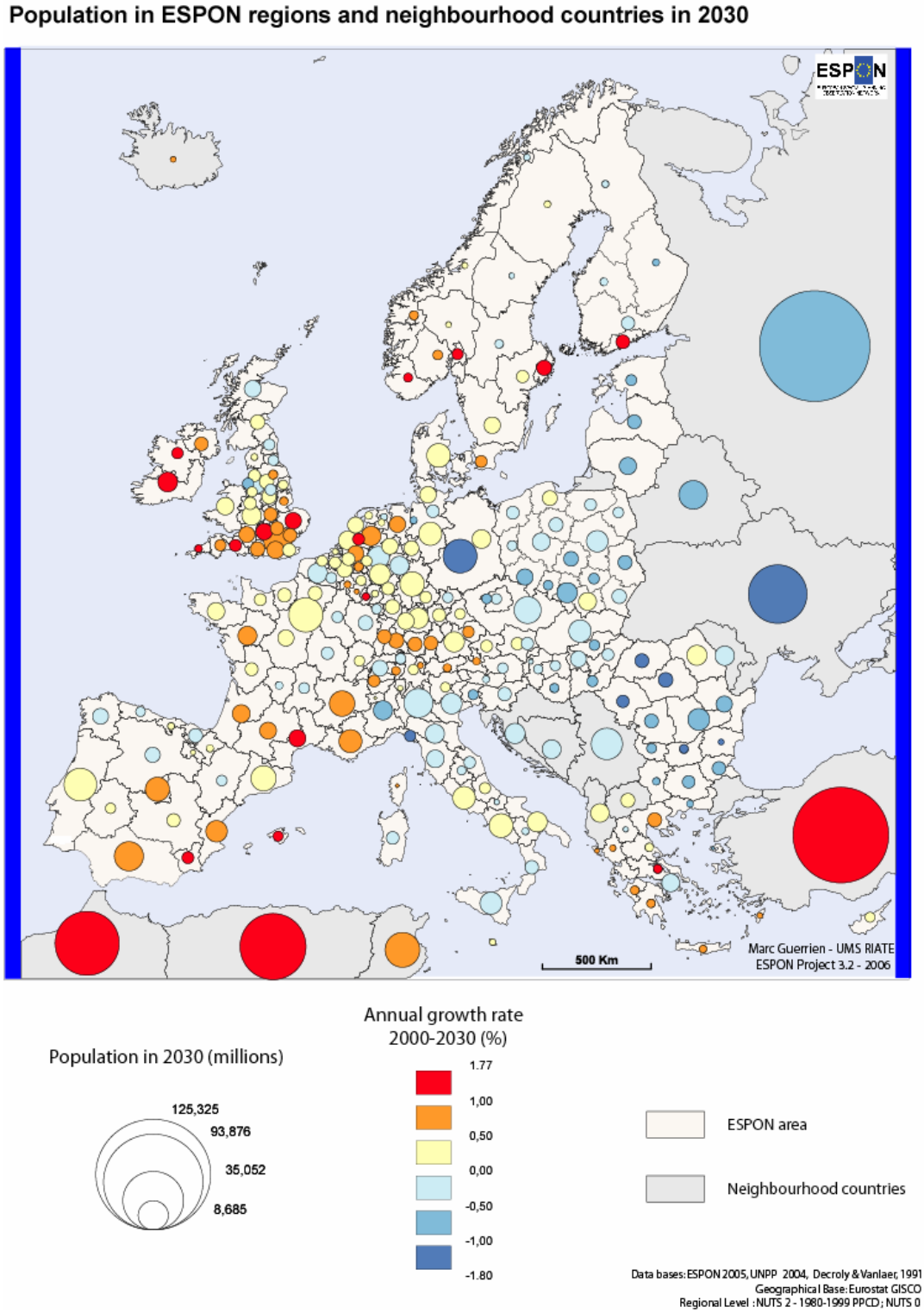


Figure 35 Example of LTDB estimation methods result.

Communication / Validation

5 Validation of scenarios

5.1 Consultation activities engaged to support the development of scenarios

From the onset of the project there was recognition that an essential element to its validation and success would be an effective consultation and collaboration and that this should be as comprehensive as possible. Therefore a wide range of persons and activities were to be employed in order to fulfil this part of the work. Here these are briefly outlined, followed by a specific section covering the role of external experts in the process.

While the intervention of external experts was to be sought at key stages of the development of scenarios, the role of the ESPON Monitoring Committee (MC) was, as the main stakeholder, intended from the start to be the most important source of validation in the process. Indeed their input has provided a fundamental and on-going guide in the actual development of scenarios and decisions about what should constitute their focus. Their input to the scenario building process was also appropriate as the MC are themselves senior officials from EU member states, as well as internationally renowned experts in subjects related to spatial development and planning.

In the early stages, and then at key phases of the project, the MC members have acted essentially as experts to provide direction when important decisions have had to be made regarding for example the themes prioritised for attention. This is a constant process with discussions taking place at almost every MC meeting since the beginning of the project. MC members have also taken part in the discussions during the ESPON seminars, notably the regional validation session at the Manchester seminar.
To complement the advisory role played by the MC, the TPG has also sought specific regional expertise from a variety of sources. The sources targeted have varied in their productiveness. ESPON contact points have been approached, but their responses have been very limited. ESPON seminar participants have, by contrast, been utilized more effectively, perhaps because as a 'captive audience' their attention was focused – if for a short time – on the scenarios and their application to individuals' regions and spheres of knowledge. Most productive in this context have been the general workshop on the thematic scenarios during the Luxembourg seminar in May 2005 and the four regional workshops held at the Manchester seminar in November 2005. These both produced significant inputs and gave the scenario building process a transparency which has also been positive in terms of validation.

Internal sources of validation have included informal contacts made by different team members to relevant institutions and individuals known to them and more specifically the relatively substantial contribution of Octavian Groza and his team from TIGRIS in Romania, who has been in a position to provide useful insights from an East European perspective, in keeping with the wishes of the MC. Finally to ensure the continuity of the project with

previous ESPON work, and build on it, we are planning to further supplement the use of experts by referring to relevant lead partners from relevant ESPON projects (as shown in Table below).

5.2 The role of external experts in the consultation process

The composition - selection and response

To provide objectivity to the validation of the scenario work, it was decided in the early stages of the project that it would be prudent to establish an external expert panel. It was anticipated that these persons would act in an independent advisory capacity and provide more dispassionate perspectives, from their fields of expertise and comments, on the robustness and plausibility of the scenarios as they were developed by the research team.

At the time of the Second Interim Report a provisional shortlist of 52 'pan-European' experts had been drawn up as a result of consultation with both members of the project group and monitoring committee. As the panel at this stage appeared to be rather dominated by experts from Germany, France, The Netherlands and the UK, further requests were made to members of the TPG, ECPs and CU for possible contributors, in an attempt to achieve a broader range of experts covering a wider territorial areas.[69]. This resulted in the forwarding of 19 additional names who were, as the experts previously designated, occupying leading positions within internationally renowned and 'ESPON relevant' institutions. There were also a couple of policy makers[70]. This new list was drawn from organisations from the following countries; Germany (13), The Netherlands (13), The UK (12), France (9), Belgium (9), Romania (3), Hungary (2), Greece (1), Ireland (1), Switzerland (1) and Denmark (1). There was one from Russia and 5 from supra-national bodies as well. All experts identified thus fulfilled - by and large - the first criteria established in the Second Interim Report for the selection (see below and SIR 4.2, p562). However, after extensive correspondence with the experts we found it necessary to modify slightly our original requirement regarding the 'generalist' nature of the experts' inputs to the project[71];

Criteria for selection of experts
• Individually, the experts should hold a strategic position in EU, national or regional policy-making or in the scientific world, be generalist rather than specialist and be 'creative, communicative and highly motivated'.
• Collectively; they should represent a broad variety of perspectives on EU territory and cohesion and be representative of different types of member states, sectors, disciplines, and aggregation levels (EU, national, regional).

With regard to the second criteria, we had more difficulties, despite repeated efforts, in achieving a complete representation of all member states and all subject areas. The way

[69] This was due to most of the suggestions coming from a small number of TPG members.
[70] Details of the actual contributors will appear in the Final Interim Report.
[71] A few of the experts approached specified that they were only prepared to give their input to scenarios which lay directly within their particular area of expertise.

that this was compensated for will be addressed below. Another issue which was inevitable given the prominent status, and thus other commitments, of nominated experts, was getting agreement from sufficient individuals willing to devote time and attention to evaluating scenarios in an on-going way without remuneration. After sending out brief summaries of information regarding the project and its' objectives, which in some instances raised substantial interest and lead to extensive communication but unfortunately no firm commitment, a final panel was eventually established by September 2005.

Just over 25% of those approached formally agreed to a commitment for the duration of the project, while the quality we hoped of those individuals may compensate in part for the quantity involved, we decided to supplemented the panel by adding relevant lead partners from relevant ESPON projects as potential future experts. In essence then, whilst retaining a 'generalist' element, at least one expert was cross-matched according to their field of expertise to each of the 9 thematic baseline scenarios for which we were seeking external validation. Thus despite a slight refinement of our original objectives and a sifting down of experts willing to commit their time to the project, the initial objectives were fulfilled by the expert exercise.

Furthermore the bias towards representatives from Western Europe was redressed in part by the 'self-selection' of experts willing to join the panel. The final representation was as follows; The UK (6), The Netherlands (6), UK/Italy (1), Denmark (1), France (1), Romania (1), Germany (1), Russia (1). Although the west European 'bias' had now narrowed down to the Netherlands and the UK, as the individuals concerned are all 'trans-national' in their experience, background and interests it was not felt that this would jeopardise the value of the panel's contribution.

The role of the panel

From the outset the point of establishing an expert panel was to provide an external evaluation and validation of the scenario work of the 3.2 team; assess and support rather than generate scenario. What exact form this expert engagement should take was explored in the First Interim Report. Here we tabulated a matrix combining four possible forms of input which were dependent on what the experts role might be in deciding 'what knowledge is relevant and how it (could) be used' (7.2.2, p 93);

VI. Remotely sampled and passive; mail, email interviews, postal surveys
VII. Remotely sampled and interactive; computer conferences, remote group-working
VIII. Physically present and passive; views elicited, collected at workshops, group events, attendance mainly as observers
IX. Physically present and interactive; scenario workshops, brainstorming

In other scenario programmes, expert panels are often used primarily by the means illustrated in our fourth category. However in view of the length and trans-national nature of the ESPON project we envisaged initially that the expert panel aspect of the consultation process for us would fall almost exclusively into the second category, remotely accessed and interactive. The input of the experts has been mainly of this character, responding in the form of pre-selected questions and validation sheets designed by CUDEM and the thematic sketch writers[72], designed to elicit insight from the experts on the strength of the scenarios as they were being developed by the research team.

As outlined above though, it must be emphasised that important additional means of communication have been employed as the project has evolved through its cyclical phases.

[72] See validation sheet distributed to all experts October 2005 in the appendix.

Indeed a more flexible approach has proved useful in seeking to maximise the contribution of the collective expertise of all associates involved in the project. Thus while we had in a sense to modify aspects of the actual expert panel contribution, the consultation process has been broadened to include a range of other validation activities, this proved especially useful during the territorialisation of the themed scenarios.

Nonetheless, in spite of the numerically small size of the expert panel, it has included members from a diverse range of expertise and from different parts of Europe and have provided substantial detail, in-depth feedback and invaluable insights which have gone in some cases beyond what had been hoped for. By the time of the Manchester Seminar in November, this input had been sent for the majority of thematic scenarios. The individual feedback from a couple of experts has still not been forthcoming but is being pursued and we are expecting to have received feedback on all thematic scenarios prior to the Salzburg Seminar in March 2006.

All authors of thematic scenarios were informed of the existing feedback and, as much as possible in terms of timing, this has been taken into account in the finalisation of the thematic scenarios and in the elaboration of the thematic contributions to the integrated scenarios.

Expert Panel for thematic validation			
	Subject specialists	**General experts Partners**	**Project Lead Partners** ***(To be approached)***
Climate change	***Ronan Uhel, NicoPieterse***	***Vincent Nadin***	*Philipp Schmidt-Thome*
Demography	***John Stillwell***	***Peter Hall***	*Mats Johansson*
Economy	***Dariusz Rosati***	***Michael Keating***	*Karl Peter Schön*
Energy	***John Heywood***		*Gabriela Prata Dias*
Enlargement	***Youri Kolosov***	***Peter Roberts***	*Folke Snickars*
Governance	***Patsy Healey***	***Andreas Faludi***	
Rural development	***Jan Klijn, Henk Massink***		*Mark Shucksmith*
Socio-cultural		***Ton Kreukels***	*Jan Van der Borg*
Transport	***Peter Nijkamp, Manfred Sinz, Nadine Cattan***		*Michael Wegener*

ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

Expert's Feedback Sheet

The ESPON Project 3.2 has the task of elaborating long-range scenarios related to the territorial evolution of Europe. This project is being carried out in various stages. The first concentrated on the elaboration of a series of thematic prospective scenarios. For each theme, rather opposite and extreme, but not unrealistic hypotheses were chosen to highlight the potential territorial impacts of individual drivers. The purpose of this exercise was essentially didactic and pedagogic, before engaging into a second phase which will lead to the elaboration of more integrated scenarios.

The contributions expected from external experts should concentrate on the scenario sketches, while the scenario bases, which are rather long and heterogeneous, provide mainly basic information on current trends, drivers and policies. The summary of these bases is attached.

More concretely, external experts should indicate their opinion on the probability of realization of the various scenarios and on possible inconsistencies. They should also transmit their knowledge in relation to the improvement of the argumentation and spatial elaboration of the scenarios.

Please fill in one feedback sheet for each scenario considered.

Background Information

Name of Expert:
Affiliation of Expert:
Title of Scenario:
Date of Validation:

Comments on the scenario sketch

Likelihood of this sketch: (please delete as appropriate):

Highly likely Quite likely Quite unlikely Highly unlikely

How do you justify this opinion?

Are there any inconsistencies or errors in the argumentation of the scenario sketch? If yes, which ones and how do you justify this opinion?

What can be added to improve the argumentation of the scenario sketch and to increase its plausibility? **How can the spatial dimension of the scenario sketch be improved? According to your knowledge, which additional territorial aspects or impacts should be added?**
Specific questions, observations, suggestions?

Please return to Michelle Wishardt (CUDEM) email: m.wishardt@leedsmet.ac.uk

6 K&C Tool - Knowledge+Communication tool

The development of this Knowledge+Communication tool (K+C) responds to the specific objective stipulated in the ESPON 3.2 terms of reference 'to continue the scientific guidance within the ESPON programme and the further development of innovative ESPON tools'. The K+C tool is service-oriented, aiming not to use advance technology for the sake of using it, but to make a useful contribution to the rest of the ESPON 3.2 project and the whole ESPON Community, only when needed.

Building on the results of ESPON 3.1 policy-approach, the K+C tool is Internet-based, open to the whole ESPON Community, and incorporates as starting point updates of this project's outcomes, syntheses of strategic policy-impact studies, a selection of existing trends and national and European scenarios to be identified, as well as user-friendly tools for data and indicator retrieval and graphic and desktop mapping visualisation, according to the need to explain and present scenarios is a friendly understandable manner.

The starting point is the work carried out by project 3.1 in some technical and scientific aspects, including data collection, spatial tools, further development of an ESPON map making facilities, as well as preparing for the cross thematic exploitation of integrated results based on all ESPON projects.

The ESPON virtual knowledge base constitutes an innovative tool; and reinforces the scientific integrity and consistency of the 3.2 co-ordinating and territorial cross-thematic project, and therefore inevitably, also that of the ESPON initiative as a whole.

The following figures show some elements of the K+C tool in its current state. Please also see the website at

http://www.mcrit.com/espon_scenarios/

vww.mcrit.com/scenarios
K&C homepage

What's K&C website?

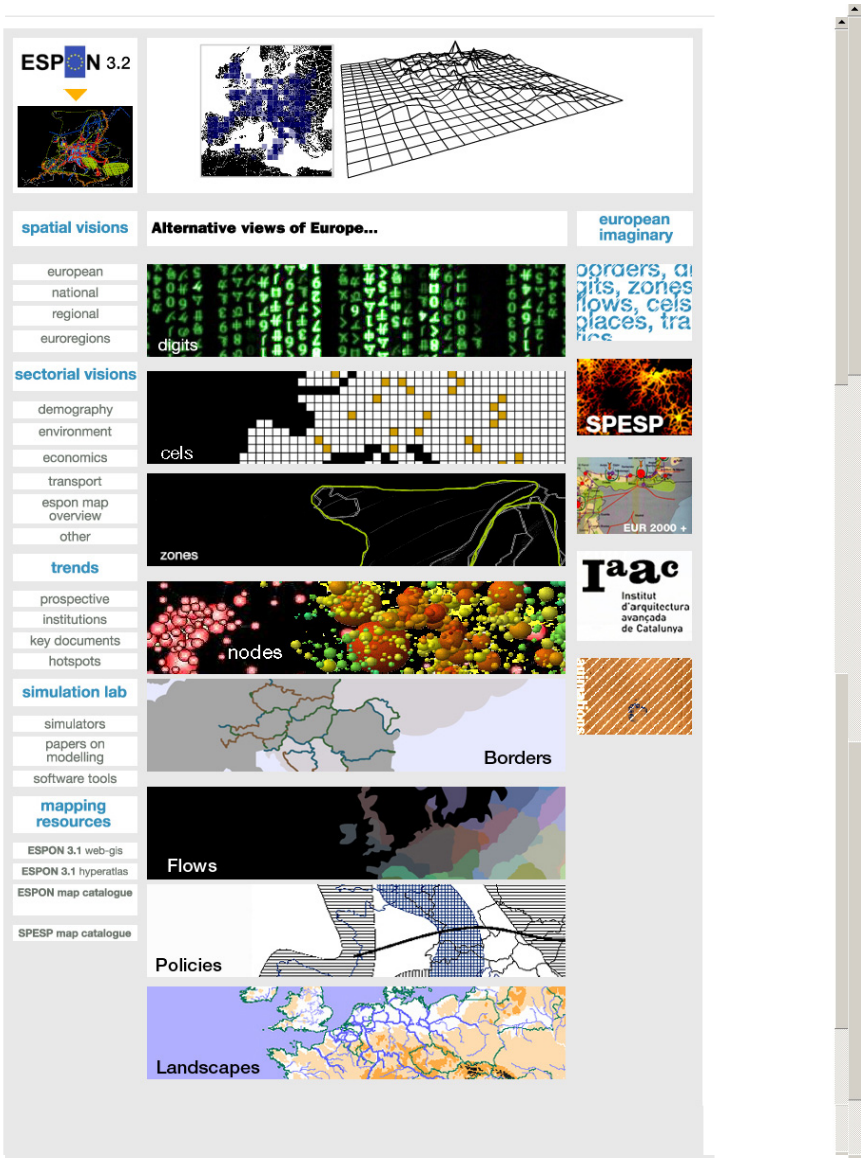
K&C is a library of **scientific** and **artistic** materials useful to assess and inspire European policy-makers and policy-analysts to imagine alternative futures for Europe.

It contains both a Knowledge-base (reference studies, databases and links) and Communication tools (interactive animations, sketches, maps from a variety of sources and design styles).

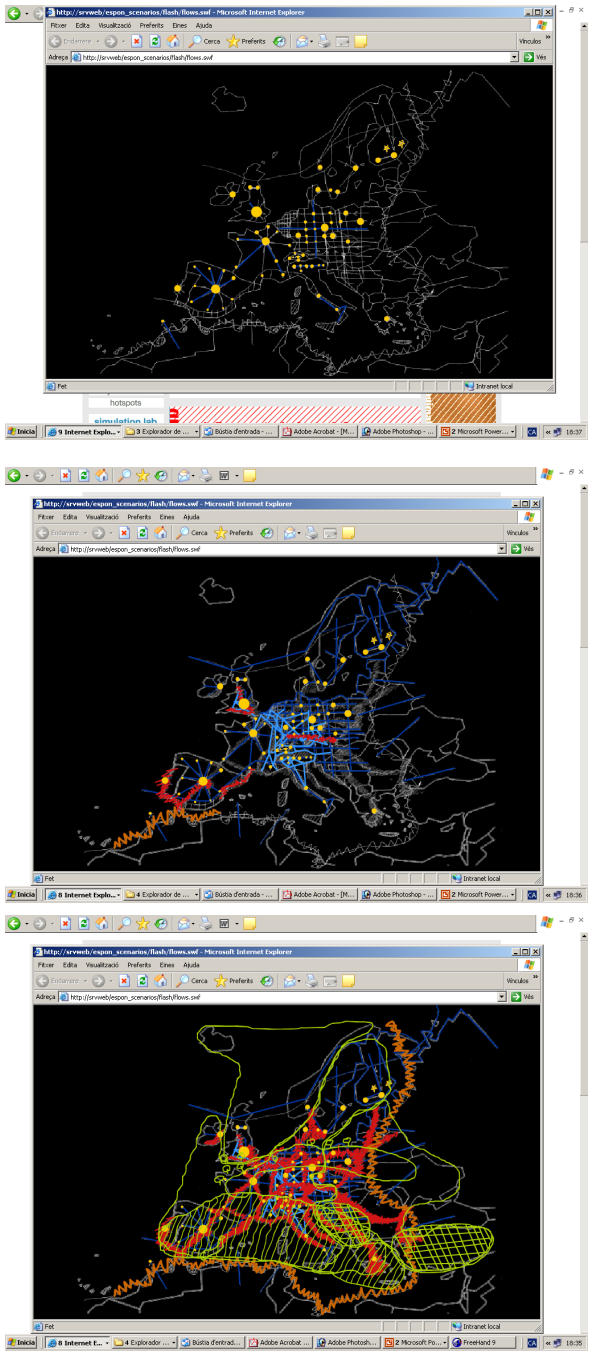
It also serves to the purpose of integrating meaningful images produced in the last decades (from Europe 2000, Europe 2000+, ESDP, SPESP, ESPON...), as well as by the partners of ESPON3.2.

In the comming months K&C will integrate the more specific illustrations of ESPON3.2 scenarios together with interactive and user-friendly simulations based on the forecast models being used in ESPON3.2 (MASST and KTEN).

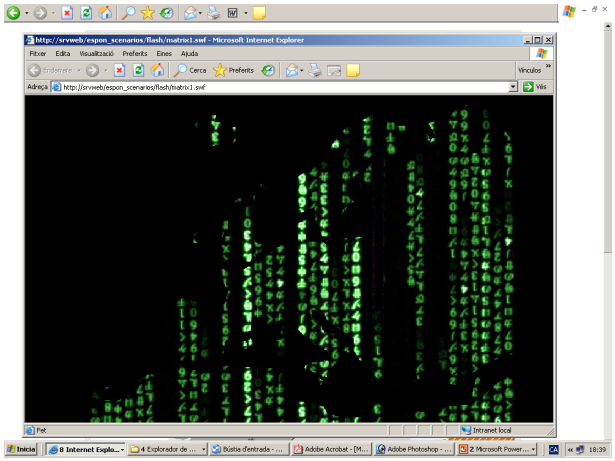
All together, K&C website paramount aim is moving people to be more active and creative, and better informed, when imagining European futures.

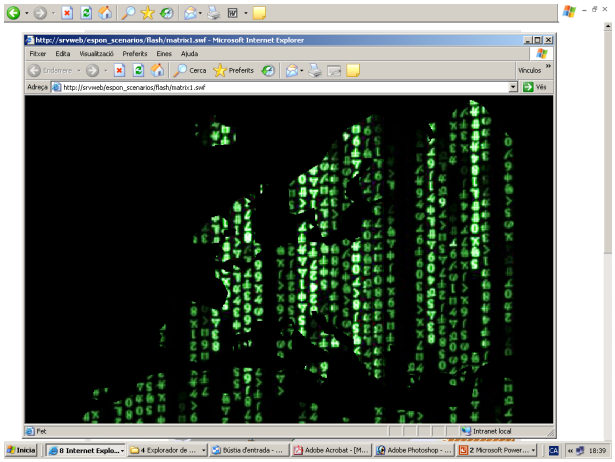


K& C alternative views of Europe

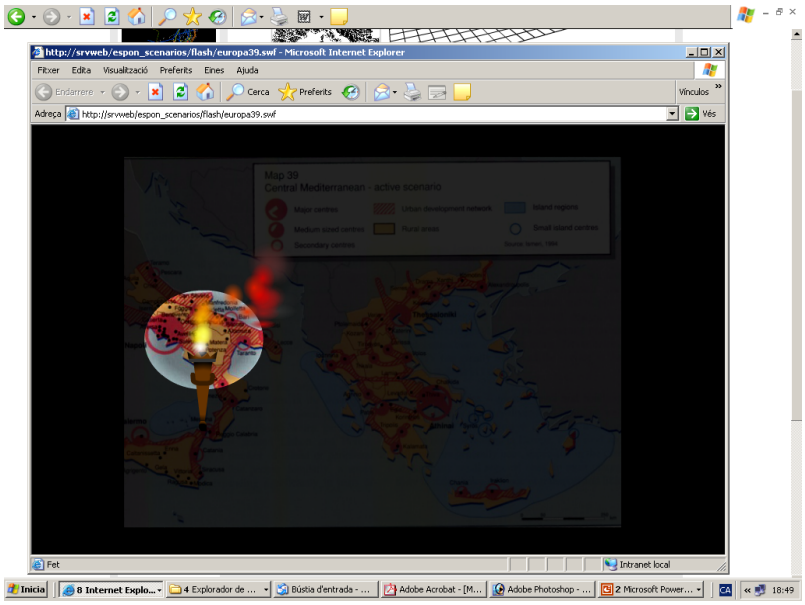


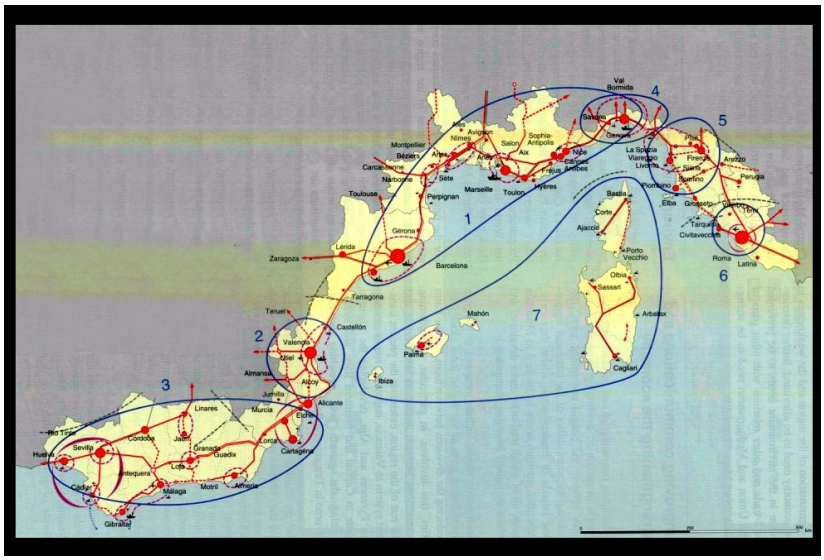
Integration of sketches made by ESPON3.2 team



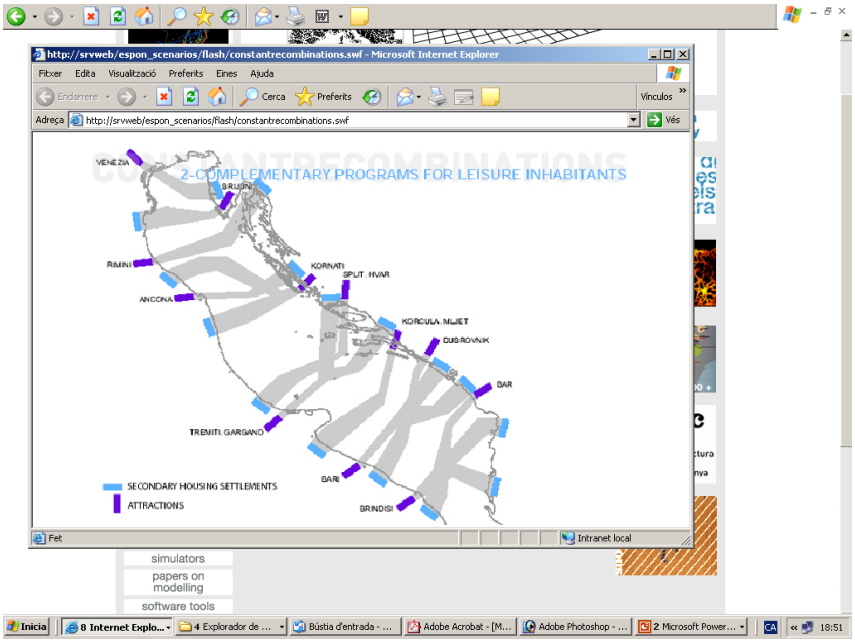


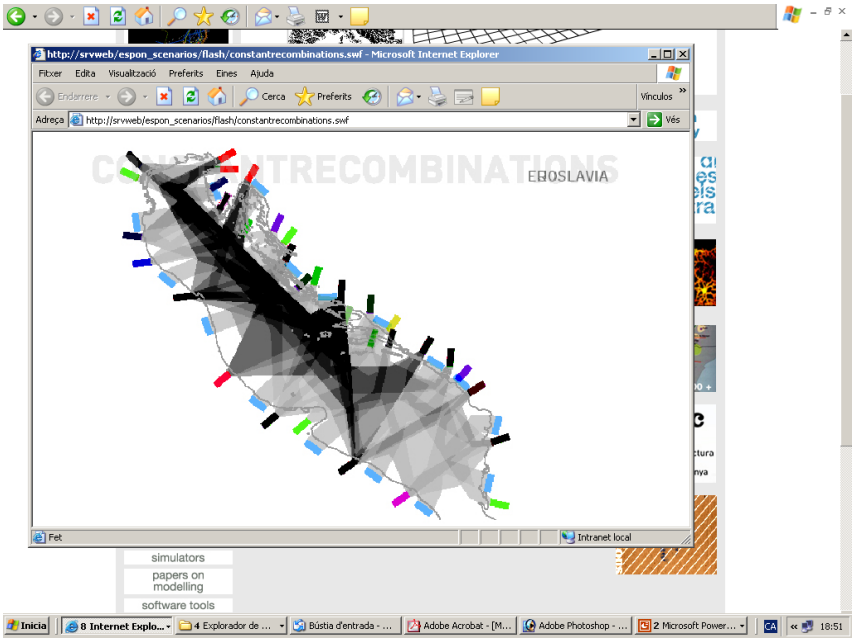
Interactive animation: Welcome to a digital Europe





Visualisation of Europe2000 maps





Sketches of European border zones

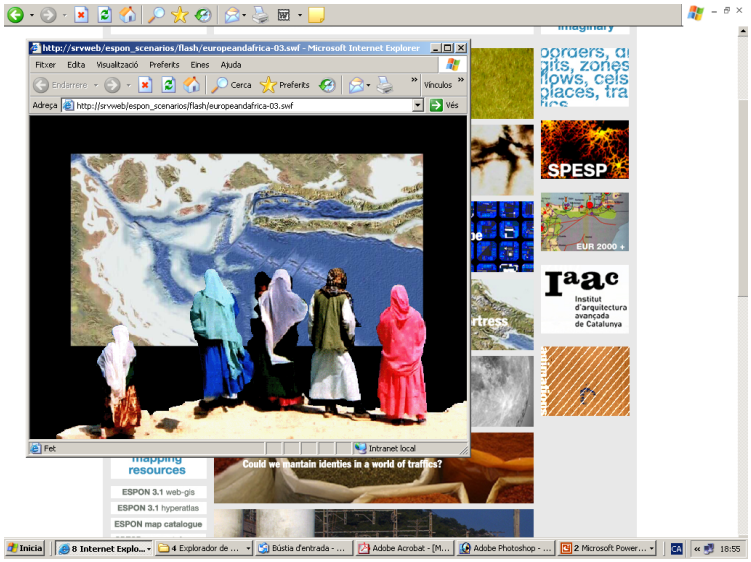


Illustration of the "Europe as a fortress" scenario

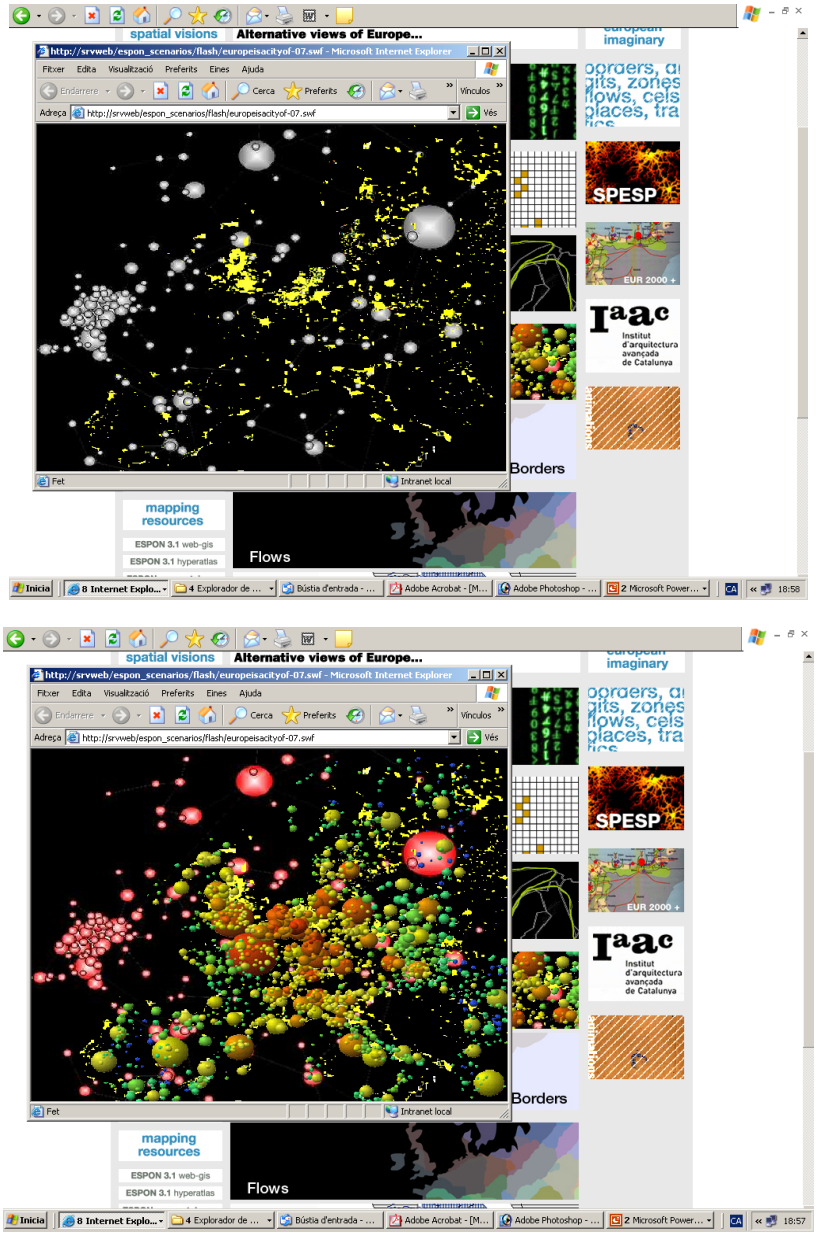
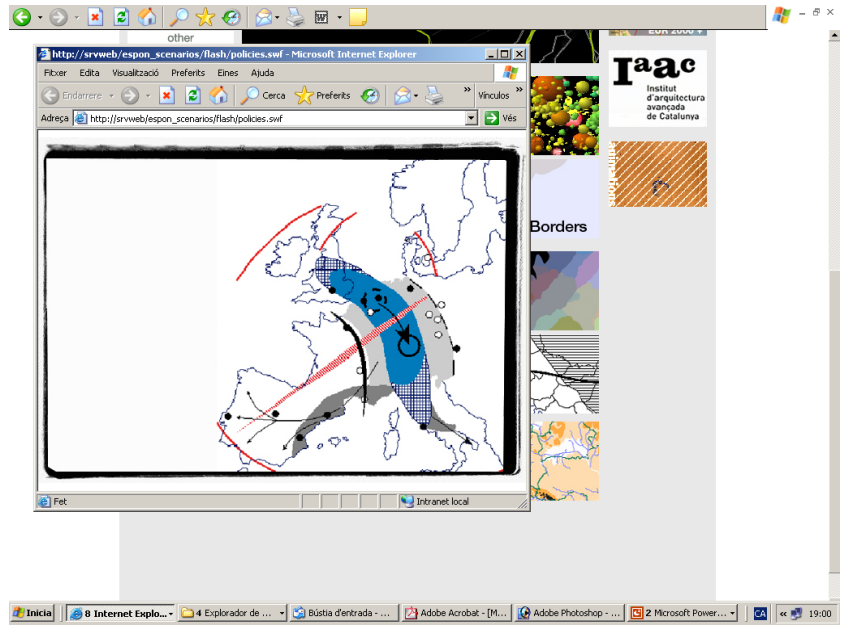


Illustration of the European cities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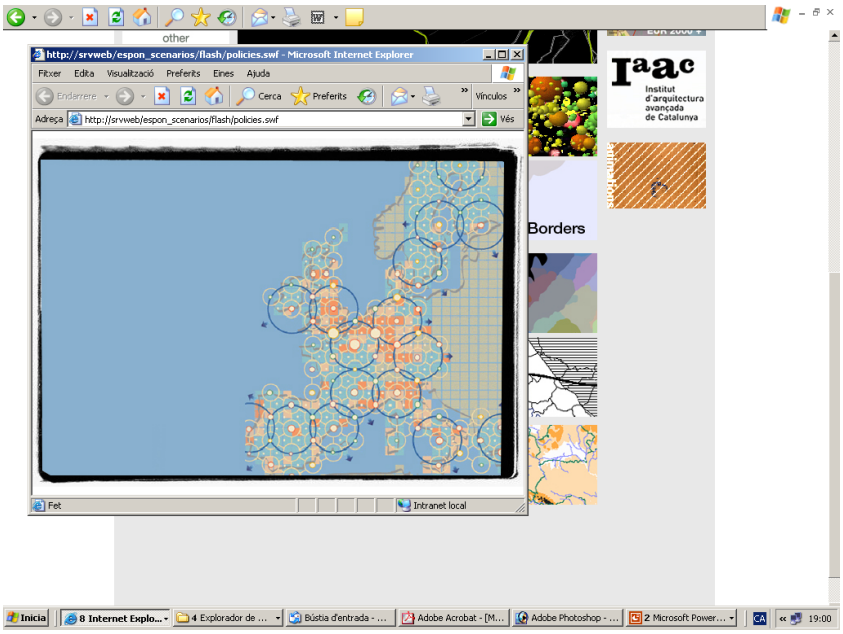
Borders


http://srvweb/espon_scenarios/flash/policies.swf - Microsoft Internet Explorer
Borders

SPESP maps

7 Communication strategy

Scenarios are not only useful for the policy makers involved in the elaboration process as mind games and for internal discussion, but also, and mainly, as communication tools. They allow to raise awareness about fundamental driving forces and to explain policy options more vividly.

The spatial scenarios developed in this project target a wide audience, from the spatial development community at European level to regional territorial policy makers and the general public. As one of the members of the Monitoring Committee put it, 'These scenarios should be understandable by any grand-mother in the country side.'

In the light of this very wide-ranging potential audience, the communication of the work in progress and the results will have to be very diversified and targeted. However, the project does not dispose of great amounts of resources, be it time or money, to elaborate a very sophisticated communication strategy. Several elements have, therefore, been privileged (in addition to the obvious communication to the ESPON Monitoring Committee and the general ESPON community at ESPON seminars):

- Transnational and national events targeting the national and regional territorial development community

National events should be based on the demand of national contacts and aim at informing the national or regional policy makers and other stakeholders about the ESPON scenarios and to discuss the national relevance of the project's findings. Such events have already taken place in Belgium, France and Austria. Both at Monitoring Committee meetings and at a meeting of the SUD committee representatives have been encouraged to envisage the organisation of such an event in their country. Now that the first drafts of the integrated scenarios have been published (see volume 3 of this report), more events are expected to take place.

The scenarios are also of special interest for the transnational territorial development stakeholders. Many of them are active in Interreg programmes, notably around spatial visions. Members of the team have been called upon to present specific thematic aspects of the work at meetings of such spatial vision groups. In the context of INTERACT seminars, the work is also presented as a whole to the representatives of the different Interreg IIIB regions.

- Presentations in events of the scientific community

All members of the team are encouraged to present our work either at scientific conferences or in scientific publications and this has been done at several occasions and will continue in the same manner in the future.

- Brainstorming on visualisation and animation of some of the scenario ideas

In order to support a communication to a larger public, work is currently going on in the form of brainstorming exercises concerning the visualisation, including in animated form, of the ideas and findings presented in the scenarios. First elements resulting from these exercises are presented in volume 3 of this report, but this will one of the main activities of the project in the next months.

- A final ESPON publication on scenarios

At the end of the project, which coincides with the end of the first phase of the ESPON programme, it is foreseen that the scenarios be presented in a special ESPON publication. The team has reserved some funding for the publication of this report. This should present the scenarios in a very synthetic, readable and easily understandable manner in order to serve as a basis for further communication activities, mainly in the context of ESPON II.

- Integration of project 3.2 into the general ESPON communication strategy

The ESPON programme has recently contracted a company to serve as its 'media bureau'. Several general ESPON communication activities are foreseen in this context and it was decided together with the coordination unit that project 3.2 be part of some of the events.

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

TPG members

- **Lead Partner:**

IGEAT – Institut de Gestion de l'Environnement et d'Aménagement du Territoire, Université Libre de Bruxelles (Belgium)

- **Co-leader:**

AETS – Agence Européenne «Territoires et Synergies » (France)

- **Partners:**

BBR – Bundesamt für Bauwesen und Raumordnung (Germany)
CRS- HAS – Centre for Regional Studies of the Hungarian Academy of Sciences (Hungary)
CUDEM – Centre for Urban Development and Environmental Management (United Kingdom)
DIG – Department of Management, Economics and Industrial Engineering, Politecnico di Milano (Italy)
MCRIT – Barcelona (Spain)
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ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

Volume 5
General scientific coordination of ESPON

Table of Contents

Introduction

An important task of project 3.2, taken over from project 3.1 in October 2004 is the support to the ESPON coordination unit in the scientific coordination of the entire ESPON programme. This consists in practical issues such as maintaining and enhancing the ESPON Database, preparing new versions of the ESPON Map Kit and preparing ESPON seminars and lead partner meetings. At the same time, more content-oriented aspects are also treated, such as the attempt of defining a common scientific approach to the projects, elaborating a limited list of ESPON key indicators for spatial monitoring, reflecting on how best to translate the research into policy recommendations (or 'policy options'), preparing ESPON publications, etc.

In this last year of the ESPON I programme, one main aim will also be to synthesise the acquis in order to make it easily transferrable to ESPON II. This concerns as much the practical issues of project management as the scientific issues.

1 The ESPON 'Binder'

In the first years of the ESPON I programme a tradition evolved of following-up each ESPON seminar with a so-called 'guidance paper'. These guidance papers attempted to summarise the discussions, in order to give clear guidance to lead partners on issues common to all research groups, the 'common scientific platform'. However, they also discussed very practical issues such as, for example, the structure and presentation of final reports.

At the lead partner meeting in February 2005, several lead partners voiced a request for one centralised document that would summarise the main messages of all guidance papers and thus make it easier for a new lead partner to find important information. It was decided to realise this in the form of a binder, both in paper (for those elements where it is possible) and electronic form, allowing a flexible and constantly evolving document. This has provisionnally be called the 'ESPON Binder', but a new name will have to be found.

Currently the following table of contents is foreseen for this binder:

Provisional table of contents of the 'ESPON Binder'

1. Introduction to ESPON

   1.1 What is ESPON
   1.2 Work Programme ?

2. General and administrative practicalities

   2.1 Role of a lead partner and relationship between lead partner and project partners
   2.2 Who's who (explanation MC, MA, CU, ECP, First-level financial control, etc + contact list CU + database maintainer + others ?)
   2.3 Explanation of the website + intranet
   2.4 Financial rules
   2.5 Copyright and publication rules

3. General research objectives and framework

   3.1 Current policy orientations
   3.2 Questions of scale: the ESPON three-level approach
   3.3 From research results and spatial goals to policy recommendations and options

4. Existing tools
   4.1 Elements of spatial monitoring
   4.2 ESPON database (see next section)
   4.3 WebGIS
   4.4 HyperAtlas
   4.5 Tools navigator
   4.6 ESPON bibliography
   4.7 TIA

5. Data issues
   5.1 ESPON database
      5.1.1 access (incl. relevant copyright issues)
      5.1.2 contents and structure
      5.1.3 submitting data to the database (incl. relevant copyright issues)
      5.1.4 requesting data for the database (incl. relevant copyright issues)
   5.2 Access to Eurostat
   5.3 Data collection handbook
   5.4 Data navigator

6. Design + structure

   6.1 Reports
   6.2 Maps
   6.3 Presentations

The tasks of elaborating the different parts of the binder have been divided between project 3.2 and the coordination unit. Work is currently ongoing.

An additional question will be the layout and form of presentation of this binder. Since it will also include references to certain tools such as the ESPON Database, the HyperAtlas, etc, a cdrom might be the best solution. The main text of the binder should, therefore, probably be written in HTML in order to provide the possibility to navigate through the binder

interactively (see figure 1). Any texts could then also be printed on paper if necessary. This will, however, have to be discussed with the coordination unit.

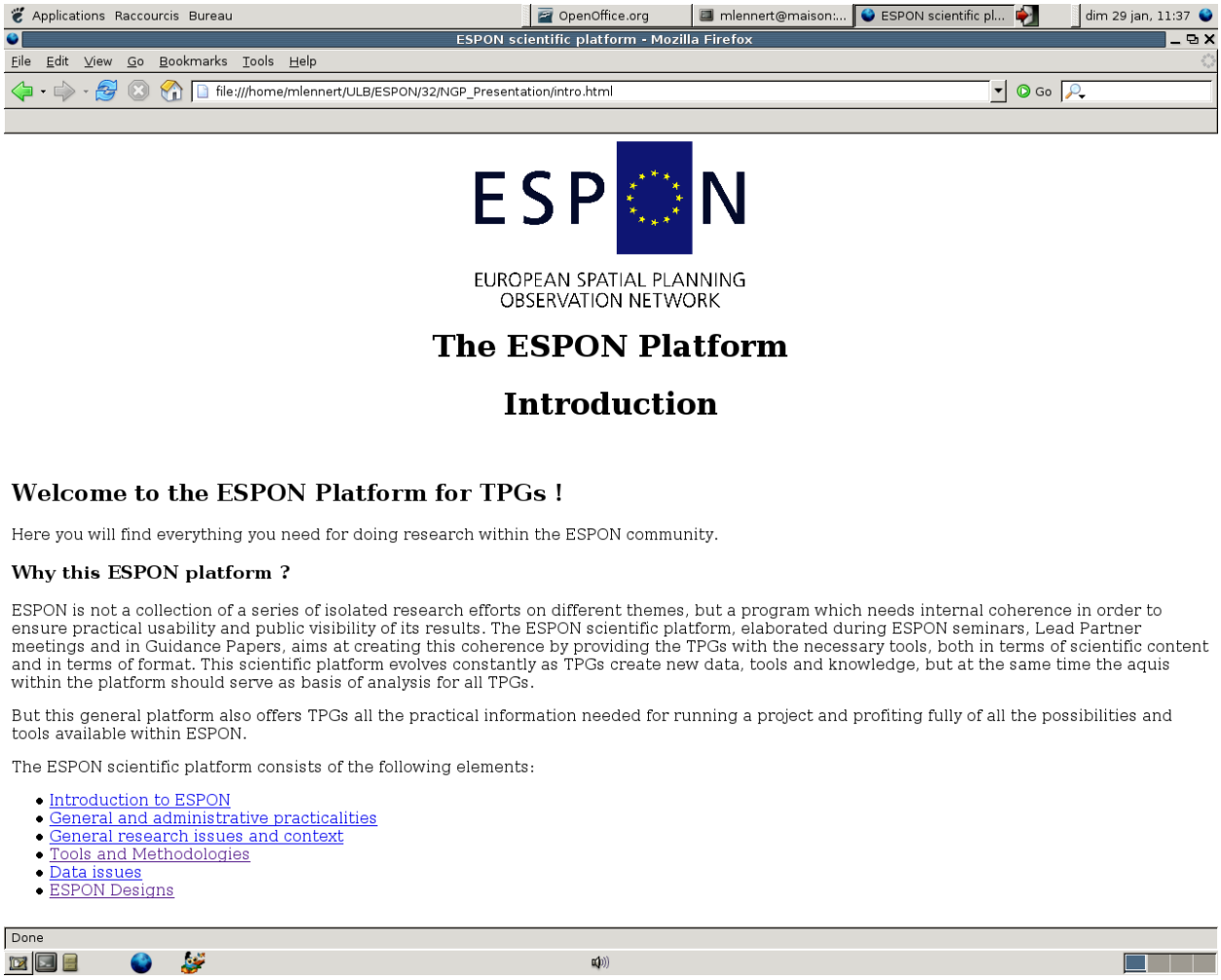

Figure 1 Example of possible interactive form of an ESPON binder

2 ESPON database

Since the presentation of the SIR in March 2005 the work on the ESPON database has been focused on the following issues:

- Collecting new data and updating existing data
- Further developing and improving of the front end (selection tool)

2.1 Collecting new data and updating existing data

The ESPON database covers data from mainly two different sources:

- General data collected by project 3.1/3.2
- Project data provided by the TPGs

New basic data

Eurostat is the most important data source for the ESPON programme, providing a great number of basic data like population structure, unemployment rate and gross domestic product. These data are normally provided for the regions of the EU25. The regions of Romania and Bulgaria have been recently been added to many series in the Eurostat Regio database. Their availability depends on the indicator. For the Swiss and Norwegian regions, data are available for only a short number of indicators. In these cases, project 3.2 will implement the filling-up and, if necessary, conversion by data from national statistical offices. In consideration of the problem of data harmonisation, this has to be done in the most appropriate way. Often, comparable regional distributions are calculated by fitting regional distributions from national sources to national values that are comparable across Europe.

A counting of the new data showed that, since the issue of the last ESPON database in October 2004, 982 new indicators and raw data have been integrated (see table 1).

Most of the new data are basic data provided by project 3.2 with more than 630 new raw data and indicators. Most of those data belong to the thematic field of population with more than 650 raw data. However, the high number of new basic data in this field is due to the division into different age groups and the coverage of several years. Furthermore, a number of new basic data (more than 80) were provided in the field of economic accounts like gross domestic product.

In more than 500 cases, the new basic data were calculated for the NUTS2 level, while only about 60 datasets concern NUTS3 level. The new basic data relate to 2003 NUTS version.

New project data

Project data represent another kind of data delivery for the database. In the framework of their scientific work, projects are required by the CU to provide process-produced data as an outcome of their research work. Project 3.2 has the task to accept these deliveries, to check them in regard to quality, to ask for additional delivery and, if needed, to integrate them into the database.

Since the last ESPON database, 340 new indicators from the TPGs have been integrated, more than 110 of which into the field of spatial typologies. Project 1.1.1, in particular, has delivered new site-related data referring to Functional Urban Areas (FUAs), Potential Urban Strategic Horizons (PUSHs) and Potential Polycentric Integration Areas (PIAs). Moreover, the final data of the Regional Classification of Europe (RCE) from project 2.4.2 make part of the current database. Single indicators as well as RCE indexes have been provided by project 2.4.2.

More than 110 new indicators have also been integrated in the field of population. These data were provided by project 1.1.4 and cover both population structure and population development models. The remaining new project data, each with more than 50 indicators, come from projects 1.3.1 and 2.1.4. Indicators from project 1.3.1 are updated hazard indicators in the field of environment. Project 2.1.4 has provided more than 50 indicators covering energy production and energy consumption.

The regional level of the new project data is in most cases NUTS 2 level. The data from project 2.1.4 are available on the basis of NUTS 0. The new and updated data from project 1.1.1 are related to the location of FUAs, PUSHs and PIAs. Only 59 indicators, mostly the hazard data from project 1.3.1, are available for the NUTS 3 level. The new project data are mostly provided for the 1999 NUTS version. Only the RCE indicators from project 2.4.2 refer to the new 2003 NUTS version.

Integration of the new NUTS classification

In August 2004, changes were made in the NUTS classification due to the creation of new regions and the reorganisation of existing regions. In some cases, those changes only affect NUTS 2 regions, in other cases also NUTS 3 regions. The changes in regions at NUTS 2 level could mostly be reconstructed by aggregation. There are only a few exceptions like Finland and Portugal. The changes in regions at NUTS 3 level cannot be adapted so easily. Latvia and Poland, for example, did not keep the regional border but set new regional delineations, which results in breaks in the data series. Since these first changes in the NUTS, the current data from Eurostat refer to the new classification and geometries. It is the task of project

3.2 to respond to these changes in the data of the ESPON database. This means that in the future, the database will contain each indicator twice: for the old NUTS classification - the '1999 NUTS version' - and for the new NUTS classification - the '2003 NUTS version'. This does not apply to the data based on model calculations from terminated projects.

Current data content of the ESPON database

By now the ESPON database covers around 4000 data. These are raw data, indicators, RCE-indicators, classifications and typologies. Numerically, we count 2501 raw data, 1349 indicators, 84 RCE-indicators, 34 classifications and 23 typologies.

Most of the data (about 3300) are available for the 1999 NUTS version, and 700 for the new 2003 NUTS version.

The current database is ready for download from the ESPON intranet site.

2.2 Further developing and improvement of the front end

One of the most important aspects of the ESPON database is its usability. Simple and fast access to data should be the prior objective. Therefore, a selection tool has been developed and provided to the ESPON projects in October 2004. Through consultation with some of the database users suggestions were collected, which will now be considered while working on a technical improvement. The completed database selection tool will be finalised and provided to the TPGs in May 2006.

One of the most important improvements in the selection tool is and will be a function that makes the search of indicators more comfortable. It was considered unsatisfying that 4 out of the 18 category folders, based on the data navigator categories, were empty: 'Enterprises and Investments', 'Social Situation', 'Housing' and 'Cultural Sites', as well as 21 subthemes. Due to the fact that the structure of the data navigator categories should be kept, a technical solution was developed, which enables the user to know if a category or theme folder is filled or not. Project 3.2 is at present working on the programming of this additional query tool.

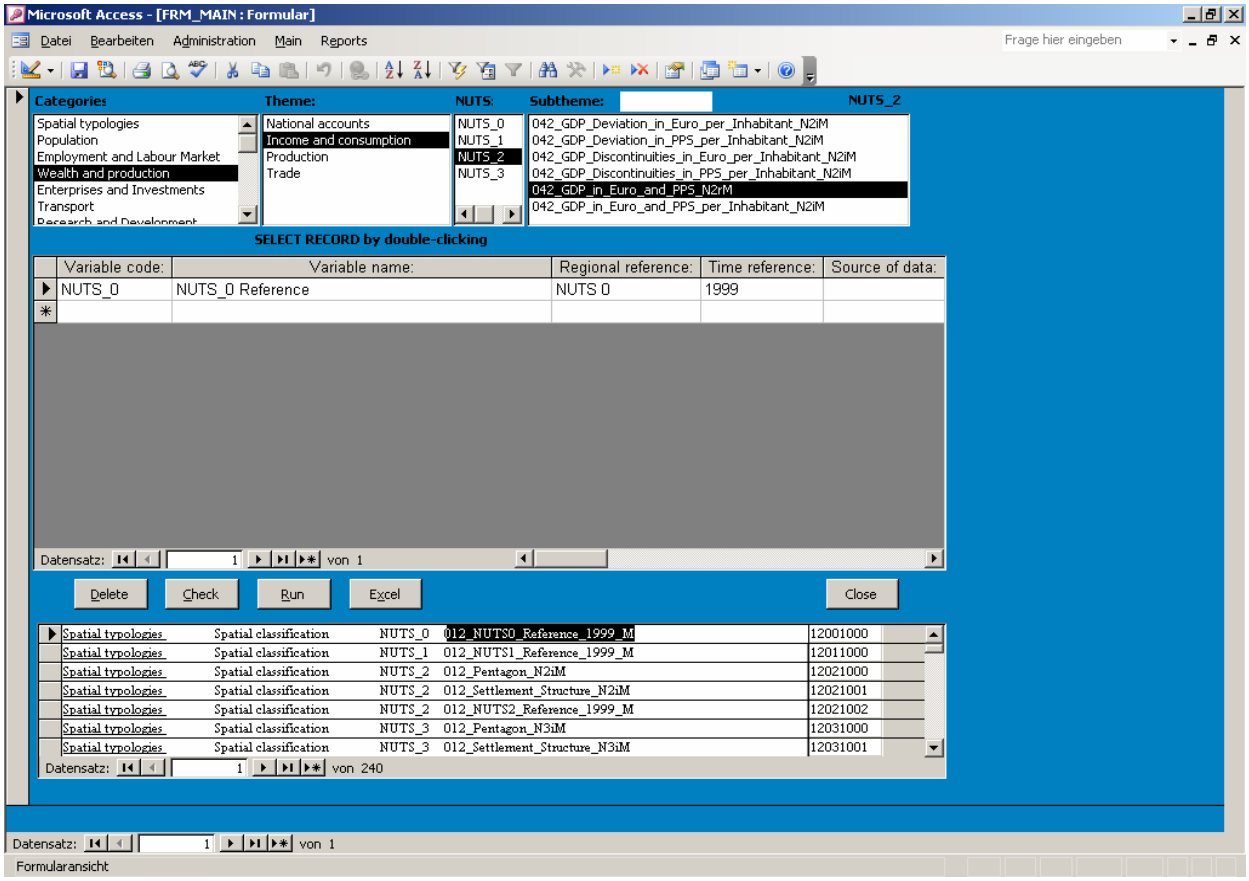

Figure 2 Screenshot of status quo of the ESPON database selection tool

The table in Appendix shows the new and updated indicators in the database.

3 ESPON map kit

3.1 State of the art and adjustments

On the basis of the in ESPON project 3.1 agreed map design, the ESPON map kit was elaborated including shape files of all regional levels for the ESPON countries. The first ESPON map kit has been designed and distributed on the basis of the ESRI software ArcView 3.2. ESPON project 3.1 has provided all the cartographic elements and data which are necessary for the construction of a EU25+2+2 map including an ArcView 3.2 apr-file as a template.

Over the past years many users migrated to the newer ESRI ArcMap software. Project 3.2 has therefore the task to provide both, an apr-file for the ArcView user and a mxd-file for the ArcMap user.

At the beginning of the map kit shape files were based on the 1999 NUTS version. Because of the changes in the nomenclature of the European statistical regions, adjustment and renovation were necessary.

Project 3.2 has integrated those changes continuously and step by step. The integration of the new NUTS geometries applied firstly to the new 2003 NUTS, appeared in November 2003. Those changes affected the NUTS 2 regions of Finland, Hungary, Italy, Poland and Portugal. In addition, NUTS 3 regions in Germany, Latvia and Poland were affected. In some cases, there was only a change in the NUTS codes. This was the case in the NUTS 2 regions of Hungary and Poland. In May 2004, when 10 new member states joined the EU, the regions became NUTS regions. After the accession, some of the new member states (Latvia, Poland and Hungary) decided on a new regional delineation. In Latvia almost all the NUTS 3 regions were affected. In Poland, changes affected the Warsaw and Slaskia regions, and in Hungary the Budapest region. Furthermore, in some countries the NUTS 1 level was introduced. Eurostat published this revision in August 2004. All these changes will be considered in the new NUTS version, which could replace the old NUTS 2003 from mid-January. The old NUTS 2003 version, for which no more data will be published by then, will just be replaced.

3.2 Provision of the new NUTS geometries

In October 2005 Eurostat provided the new GISCO geometries. Project 3.2 has the task to prepare these new files and provide them as new shape files to the TPGs.

Two new versions will be provided: The generalisation in 1:20 million. This more generalised version is suitable for mapping. The generalisation in 1:1 million. This fine generalisation is

for analytical purposes. Furthermore, unprojected files will be provided as well as projected files. The latter are particularly easy to use in ArcView but not only.

Project 3.2 is working on the preparation of those new files. However, there are still some problems with the new geometries. The Gisco geometries do not fit the Eurostat data in the case of Bulgaria. Currently the geometries are being prepared to fit with the Eurostat data. The new geometries will be delivered in the weeks after the submission of this report.

4 ESPON Indicators – the base of a European Continuous Spatial Monitoring

4.1 ESPON core indicators

Through the different rounds of ESPON projects, thematic studies and policy impact studies as well the integrative and scenario oriented projects, the ESPON programme has laid the ground for comparative information and for analysis of spatial structures and development of the European territory, not only the EU 25 Member States, but also the Candidate countries Bulgaria and Romania as well as the neighbouring countries Switzerland and Norway.

One of the aspects within the tasks of the transnational project groups was the provision of thematic related data and indicators based on them. For a first time data was collected systematically across many different fields in this territorial coverage and, thus, the basis for a spatially oriented information system was developed. The data collected so far includes a wide range of indicators for different spatial contexts, allowing for spatial monitoring, analyses of situations and trends as well as spatial policy advice including the assessment of the achievement of political goals.

The ESPON projects resulted in a great number of indicators covering their specific thematic aspect. With the recent updates the ESPON database now includes a total number of 1060 indicators. With respect to the restricted life time of the projects and to allow further continuation and update of the most relevant information the projects 3.1 and succeeding 3.2 elaborated, on the basis of project suggestions, a list of around 100 'core' indicators (which forms part of the ESPON database) of potentially high importance within a spatial information system and the measurement of living conditions in the regions of Europe.

Building upon these efforts, the ESPON database must guarantee a continuous provision of regional and spatial information during the ESPON process and should also lay the ground for the investigation of relevant issues to be considered in the future elaboration and definition of spatial indicators. Especially thinking of the programming period of ESPON and the successive ends of the different projects, the list of ESPON 'core' indicators has a crucial role within the discussion and decision-making processes in European spatial information and regional statistic activities and is one of the fundamental outcomes of the ESPON projects.

The selection of this range of indicators will be a valuable input for the potential maintenance and updating in the future. This must not stick necessarily to the future use of an indicator as such and as it has been defined in detail within ESPON. Especially related to model calculation output this 'core' indicator could be interpreted also as indication of the development and further development of indicators representing the same thematic evidence – maybe in a slightly different algorithm – but in a comparable spatial policy related orientation.

In this respect the list of ESPON 'core' indicators should be completed including the final results of the projects and the TPG's ending in the first half of 2006.

4.2 Spatial monitoring

In the philosophy of spatial monitoring aiming at measuring and analysing spatial phenomena, information is needed not only on the spatial structure, but also on elements that influence and change the spatial reality.

Spatial monitoring must satisfy both

I. demands for an analytical base for sound spatial analysis and
II. varying political demands enabling the evaluation of policy strategies and the assessment of the achievement of policy aims.

A policy-oriented spatial monitoring needs the sound base of a broader selection of the 'core' indicators. The freedom of choice is necessary to cover a detailed and profound demand on information arising from the need of interpretation on different regional levels and also to enable a detailed thematic evidence base.

However, a more general spatial policy-related process targeting to support the discussion of territorial issues could not be done with the complete range of spatial information as this would make the data too complex. The characterisation of the main challenges and the key factors in the context of territorial cohesion and spatial development needs a selection of a smaller number of indicators.

A limited list of indicators related to a territorial agenda - comparable to the elaboration of the short list of indicators related to the Lisbon/Gothenburg agenda - seems appropriate. As the name of this list indicated, it should be a short list. In the ideal case - but not necessarily due the thematic orientations of the ESPON in this programming period – it would represent a subset of the 'core' indicator list.

4.3 Towards a short list of indicators for general spatial monitoring

With the active involvement of Monitoring Committee members and Lead Partners of ESPON projects, a process was, therefore, initiated in order to identify a short list of 'key' indicators which could support a process of continuous monitoring, resulting in periodical reports related to territorial development.

Following the discussion of a proposal at the recent ESPON Lead Partner meeting, it was decided to proceed with the identification of the key indicators by crossing selected themes with agreed spatial policy options and aims.

Based on the current policy debate related to intergovernmental processes, in particular the ESDP and the future document on the Territorial State and Perspectives of the European Union, but also related to European policy objectives and priorities, particularly in relation to Territorial Cohesion and to the Lisbon Strategy, the following territorial policy fields were identified:

- Balanced distribution of population, wealth, cities, etc.
- Assets for global competitiveness
- Innovative knowledge society
- Diversified regional economies
- Sustainable transport and energy
- Sustainable settlement structures
- Socially inclusive society and space

- Healthy environment and hazard prevention
- Diversified cultural heritage and identities
- Territorially oriented governance

The more sector-oriented themes (although obviously also linked to policy priorities) include socio-economic, environment and culture related fields, which are based on ESPON projects:

- Urban development & hierarchy
- Urban-rural relationships
- Demography
- Innovation
- ICT
- Hazards
- Culture
- Transport
- Agriculture, Fisheries and Rural Development
- Energy
- Governance
- Environment
- Social issues
- Economy

The crossing of themes and policy objectives resulted in a matrix (see table) identifying, as a proposal, sets of thematic indicators in their territorial outline representing the short list of territorial indicators.

The 28 indicators included (without taking into account indicator proposals in the field of ESPON projects still running) can be considered 'intersections' of the full set of 'core' indicators with the main general policy needs. The empty boxes in the matrix are not foreseen to be filled in. However, indicators can be replaced with others that might be considered reflecting better an intersection of theme and policy orientation.

The set of 28 indicators that have been identified using the matrix covers all sectors and all identified main policy options with the exception of a) Governance, and b) Agriculture, Fishery and rural development. Suitable proposals to cover these aspects should come from the ongoing ESPON projects.

Also included in the matrix are indicators which can be based an ESPON data, but which have not yet been calculated. Furthermore a few indicators have been included from external sources on themes and policy orientations which could not be covered by projects of the first ESPON programme.

It has to be said that the current work on indicators confirms the continued existence of severe gaps in Europe-wide data at regional scale. One of the outcomes of the further considerations on mechanisms of European spatial monitoring will therefore include recommendations concerning future data collection, once the indicators and methodologies have been further defined and validated by the Monitoring Committee.

		Balanced distribution of , population, wealth, cities, etc.	Assets for global competitiveness	Innovative knowledge society	Diversified regional economies	Sustainable transport and energy	Sustainable settlement structures	Socially inclusive society and space *	Healthy environment and hazard prevention	Diversified cultural heritage and identities *	Territorially oriented governance *
Hazards	Project 1.3.1 'Natural hazards'								Hazard risk typology		
Culture	Project 1.3.3 'Cultural heritage'									Number of cultural sites	
Transport	Project 1.2.1 'Transport trends'; Project 2.1.1 'Transport Policy impact'	Potential time distance to centres of different levels	Multimodal accessibility			Intensity of transport flows by mode		Accessibility by public transport (or just by train – as a proxy)			
Agriculture, Fisheries and Rural Development	Project 2.1.3 'CAP impact'; Project 2.1.5 'Fisheries'										
Energy	Project 2.1.4 'Energy'					Energy consumption per type of user and source					
Governance	Project 2.3.1 'ESDP impact'; Project 2.3.2 'Governance'										
Environment	Project 1.3.2 'Natural heritage'; Project								Fragmentation index / Ground water quality		
Social issues	Project 1.4.2 on 'Social Dimension'	Rank-size index (by household income)		Population by education level							
Economy	Project 3.3 'Lisbon strategy'; Project 3.4.2 'Economy'	Rank-size index (by GDP)	Number of multinational headquarters	Employed in HI-TEC sector	Added value by economic sector (some specialisation index)						
Note: rank-size indices can be done in reference to the EU as a whole, countries, transnational cooperation areas, etc.											

Table 1 Matrix

4.4 The next steps

As the selection of 'key' indicators is relies on the broader base of the 'core' indicators, it seems necessary to put the selection process at the end when the results of all projects can be integrated. The complete list of spatial evidence developed at that point – in form of 'core' indicators will become the heritage of territorial evidence of ESPON for a continuous spatial monitoring and will provide the basis for the extraction of the 'key indicators'.

The identification of key indicators of the European territory has to be a process, subject to revision and adaptation every time main policy aims are revised and/or new knowledge on specific issues is produced, allowing for the identification of a better indicator.

The monitoring tool should also be seen as an integral part of a system, which includes the ESPON database (see section 2) and the entire list of 'core' indicators, the TIA tool (see volume 6) and the continuation of research work indispensable to understand deeper territorial trends and impacts of EU policy (for ex-ante but also for ex-post evaluation).

It also has to be recalled that without an extraordinary effort to collect and maintain territorialized data at NUTS 3 (or at least NUTS 2) level, these attempts to fill the gap in territorial knowledge will hardly succeed. And as explained in volume 4, section 3 (ETCI), some elements of territorial development actually demand even more precise data, going down to the LAU 1 and 2 levels.

During the ESPON seminar on 7-8 November 2005 in Manchester further discussions raised question concerning the following elements:

- What are the most important policy orientations and themes?
- Is the current crossing of themes and policy orientations, and the proposed resulting indicators, considered a good choice?
- Should some indicators be replaced?

This discussion process should be further cultivated within the ESPON community during the next month. The ESPON seminar in Salzburg on 13-14 March 2005 and the Final reports of almost all projects in spring this year provide a schedule to conclude this discussion in parallel to the elaboration of the final list of 'core' indicators.

On this base ESPON 3.2 and the CU will then adjust the matrix and propose the organisation of the further process with the aim of gaining the first experiences from testing in practice a monitoring based on the matrix and its key indicators.

APPENDIX

New and updated indicators for the ESPON database

Category	table	Indicator	NUTS level	NUTS Version	from Project	new / updated	date
01 Spatial typolgies	012_Polycentricity_indicators_N2303_I	Primacy rate	NUTS 2/3	2003	2.4.2	new	Jan 06
		Population density of permanently populated area	NUTS 2/3	2003	2.4.2	new	Jan 06
		Share of population in cities below 50.000 inhabitants	NUTS 2/3	2003	2.4.2	new	Jan 06
		FUA within the region	NUTS 2/3	2003	2.4.2	new	Jan 06
		MEGA within the region	NUTS 2/3	2003	2.4.2	new	Jan 06
	012_Regional_Classification_Europe_-final-_N203_I	GDP per capita in PPS	NUTS 2	2003	2.4.2	updated	Nov 05
		GDPgrowth in PPS per capita 1995-2002	NUTS 2	2003	2.4.2	updated	Nov 05
		Productivity - GDP per person employed	NUTS 2	2003	2.4.2	updated	Nov 05
		Employment rate	NUTS 2	2003	2.4.2	updated	Nov 05
		Expenditures, R&D, all institut sectors, in %	NUTS 2	2003	2.4.2	updated	Nov 05
		R&D BES personnel	NUTS 2	2003	2.4.2	updated	Nov 05
		High education population	NUTS 2	2003	2.4.2	updated	Nov 05
		Unemployment rate 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Developm Unemployment rate 1999-2003 in PP	NUTS 2	2003	2.4.2	updated	Nov 05
		Youth unemployment 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Labour Force Replacement:	NUTS 2	2003	2.4.2	updated	Nov 05
		Number of persons employed per km2 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Employment in tertary sector	NUTS 2	2003	2.4.2	updated	Nov 05
		Population ages 65 years and more, share of	NUTS 2	2003	2.4.2	updated	Nov 05
		Changes in Natural Growth Potential	NUTS 2	2003	2.4.2	updated	Nov 05
		Percent pop change 1995-2002	NUTS 2	2003	2.4.2	updated	Nov 05
		Artificial surface	NUTS 2	2003	2.4.2	updated	Nov 05
		Natural surface	NUTS 2	2003	2.4.2	updated	Nov 05
		Agricultural intensity	NUTS 2	2003	2.4.2	updated	Nov 05
		Regional average number of flood events	NUTS 2	2003	2.4.2	updated	Nov 05
		Approximate probability of having winter storms	NUTS 2	2003	2.4.2	updated	Nov 05
		Earthquake hazard potential	NUTS 2	2003	2.4.2	updated	Nov 05
		Change of dry spell combination with drought	NUTS 2	2003	2.4.2	updated	Nov 05
		Forest fires hazards	NUTS 2	2003	2.4.2	updated	Nov 05
		Oil hazards	NUTS 2	2003	2.4.2	updated	Nov 05
		Chemical plants	NUTS 2	2003	2.4.2	updated	Nov 05
		Potential Accessibility by Air	NUTS 2	2003	2.4.2	updated	Nov 05

		Potential Accessibility by Rail	NUTS 2	2003	2.4.2	**updated**	Nov 05
		Potential Accessibility by Road	NUTS 2	2003	2.4.2	**updated**	Nov 05
		Time to market meso-scale	NUTS 2	2003	2.4.2	**updated**	Nov 05
	012_Regional_Classification_Europe_-final-_Indices_N203_I	RCE - classified accessibility	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified demography	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified economy	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified labour market	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified lisbon performance	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified naturalness	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified natural hazards	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified technological hazards	NUTS 2	2003	2.4.2	**updated**	Nov 05
	013_Functional_Urban_Areas_I	FUA population			1.1.1	**updated**	Sep 05
		FUA DEMOGRAPHIC-MASS_CODE			1.1.1	**updated**	Sep 05
		FUA TRANSPORT_CODE			1.1.1	**updated**	Sep 05
		FUA UNIVERSITY_CODE			1.1.1	**updated**	Sep 05
		FUA DECISION-MAKING_CODE			1.1.1	**updated**	Sep 05
		FUA ADMINISTRATION_CODE			1.1.1	**updated**	Sep 05
		FUA TOURISM_CODE			1.1.1	**updated**	Sep 05
		FUA manufacturing, with two sub-indicators, classification			1.1.1	**updated**	Sep 05
		FUA AVERAGE			1.1.1	**updated**	Sep 05
		FUA CLASSIFICATION			1.1.1	**updated**	Sep 05
	013_Functional_Urban_Areas_MEGAS_I	MEGA_DEMOGRAPHIC-MASS_INDEX			1.1.1	**updated**	Sep 05
		MEGA_COMPETITIVENESS_INDEX			1.1.1	**updated**	Sep 05
		MEGA_CONNECTIVITY_INDEX			1.1.1	**updated**	Sep 05
		MEGA_KNOWLEDGE_INDEX			1.1.1	**updated**	Sep 05
		MEGA_AVERAGE_INDICES			1.1.1	**updated**	Sep 05
		MEGA_DEMOGRAPHIC-MASS_SCORE			1.1.1	**updated**	Sep 05
		MEGA_COMPETITIVENESS_SCORE			1.1.1	**updated**	Sep 05
		MEGA_CONNECTIVITY_SCORE			1.1.1	**updated**	Sep 05
		MEGA_KNOWLEDGE_SCORE			1.1.1	**updated**	Sep 05
		MEGA_CLASSIFICATION			1.1.1	**updated**	Sep 05
	013_Potential_Polycentric_Integration_Areas_PIA_I	PIA population: Number of inhab in municipalities included in PIA			1.1.1	**new**	Sep 05
		Number of PUSH areas in each PIA			1.1.1	**new**	Sep 05
		Rank of PIA main node according to its PUSH population			1.1.1	**new**	Sep 05

		Rank of PIA according to its total population			1.1.1	new	Sep 05
		Rank of PIA, comparing its total pop.			1.1.1	new	Sep 05
	013_Potential_Urban_Strategic_Horizons_PUSH_I	Extent of 45-minute Isochrones;			1.1.1	new	Sep 05
		Ratio between PUSH Area and Isochrone area;			1.1.1	new	Sep 05
		PUSH area population			1.1.1	new	Sep 05
		Ratio between PUSH area population and FUA pop			1.1.1	new	Sep 05
		Number of FUA centres included in each PUSH area;			1.1.1	new	Sep 05
		Number of ESPON countries covered by each PUSH area			1.1.1	new	Sep 05
		Proportion of PUSH area overlapping with other PUSH areas			1.1.1	new	Sep 05
		Total settlement area (in km2)			1.1.1	new	Sep 05
		Number of settlement units within the PUSH			1.1.1	new	Sep 05
		Proportion of settlement area on total PUSH area (in %)			1.1.1	new	Sep 05
		Smallest settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 100 % criterion			1.1.1	new	Sep 05
		Area of the 2nd greatest settlement area in PUSH (in km2			1.1.1	new	Sep 05
		Largest settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Average settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Standard deviation of settlement areas in PUSH (in km2)			1.1.1	new	Sep 05
		Gini coefficient of settlement areas			1.1.1	new	Sep 05
		Average distance between all settlement areas within a push			1.1.1	new	Sep 05
		Distance between the largest and 2nd largest settlement unit			1.1.1	new	Sep 05
		Maximum standardised area concentration index (PUSH=100)			1.1.1	new	Sep 05
		2nd highest standardised area concentration index (PUSH =100)			1.1.1	new	Sep 05
		Minimum standardised area concentration index (PUSH =100)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 50 % criterion			1.1.1	new	Sep 05
		Average standardised area concentration index (PUSH=100)			1.1.1	new	Sep 05
		Range between max & min standardised area concentration index			1.1.1	new	Sep 05
		Difference between highest & 2nd highest standardised area concent. index			1.1.1	new	Sep 05
		Difference between 2nd highest & average standardised area concentration index			1.1.1	new	Sep 05
		Ratio between 2nd highest and highest standardised area concentration index			1.1.1	new	Sep 05
		Ratio between average and highest standardised area concentration index			1.1.1	new	Sep 05
		Ratio between minimum and highest standardised area concentration index			1.1.1	new	Sep 05

		Settlement structure assignment (1,2,3,4)			1.1.1	new	Sep 05
		Settlement structure assignment (alternative 1,3,4)			1.1.1	new	Sep 05
		Generation of PIAs - first iteration. Code of larger FUA (in terms of population) with which at least 33% of the PUSH area is shared			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 10 % criterion			1.1.1	new	Sep 05
		Generation of PIAs - second iteration. FUA (in terms of population) with which FUA indicated by "PUSH 39" shares at least 33% of its PUSH area.			1.1.1	new	Sep 05
		Generation of PIAs - third iteration. FUA (in terms of population) with which FUA indicated by "PUSH 40" shares at least 33% of its PUSH area.			1.1.1	new	Sep 05
		Generation of PIAs - fourth iteration. FUA (in terms of population) with which FUA indicated by "PUSH 41" shares at least 33% of its PUSH area. (Fifth iteration produces no further merges)			1.1.1	new	Sep 05
		PIA complexity - number of iterations needed to contruct the PIA (0 corresponds to PUSH areas which are not integrated into any PIA)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 5 % criterion			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 100 % criterion			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using 50%			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 10 % criterion (threshold adopted for the rest of the			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 5 % criterion			1.1.1	new	Sep 05
02 Population	021_Dependency_rates_95-99_N099_I	Dependency rate 1995	NUTS 0	1999	1.4.1	updated	Sep 05
		Dependency rate 1999	NUTS 0	1999	1.4.1	updated	Sep 05
	021_Dependency_rates_95-99_N299_I	Dependency rate 1995	NUTS 2	1999	1.4.1	updated	Sep 05
		Dependency rate 1999	NUTS 2	1999	1.4.1	updated	Sep 05
	021_N2-population_in_decreasing_N3-regions_N299_I	Share of NUTS 2 average population 1999 living in NUTS 3 regions with population decline 1995-1999	NUTS 2	1999	1.4.1	updated	Sep 05
		Share of NUTS 2 area comprising NUTS 3 regions with population decline 1995-1999	NUTS 2	1999	1.4.1	updated	Sep 05
	021_Population_age15-64_model-calculation_N099_I	Population between 15 and 64 years in 2000 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B3)	NUTS 0	1999	1.4.1	updated	Sep 05

		Population between 15 and 64 years in 2025 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_modelA-B_N099_I	Population with 65 and more years in 2050 (%) Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_model-calculation_N099_I	Population with 65 and more years in 2050 (%) (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_model-calculation_N299_I	Population with 65 and more years in 2000 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_N012399_I	Share (%) of population in the ages 65+ 1990	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
		Share (%) of population in the ages 65+ 1995	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
		Share (%) of population in the ages 65+ 1999	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
	021_Population_ageing_depopulation_N299_I	Average score on indirect "ageing"/ "depopulating" indicators	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Average score on indirect "ageing"/ "depopulating" indicators, Grouped (quartiles)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		National Total Fertility Rates 1999-2000 CODE	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_indicators_by_groups_N299_I	Ageing Population (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05

		Ageing "Labour Force" (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		"Labour Force" Replace-ment (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Post-Active Dependency (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Aged People vs. Youth (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Share of children (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Changes in Natural Growth Potential (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_indicators_by_indexes_N299_I	Ageing "Labour Force" (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Ageing Population (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Aged People vs. Youth (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Changes in Natural Growth Potential (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		"Labour Force" Replace-ment (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Post-Active Dependency (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Share of children (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Potential Support Ratio_modelAB1B2_N299_I	Potential Support Ratio in 2000 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2000 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2000 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Rural_area-typology_depopulation-category_N399_I	Type of rural area	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Relative depopulation, quartiles	NUTS 3	1999	1.4.1	**updated**	Sep 05
	021_Total_fertility_rate_N299_I	Total fertility rate 1990	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total fertility rate 1995	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total fertility rate 1999	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_External_immigration-rate_N299_I	External immigration	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Internal_external_migratory-balance_N299_I	Internal migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
		External migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Internal_mobility_N299_I	Internal mobility by region	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Mobility by region relative to national mobility	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_96-99_N2N399_I	Migratory balance between 1996 and 1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05

	022_Migratory_balance_96-99_N299_I	Migratory balance by regions between 1996 and 1999	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Absolute migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_by_age-class_N299_I	Migratory balance 17.5 to 27.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Migratory balance 32.5 to 42.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Migratory balance 52.5 to 67.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Synthetic cartography of migratory balances for the main age classes, 1995-2000	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_by_age-class_typology_N299_I	Typology of migratory balances by age classes	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_typology_N299_I	Typology crossing mobility and migratory balances	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_00-50_model-calculation_N099_I	Variation of the population 2000-2050 (%) (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B0)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B2)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	022_Population-change_00-50_model-calculation_N299_I	Variation of the population 2000-2050 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_90-00_N399_I	Popualtion change 1990-2000	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Popualtion change 1990-1995	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Popualtion change 1995-2000	NUTS 3	1999	1.4.1	**updated**	Sep 05
	022_Population-change_model-calculation_indicators_N299_I	Population with 65 and more years in 2050 (%) Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) vs Population with 65 andmore years in 2050 (%) (Model A) 4 categories	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) vs Population with 65 andmore years in 2050 (%) (Model A) 9 categories	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_net-migation_N2N399_I	Total population development 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05
		Natural population development 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05

		Net migration 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05
	021_Population_avg_90-03_N303_R	Average Population 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1992	NUTS 3	2003	3.2	**new**	Okt 05

		Average Population, males, 1992	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1992	NUTS 3	2003	3.2	new	Okt 05
		Average Population 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population, males, 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population 1990	NUTS 3	2003	3.2	new	Okt 05
		Average Population, males, 1990	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1990	NUTS 3	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1995_N203_R	Population total 1995	NUTS 2	2003	3.2	new	Okt 05
		Population male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years female 1995	NUTS 2	2003	3.2	new	Okt 05

		Population 40-44 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years female 1995	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1996_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1997_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1998_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1999_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_2000_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05

	021_Population_by_age-groups_2001_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
	021_Population_by_age-groups_2002_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
	021_Population_by_age-groups_2003_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
03 Employment and labour market							
04 Wealth and production	042_GDP_in_Euro_and_PPS_N003_R	GDP in Millions of Euro 1998	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 1999	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2000	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2001	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2002	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 0	2003	3.2	**new**	Nov 05
	042_GDP_in_Euro_and_PPS_N103_R	GDP in Millions of Euro 1998	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 1999	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2000	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2001	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2002	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 1	2003	3.2	**new**	Nov 05
	042_GDP_in_Euro_and_PPS_N203_R	GDP in Millions of Euro 1998	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 1999	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2002	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 2	2003	3.2	**new**	Okt 05
	042_GDP_in_Euro_and_PPS_N303_R	GDP in Millions of Euro 1998	NUTS 3	2003	3.2	**new**	Okt 05

		GDP in Millions of Purchasing Power Parities 1998	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 1999	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2000	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2001	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2002	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 3	2003	3.2	new	Okt 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N003_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1998	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1999	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2000	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2001	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2002	NUTS 0	2003	3.2	new	Nov 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N103_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1998	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1999	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2000	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2001	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2002	NUTS 1	2003	3.2	new	Nov 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N203_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 2	2003	3.2	new	Okt 05
		GDP in Euro per inhabitant 1998	NUTS 2	2003	3.2	new	Okt 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 2	2003	3.2	new	Okt 05
		GDP in Euro per inhabitant 1999	NUTS 2	2003	3.2	new	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 2	2003	3.2	new	Okt 05

		GDP in Euro per inhabitant 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2002	NUTS 2	2003	3.2	**new**	Okt 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N303_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 1998	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 1999	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2000	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2001	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2002	NUTS 3	2003	3.2	**new**	Okt 05
	042_Regional_specialisation_and_GDP_typology_N299_I	Typologies of regional specialisation and GDP per capita	NUTS 2	1999	1.1.3	**new**	Feb 05
	042_Regional_specialisation_and_GDP_typology_N299_I	Typologies of regional specialisation and GDP per capita	NUTS 2	1999	1.1.3	**new**	Feb 05
05 Enterprises and investments							
06 Transport							
07 Research and development							
08 Utilities	081_Carbon_dioxide_N099_I	CO2 Emissions 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		CO2 intensity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		CO2 per capita 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
	081_Energy_demand_by_sector_N099_I	Final Energy Demand 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Transport 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Commerce & others 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
	081_Energy_demand_by_source_N099_I	Final Energy Demand 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Electricity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05

		Final Energy Demand Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Final Energy Demand Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_net_imports_N099_I	Energy Net Imports 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Electricity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Derived Heat 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_prices_N099_I	Electricity Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Natural Gas Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Natural Gas Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Heating Gasoil Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Residual Fuel Oil Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Steam Coal Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Unleaded Petrol (95 RON) Prices 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Automotive Diesel Oil Prices 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_Production_N099_I	Energy Production 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Greenhouse_Gas_Emissions_N099_I	Greenhouse Gas Emissions 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Emissions of Acidifying Substances Acidifying Potential 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	082_Electricity_generation_N099_I	Electricity Generation 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Coal 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	082_Energy_consumption_N099_I	Energy Inland consumption 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05

		Energy Inland consumption Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
09 Communication technology	091_Telecommunication_typology_N299_I	A typology of estimated levels of business telecommunications access and uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	An overall typology of combined household and business telecommunications development	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	A typology comparing levels of household and business telecommunications uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	A typology of levels of household telecommunications uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
10 Household oriented infrastructure	102_Knowledge_indicators_N23i	Students in tertiary education (ISCED 5,6) in % of total students	NUTS 2/3	2003	2.4.2	**new**	Jan 06
		Patent registrations to the EPO per million inhabitants	NUTS 2/3	2003	2.4.2	**new**	Jan 06
11 Land use							
12 Environment	124_Avalanche_hazard_N399_I	Source of the avalance data	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Avalanche_hazard_N399_I	Occurrence of snow avalanches	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Change_of_dry_spell_length_forest_fire_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Change_of_dry_spell_length_forest_fire_N399_I	Change of dry spell length combined with forest fire hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Number of chemical plants in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Density of chemical plants per NUTS2 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Chemical plants hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Observed climatological average of total annual precipitation	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Present day dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Future dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Present day dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale basins in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale droughts in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale droughts in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Earthquake_pga_acceleration_N399_I	Pga in proportion on acceleration of gravity (with a 10% change of exceedance in 50 years) (raster data size 0.0833 degrees)	NUTS 3	1999	1.3.1	**updated**	Aug 05

	124_Earthquake_pga_acceleration_N399_I	Number of Avg_pgs_ac gridpoints inside a NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Earthquake_pga_acceleration_N399_I	Regional earthquake hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Cold day	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Cold wave (7 day minimum temperature)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Hot day	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Heat wave (7-day maximum temperature)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Extreme temperatures	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_events_average_1987_2002_N399_I	Regional flood hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_events_average_1987_2002_N399_I	Number of floods on remote areas	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_hazard_N399_I	Regional flood hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_hazard_N399_I	Change of precipitation combined with flood hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Number of observed forest fires in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Number of observed forest fires/1000sq. km in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Forest fire hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted natural hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted technological hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Degree of natural vulnerability in Europe (fragmented natural areas)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Damage potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of the vulnerability indicators	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Integrated vulnerability of Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Degree of economical vulnerability in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Known_volcanic_eruptions_N399_I	Volcanic eruptions during the last 10 000 years	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Landslide_occurrence_N399_I	Occurrence of landslides	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Nuclear_power_plants_distance_N399_I	Potential risk of radioactive contamination on NUTS3 regions	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of refineries and depots in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of oil terminals in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of oil pipelines in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Classification of Oil-SUM values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Storm_surge_hazard_N399_I	Occurrence of storm surges	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Number of airports in a NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Sum of passangers in NUTS3 region in millions in a year	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Air traffics hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Tsunami_occurrence_N399_I	Occurrence of tsunami runups and tsunami potential areas in	NUTS 3	1999	1.3.1	**updated**	Aug 05

		Europe					
	124_Vulnerability_N399_I	Degree of vulnerability in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Winter_and_tropical_storm_hazard_N399_I	Approximate probability of having winter storms and for tropical storms probable maximum intensity	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Winter_and_tropical_storm_hazard_N399_I	For tropical storms probable maximum intensity	NUTS 3	1999	1.3.1	**updated**	Aug 05
13 Agriculture							
14 Social situation							
15 Housing							
16 Cultural sites							
17 Tourism							
18 Public sector							
19 Other data							

ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

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January 2006

Volume 6
Territorial Impact Assessment

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

This basic report exists only in an electronic version.

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Introduction

The ESPON programme has come a long ways in exploring the territorial aspects of European developments and policies. It has, thus, accumulated great amounts of knowledge which, aside from the scientific advances, should offer policy makers a greater pool of information on which to base their decisions. Some efforts have been made to synthesise this information in a more understandable and concrete way (see project 2.4.2, for example, and, obviously, the work on scenarios in project 3.2). However, there still is a need for further operationalisation of this knowledge in order to allow its usage in the day-to-day context of policy making.

One of the tools high on the wish list of territorial policy makers is a tool which should allow non-specialists to organise their thinking about the territorial impacts of particular policy choices and programmes. This tool should offer the necessary framework for decision makers, and stakeholders in general, to help them explore the impacts of any policy on different spatial levels in order to allow informed debate and decision-making processes.

In reference to non-territorialised assessments of the same kind, this type of tool has been baptised **T**erritorial **I**mpact **A**ssessment (or TIA). Since the beginning of the programme, ESPON has attempted to shed some light on what TIA means and what it could look like in practical terms. TIA has been covered by all the priority 2 projects of the programme and some others. Most of the work has been about ex-post assessment of different sectoral policies, but some first attempts at ex-ante assessments also exist.

This report summarises the current state of work and debate in the ESPON programme on territorial impact assessment and presents a proposition of how project 3.2 proposes to advance on that question until the final report on this task which is foreseen for May 2006.

1. Caveat lector – about combining science and policy making in one tool

The interface between scientific research and evidence and policy making is a difficult one. Science is often incapable of giving clear answers to important questions as evidence is shaky and results can be interpreted in different ways. Policy making is often incapable of using scientific results as it operates within many other constraints then just those imposed by the limits of scientific knowledge. Policy will never be scientific as it is not about searching for the 'truth', but essentially about synthesising power struggles. Science will never be policy as it is not about taking decisions, but about asking questions.

Territorial impact assessment as discussed in this report is about finding a compromise between the two worlds by offering to policy makers a tool which is useful in their daily work but which at the same time results out of scientific knowledge. It has to allow the integration of power struggles and conflicts of interest while maintaining a certain solidity based on 'reality' as defined by scientific knowledge.

By definition, impact assessment of policies, especially of territorial policies, cannot be scientific in the positivist sense because of a lack of control groups and because results are not contestable. It is impossible to find exactly identical regions with exactly the same driving forces at work within them and to then apply a policy on some of these and not on the others in order to see the difference made by the policy. Territorial development is too

complex for identical regions to exist, and policy making does not allow for laboratory-type experimentation. This is true for ex-post assessments, and *a fortiori* for ex-ante approaches.

An important consequence of this is that assertions about specific impacts of specific policies cannot be falsified. Just as much as one cannot prove the actual cause and effect relationship between a policy and the evolutions in the territory this policy was applied upon (because of the lack of control groups), one cannot disprove claims about such effects. This makes impact assessment a highly political and - to a certain extent – politicized tool.

Any approach to impact assessment in general, and to territorial impact assessment in particular, therefore has to take this fundamental short-coming into account and has to make as explicit as possible the political aspects of the process.

2. TIA in ESPON

Within ESPON, TIA has been covered mainly by projects with Strand 2, plus some other projects which combine general trends and policy impacts:

- Project 1.1.3 'Enlargement'
- Project 2.1.1 'Transport Policy impact'
- Project 2.1.2 'R&D Policy impact'
- Project 2.1.3 'CAP impact'
- Project 2.1.4 'Energy'
- Project 2.1.5 'Fisheries'
- Project 2.2.1 'Structural Funds impact'
- Project 2.2.2 'Enlargement, Acquis, Pre-Aid, Phare/Tacis'
- Project 2.2.3 'Urban in Structural Funds'
- Project 2.3.1 'ESDP impact'
- Project 2.3.2 'Governance'
- Project 2.4.1 'Environment'
- Project 3.3 'Lisbon Strategy'
- Project 3.4.2 'Economy'

As can be seen from this list, most of these projects cover sectoral policies which are often devised without territorial aspects in mind. The aim of these projects was, therefore, to understand and to explain to policy makers how these policies affect different territories in diverse manners and what this implies for general aspects of the European territory such as its cohesion and structure.

3. Existing general evaluation of TIA in ESPON

ESPON project 3.1 has summarised the current state of TIA in ESPON in its final report, published in October 2004. In the outset they note the difference between classical impact assessment of projects and the proposed TIA of policies, which they propose to rather call 'territorial impact analysis' in order to give it a broader scope than the quite limited notion of assessment in a technical sense.

The authors also noted the difficulty of finding common methodological elements across a wide range of policy fields as shown in the following table from the report which provides an overview over the different approaches and methodologies used:

Table 72 Overview (FR = final report; TIR = third interim report)

TIA Minimum requirements	2.1.1 Transport &TEN (FR)	2.1.2 R&D (FR)	2.1.3 CAP & RD (FR)	2.1.4 Energy (TIR)	2.2.1 SF (TIR)	2.2.2 PreAc. (TIR)	2.2.3 SF urban areas (FR)
Reference to causing policy interventions	no reference to interventions (highly aggregated)	financial actions (RTD Frame, ERDF, ESF)	CAP expenditures	investments, energy infrastructure & energy relations (in 5 'blocks')	EU-funding incl. national co-financing	Phare and pre-accession aid measures	ERDF, ESF, CI Urban (30 interventions)
Hypothesis on cause-effect-relations	several existing complex models	speculations only	- 'direct' regional income - income multiplier	5 types of energy territorial impacts	economic disparities	Economic and social performance	Positive impacts on urban areas
Regional scale (min. NUTS 2)	NUTS 3	NUTS 2 (NUTS 1 for some)	NUTS 2/3 (estimations)	NUTS 2	NUTS 2/3	NUTS 3 (NUTS 2 for some)	NUTS 3/5 for observation NUTS 2/3/5 for analysis
Reference to past & future interventions	reference to past (1981-2001) hypothesis about future impacts (2001-2021)	primarily backwards	only ex-post analysis	review 'way forward'	Meta-evaluation of previous SF interventions	Analysis of past interventions, ex-post analysis	1994-1999 2000-2006
Interventions/ effects registered	accessibility regional welfare	input and context variables	subsidies farm income	energy - investment - production, - consumption,	SF at regional level, regional development trends and changing disparities	Economic and social performance	structure of intervention s

TIA Minimum requirements	2.1.1 Transport &TEN (FR)	2.1.2 R&D (FR)	2.1.3 CAP & RD (FR)	2.1.4 Energy (TIR)	2.2.1 SF (TIR)	2.2.2 PreAc. (TIR)	2.2.3 SF urban areas (FR)
				- service in 5 'domains'			
Quantitative/ qualitative appraisal	Quantitative Scenario analysis	mainly quantitative	mainly quantitative	mainly quantitative	mainly quantitative	Quantitative and qualitative analysis; test of working hypothesis	mainly quantitative
Concepts/ goals referred to	Cohesion, polycentricity efficiency v. equity	balanced development polycentric development competitiveness	cohesion environmental protection, polycentricity	Three ESDP guidelines	territorial cohesion, polycentric development; balanced development,	Balanced spatial competition and equity of economic and social cohesion	missing
Technique of analysis	simulation models classification of regions case studies	aggregate statistical analysis case studies	aggregate statistical analysis case studies	Input-Output model; aggregate statistical analysis case studies	comparing maps of regional distribution case studies	Cluster analysis, gini-coefficient, regression analysis	aggregate statistical analysis of 25 urban areas case studies
Applied understanding of 'territorial'	regional disparities	'Islands of R&D' (regions)	regional disparities	regional disparities	cross-sectoral approach to space	regional disparities	declining industrial urban areas
Territorial reference of outcome	several typologies of regions	typology of regions	typologies of regions	typologies of regions	typologies of regions	Typologies of all regions	typologies of regions

Figure 1 ***Overview of assessment approaches*** **- October 2004 (ESPON project 3.1, final report, Part C2, pp. 435-6, table 72)**

The project also developed a set of 'minimum requirements' defining the necessary elements of any TIA within ESPON (project 3.1, final report, pp. 453-455):

Elements constituting the analysis/assessment of territorial impacts of EU policies and programmes

Scoping

(1) Reference to policy interventions
Designation of the causing interventions assignable to EU budget lines
e.g. EIB grants for rail network element development
R&D support grant
direct income payment for farmers
ERDF expenditures co-financing government aids or public investments
Question to be answered: What is causing the impacts?

(2) Hypothesis on cause-effect-relations
Basis: hypothesis concerning cause-effect-relations (with varying empirical proof),
e.g. economic growth caused by improved accessibility,
increased innovation capacity by new R&D jobs,
lower unemployment by subsidising farms,
increasing GDP per capita by ERDF expenditures
Question to be answered: What is changed by the intervention(s)?

(3) Regional scale of observation
Designation of geographic reference to be used: regions concerned by intervention/effect; territorial level(s) of observation; covering all or selected (by what criteria) regions cause-effect-relations
e.g. NUTS 5, 4, 3, 2 regions
types of regions
Question to be answered: Level of observation and analysis?

(4) Reference to past and future
Cause-effect relations in the past as the basis for predicting the effects of future interventions; empirical experiences as well as outlooks to the future crucial for analytic treatment and political perception
e.g. past transport infrastructure investments (improvement of accessibility) and economic performance of regions; future scenarios of agriculture
Questions to be answered: What has happened, what may happen in future?

Analysing

(5) Interventions and effects measured
Implementation of the hypothesis concerning cause-effect-relations
e.g. relationship development investment amount accessibility changes,
R&D expenditures employment growth,
indirect payments changes of average farm income,
ERDF expenditures increasing GDP per capita
Question to be answered: What is registered, measured, appraised?

(6) Quantitative/qualitative appraisal
Designation of type of indicators selected

e.g. statistical variables
survey data
qualitative appraisals (ranking)
Question to be answered: By what kind of indicators the topic is described?

(7) Technique of analysis
Designation of type of analysis used
e.g. correlation analysis
simulation model
case studies
classifying regions
Question to be answered: How is the analysis performed?

Assessing

(8) Goals referred to
Designation of criteria for evaluation derived from the two ESPON key concepts focusing on the spatial dimension
Polycentric spatial development
at European level: several metropolitan regions as global integration zones instead of only one
at transnational level: enforcement of a polycentric system of metropolitan regions, city clusters and city networks
at national level: systems of cities including the corresponding rural areas and towns
open for application at lower levels, e.g. for the development within city regions (intra-regional)
(polycentric development at one level does not necessarily go along with the same at the other levels)
Cohesion
Economic: balanced territorial development concerning economic performance
Social: balanced territorial development concerning employment, income, education, population change
Territorial: fair access for citizens and economic operators to services of general economic interest; balanced distribution of human activities
Other goals derived from official documents may also be taken into account if they are related to types of regions or particular spatial entities mentioned below (9)
Question to be answered: What goals are referred to?

In the following section we will describe the practical approach proposed by project 3.2, taking into account the framework defined by the minimum requirements.

4. TEQUILA – a proposal for a general TIA methodology

4.1 The TIA / Territorial Cohesion link

A TIA methodology has necessarily to start by linking up with a sound theoretical and operational definition of Territorial Cohesion (TC) (cf. *Assessment* part of the minimum requirements).

TIA in fact means assessment of the impact of EU policies on the dimensions which are implicit in the general goal of Territorial Cohesion.

Unfortunately, up to now the Commission (and the ESPON project) were not able to agree on a defined and shared set of quantitative indicators enabling measurement of territorial cohesion and even its definition and content evolve continuously in parallel with the continuous deepening of the European reflection on possible territorial strategies.

While in another part of the present ESPON 3.2 Project an operational definition of TC is proposed in terms of geographical indicators (see vol.4, section 3 'ETCI'), in this part of the project the need for a theoretical definition is felt as crucial for the construction of a methodology for territorial impact assessment on a sound basis.

4.2 A theoretical definition of Territorial Cohesion

The very concept of territorial cohesion still remains somehow fuzzy and deserves clarification and logical consistency. In the Third Cohesion Report the Commission refers to it as a synonym for 'more balanced development', for 'territorial balance' or 'avoiding territorial imbalances' (CEC, 2004a, p. 27), elements that do not add much in definitional terms. As a further objective, the Commission states that 'the concern is also to improve territorial integration and encourage cooperation between regions', an important indication that may be placed though in a second rank in terms of priorities for policies.

More telling is the subsequent specification of the aspects that the new concept encompasses, at the different territorial levels: the excessive concentration of economic activity and population in the European 'pentagon', the imbalance between the main metropolitan areas and the rest of the countries, the growing congestion and pollution and the persistence of social exclusion in the main conurbations, the presence of rural areas suffering from inadequate economic links and peripherality, the sprawling nature of urban growth, the accumulation of natural and geographical handicaps in outermost areas. These are the main results of the effort engaged through the ESDP, that are now included in a policy document like the Cohesion Report.

A more thorough presentation of the concept of territorial cohesion is given by DG Regio in a subsequent report, the 'Interim Territorial Cohesion Report' (CEC, 2004c) devoted specifically to the subject, taking advantage of the early results of the ESPON program and of other Commission studies. According to the Report, territorial cohesion is complementary to economic and social cohesion, meaning 'the balanced distribution of human activities across the Union'; more importantly, 'it translates the goal of

sustainable and balanced development assigned to the Union into territorial terms' (CEC, 2004c, p. 3). The subsequent exemplification of the fields of application is similar to the one of the main Cohesion Report.

Subsequent policy documents and political statements on the subject did not develop the concept any further. The Presidency conclusions of the Informal Ministerial Meeting in Rotterdam (November 2004), explicitly devoted to territorial cohesion, states in fact that '…territorial cohesion adds to the concept of economic and social cohesion by translating the fundamental EU goal of balanced and sustainable development into a territorial setting'. In spite of the persisting fuzziness of the concept, the reference to a 'territorial setting' allowed Ministers to engage themselves until 2007 in a proper identification of '…the contribution of integrated spatial development approaches towards enabling regions and cities to exploit their potentials more effectively': the reference is to a future document on 'the territorial state of the Union', a second ESDP with a stronger policy emphasis.

The Scoping document on this new perspective was presented at the Informal Ministerial Meeting in Luxembourg, May 2005 (Luxembourg Presidency, 2005a). The definition of territorial cohesion remains the same, but it acquires a new 'practical' meaning when it is included in a direct policy frame: 'In practical terms territorial cohesion implies: *focusing regional and national territorial development policies* on better exploiting regional potentials and territorial capital – Europe's territorial and cultural diversity; *better positioning of regions in Europe* .....facilitating their connectivity and territorial integration; and *promoting the coherence of EU policies with a territorial impact*....' (p. I; emphasis in the text).

Relevant innovations are present in this passage. First, traditional 'spatial development policies' are called 'territorial', using a neologism in the English language that suggests the exploitation of territorial specificities going beyond pure location and distance in space. Second, the concept of territorial capital is used for the first time, implicitly underlining the fact that territory is a resource, potentially generating productivity increases ('higher return for specific kinds of investment') and utility flows to local communities.

Once arrived at this stage of comprehension of the content of territorial cohesion, a further step forward is necessary to reach a proper theoretical definition of the concept.

In our opinion, if the concept of territorial cohesion has to add to the content of economic and social cohesion, it must necessarily link with the sustainability issue. In a word, *territorial cohesion may be seen as the territorial dimension of sustainability*. And similarly to the concept of sustainability, it bears at the same time a positive and a normative sense (i.e., it defines a condition and policy goal) and operates by integrating different dimensions: the economic, the social and the environmental one (Camagni, 2005a and b).

The preceding definition may be explained in the following way. Considering both the positive and the normative side, sustainability conditions (and sustainability goals) refer to (and can be reached by operating through) four main (policy) dimensions (Camagni, 1998; Camagni, Capello, Nijkamp, 2001):

- the *technological dimension*, governing production processes,
- the *behavioral dimension*, determining life-styles, consumption habits and also organizational models of production (e.g. transport intensive models like just-in-time),
- the *diplomatic dimension*, referring to the international strategies to assure co-

operation among countries at different development levels, with different development expectations, and
- the *territorial dimension*, residing in an ordered, resource-efficient[1] and environmental-friendly spatial distribution of human activities.

In our opinion, territorial cohesion refers directly to the last dimension[2].

Taking this reflection further, we can envisage three main components of territorial cohesion, namely:

- *Territorial quality*: the quality of the living and working environment; comparable living standards across territories; similar access to services of general interest and to knowledge;
- *Territorial efficiency*: resource-efficiency with respect to energy, land and natural resources; competitiveness of the economic fabric and attractiveness of the local territory; internal and external accessibility;
- *Territorial identity*: presence of 'social capital'; capability of developing shared visions of the future; local know-how and specificities, productive 'vocations' and competitive advantage of each territory.

These objectives may be reached through an integrated approach, securing the virtuous integration and positive co-evolution of the three sub-systems mentioned above - the economic, the social and the physical-natural systems - in their spatial manifestation or phenomenology (Figure 1). This means maximizing the synergies and the positive cross-externalities from each sub-system and all the others, and minimizing the negative externalities (Camagni, 1998)[3].

The integrated, multidimensional nature of the sustainability concept provides a rationale for an integrated approach to territorial cohesion policies. But other elements push in the same direction, namely:

- the fragmentation of decision making powers, both in the public and the private spheres, with a diffuse presence of veto powers. This fact calls for the necessity of an integration and a co-operation, both vertical and horizontal, between the different tiers of the public government structures (usually engaged in different policy fields) and between the different departments of the same administration acting on the territory;
- the evidence of growing problems and concerns in specific territorial contexts, which call for complex, multidimensional interventions: metropolitan development, peri-urban settlement structure, coastal development, development through wide industrial corridors, sensitive environments like mountain areas crossed by international mobility corridors, … What really matters is the overall result of an equilibrated spatial development process, not the single dimensions through which such an equilibrium can be reached (infrastructure efficiency, proper land-use, smart development policies).

Territorial efficiency, quality and identity represent objectives and values in

1 We are referring to land resources, energy, natural and landscape resources.

2 One also has to bear in mind that the sustainability concept refers and links the need for ecological equilibria to the needs of the entire society, and therefore addresses a correct integration or co-evolution of the natural, the economic and the social system. Here we can find the link with the term 'cohesion'.

3 As an example among others: economic development in peripheral areas may be advantageous to the environment if a long term perspective on the use of local natural resources is taken and if it provides the (public) financial resources that may be channelled towards the betterment of environmental infrastructure; at the same time it may guarantee the permanence of the local population and the strengthening of its production culture and sense of belonging.

themselves; no modern society can do without them, as they are at the base of local collective wellbeing. But they are at the same time preconditions for local competitiveness and no conflict exists in this sense between the needs of the local population and the needs of the economic fabric, at least not in the long run. This element is conceptually utilized in recent EC's documents (Luxembourg Presidency 2005a and b) in order to justify compliance and consistency between cohesion policies and the Lisbon strategy.

While the first two objectives are rather familiar, the third, namely territorial identity, may be seen as rather surprising, but is in our opinion crucial and will become increasingly central for European policies. Territorial identities incorporated in local culture, know-how, social capital and landscape are the basic constituents of the territorial realm as, at the same time:

- they represent the ultimate glue of local societies,
- are linked with the spatial division of labor and in many cases determine its evolution,
- facilitate processes of collective learning and consequently boost the efficiency of the local production fabric.

Identities evolve but may be easily destroyed by spatial processes such as those of economic decline and desertification, peripheralization and lack of accessibility, destruction of the natural heritage, trivialization of territorial landscape through sprawling settlements. For these reasons they are fundamental constituents of territorial cohesion.

An important step in this direction is made by the already mentioned recent Scoping document of the Luxembourg Presidency (2005a), where natural but also cultural values are indicated as part of the endogenous potential of the different areas, worth a full exploitation. Furthermore, it is worth mentioning that the ESDP begins and ends with a reference to culture, cultural variety and cultural heritage as a characteristic feature of the European identity.

What situations and issues deserve attention from the new territorial policies and possibly from the new European structural policies? They may be found and described in the documents mentioned earlier, particularly in the ESDP, and may be summarized as in Figure 2. Reference to the main ESDP goals represents a must for any TIA methodology, as is well indicated in the 'minimum requirements' list presented before, in the 'assessing' part (point 8); our method is therefore consistent with these requirements.

The main issues encompassed by territorial efficiency, quality and identity may be indicated in rough terms as follows (but they will be more precisely detected and listed in the next phase of the research work.

Territorial efficiency:

Efficient and polycentric urban system

Inter-regional integration

Development of city-networks and medium cities

Resource efficiency: consumption of energy, land, water….

General accessibility

Sustainable transport: share of public transport and absence of congest.

Quality of transport and communication services
Compact city form, reduction of sprawl
Reduction of technological and environmental risk

Territorial quality:

Conservation and creative management of natural resources
Access to services of general interest
Quality of life and working conditions
Multiethnic solidarity and integration
Reduction of interregional income disparities
Reduction of poverty and exclusion
Cooperation between city and coutryside
Employment performance
……..

Territorial identity:

Conservation and creative management of cultural heritage
Development of region-specific know-how and knowledge
Development of territorial 'vocations' and 'visions'
Development of social capital; shared behavioural rules
Accessibility to global knowledge and creative 'blending' with local knowledge
……..

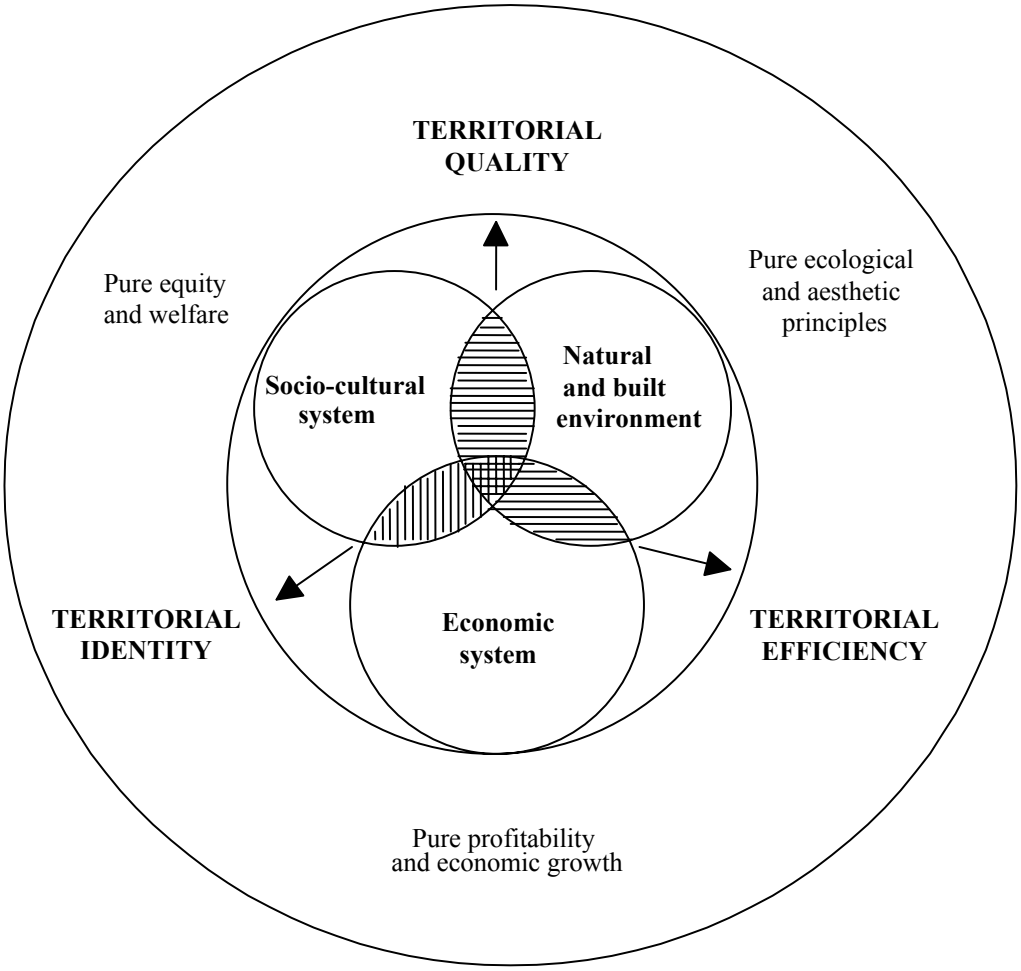

Figure 2 The components of territorial cohesion

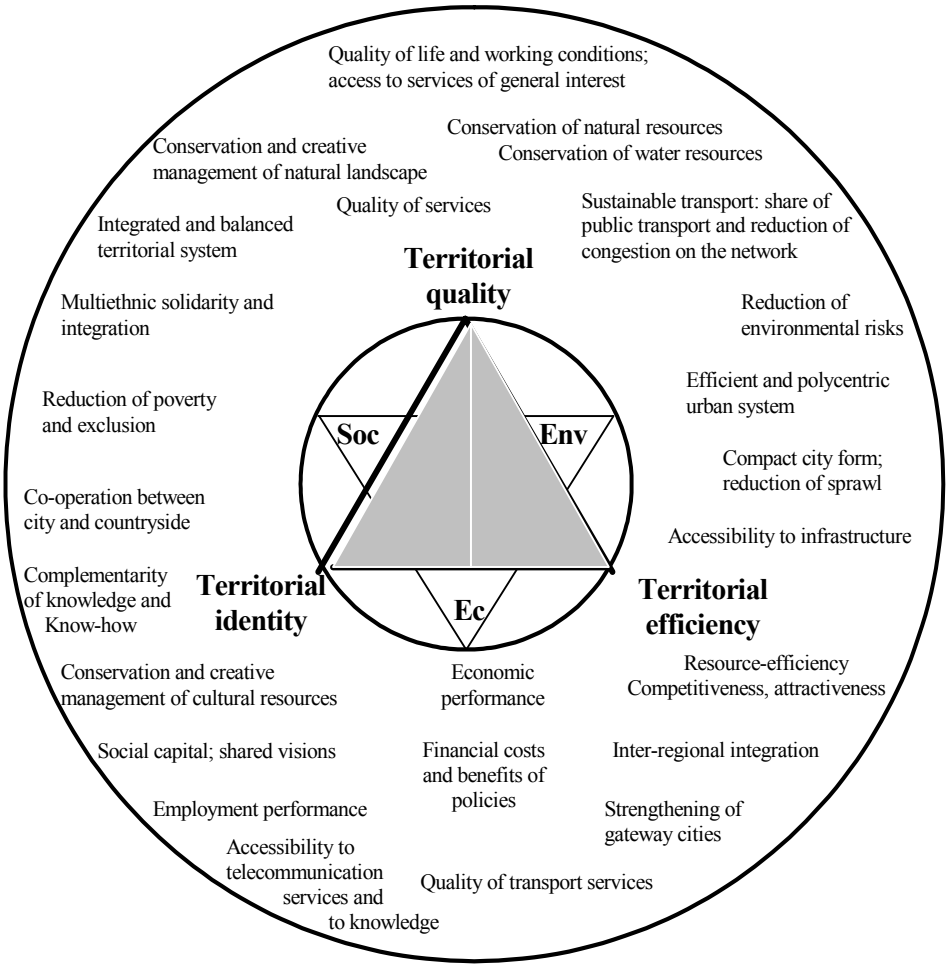

Figure 3 An integrated strategy for territorial cohesion: objectives and assessment criteria

Territorial quality: quality of living and working conditions; comparable living standards across territories; similar access to services of general interest and to knowledge

Territorial efficiency: resource-efficiency with respect to energy, land and natural resources; competitiveness and attractiveness; internal and external accessibility

Territorial identity: presence of "social capital"; capability of developing a shared vision of the future; know-how, specificities, productive "vocations" and competitive advantage of each territory

4.3 The General Assessment model: the TEQUILA Model

The theoretical definition of TC and its three main dimensions represent the basis elements on which the assessment methodology is built, the TEQUILA Model:

Territorial
Efficiency
QUality
Identity
Layered
Assessment
Model

The model will be built in operational terms in the next phase of project 3.2., but its main characteristics may be indicated now in the following points.

1. TEQUILA is a Multicriteria Model for the Territorial Impact Assessment of EU policies. As the 'dimensions' of territory are multiple, this well known assessment approach looks the most appropriate. (cf. *Analysing* part of the minimum requirements)

2. The 3 components of the T.C. concept and their sub-components become the *criteria* in the *General Assessment Model*

3. The *weights* of the 3 components and sub-components are defined in a multiple and flexible way:
   - determined inside ESPON 3.2. or ESPON in general, through an internal expert discussion
   - determined (or evaluated) by the ESPON Monitoring Committee
   - discussed with DG 16,
   - defined through Delphi inquiries, or else.

   In principle, they should not vary with respect to the policies analysed. Inside single assessment experiments, sensitivity of results with respect to change in weights will be tested. This is where the power relationships and the priorities of different interest groups mentioned in the 'caveat lector' section come apparent and are treated transparently (as long as the process of weighting is public).

4. The general impact of EU policies on each component/criterion will be defined using ad hoc studies and/or expert judgements. Cause/effect relations will be inspected (in accordance to minimum requirement n. 1-2) (points 2, 4, 5, 6 and

7 of the minimum requirements)

5. The methodology will accommodate in consistent and statistically sound ways both qualitative and quantitative impacts (in accordance to minimum requirement n. 6)

6. A method for combining quali-quantitative impact indicators inside the multi-criteria analysis will be supplied.

4.4 The Territorial Assessment model

The TEQUILA Model will supply us with a General Assessment of the impact of EU policies on the overall European territory (1st layer).
This assessment refers to an abstract territory, and the impact may be seen as a 'potential impact' (PIM) (cf. points 2 and 5 of the minimum requirements).

This 'general' assessment has to be made truly 'territorial', considering the specificities of the single European regions, as:

- the *impact* could be diversified according to regional specificities
- the *intensity* of the policy application may be different on different regions
- the *relevance* of the different 'criteria' of the assessment method is likely to be different for different regions (e.g.: the same increase in income has a different relevance according to the development level already achieved by the single regions)
- a region may not be subject to a specific policy

A **Territorial Impact Model** will be built, for assessing the impact on single regions r (2nd layer). It will be simple, operational and straightforward:

$$\mathbf{TIM}r = \sum_c \theta c \,.\, \mathbf{PIM}c \,.\, \mathbf{S}r,c \,.\, \mathbf{PI}r \,.\, \mathbf{Pa}r$$

TIM = territorial impact
c = criterion/dimension of the multi-criteria method
r = region
θc = weight of the c criterion/dimension
PIM = potential impact of policy (abstract, coming from Tequila model)
Sr,c = sensitivity of region r to criterion/dimension c (a weighted sum of regional indicators)
PI = policy intensity (in region r)
PA = policy applicability (a 0/1 variable)

Sr,c will be a vector (weighted sum) of regional characteristics, coming mainly from the ESPON data base.

4.5 Operational steps

The following operational steps will be performed in the next research phase:

1. Criteria: definition of criteria and sub-criteria, and their specific weight

2. Policies: selection of 2 EU pilot policies in different fields (e.g. infrastructure, R&D, social policy) to be used for the assessment exercise

3. Impact: definition of the logical link between each policy and the impact on criteria and sub-criteria

4. Model: construction of the full TEQUILA model: management of quali/quantitative impacts; sensitivity analysis of the model reaction to weight changes

5. Sensitivity: construction of the regional sensitivity indicators, for each policy

6. Mapping: experimental exercise on 2 policies

7. Evaluation of results with the Monitoring Committee

8. Revision (if necessary)

Once built and applied to two types of policies, the TEQUILA model will be (almost) ready for application to other EU policies. The only application-specific elements of the methodology are PIM, the potential impact of policies, that have to be evaluated case by case, and PI, namely policy intensity in each region (a much easier task with respect to PIM).

Regional scale of observation is in principle NUTS 3 (NUTS 2 in Germany), providing a good balance between data availability and internal homogeneity of regions (minimum requirement n. 3).

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

TPG members

- **Lead Partner:**

IGEAT – Institut de Gestion de l'Environnement et d'Aménagement du Territoire, Université Libre de Bruxelles (Belgium)

- **Co-leader:**

AETS – Agence Européenne «Territoires et Synergies » (France)

- **Partners:**

BBR – Bundesamt für Bauwesen und Raumordnung (Germany)
CRS- HAS – Centre for Regional Studies of the Hungarian Academy of Sciences (Hungary)
CUDEM – Centre for Urban Development and Environmental Management (United Kingdom)
DIG – Department of Management, Economics and Industrial Engineering, Politecnico di Milano (Italy)
MCRIT – Barcelona (Spain)
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ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

Volume 5
General scientific coordination of ESPON

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Introduction

An important task of project 3.2, taken over from project 3.1 in October 2004 is the support to the ESPON coordination unit in the scientific coordination of the entire ESPON programme. This consists in practical issues such as maintaining and enhancing the ESPON Database, preparing new versions of the ESPON Map Kit and preparing ESPON seminars and lead partner meetings. At the same time, more content-oriented aspects are also treated, such as the attempt of defining a common scientific approach to the projects, elaborating a limited list of ESPON key indicators for spatial monitoring, reflecting on how best to translate the research into policy recommendations (or 'policy options'), preparing ESPON publications, etc.

In this last year of the ESPON I programme, one main aim will also be to synthesise the acquis in order to make it easily transferrable to ESPON II. This concerns as much the practical issues of project management as the scientific issues.

1 The ESPON 'Binder'

In the first years of the ESPON I programme a tradition evolved of following-up each ESPON seminar with a so-called 'guidance paper'. These guidance papers attempted to summarise the discussions, in order to give clear guidance to lead partners on issues common to all research groups, the 'common scientific platform'. However, they also discussed very practical issues such as, for example, the structure and presentation of final reports.

At the lead partner meeting in February 2005, several lead partners voiced a request for one centralised document that would summarise the main messages of all guidance papers and thus make it easier for a new lead partner to find important information. It was decided to realise this in the form of a binder, both in paper (for those elements where it is possible) and electronic form, allowing a flexible and constantly evolving document. This has provisionnally be called the 'ESPON Binder', but a new name will have to be found.

Currently the following table of contents is foreseen for this binder:

Provisional table of contents of the 'ESPON Binder'

1. Introduction to ESPON

   1.1 What is ESPON
   1.2 Work Programme ?

2. General and administrative practicalities

   2.1 Role of a lead partner and relationship between lead partner and project partners
   2.2 Who's who (explanation MC, MA, CU, ECP, First-level financial control, etc + contact list CU + database maintainer + others ?)
   2.3 Explanation of the website + intranet
   2.4 Financial rules
   2.5 Copyright and publication rules

3. General research objectives and framework

   3.1 Current policy orientations
   3.2 Questions of scale: the ESPON three-level approach
   3.3 From research results and spatial goals to policy recommendations and options

4. Existing tools
   4.1 Elements of spatial monitoring
   4.2 ESPON database (see next section)
   4.3 WebGIS
   4.4 HyperAtlas
   4.5 Tools navigator
   4.6 ESPON bibliography
   4.7 TIA

5. Data issues
   5.1 ESPON database
      5.1.1 access (incl. relevant copyright issues)
      5.1.2 contents and structure
      5.1.3 submitting data to the database (incl. relevant copyright issues)
      5.1.4 requesting data for the database (incl. relevant copyright issues)
   5.2 Access to Eurostat
   5.3 Data collection handbook
   5.4 Data navigator

6. Design + structure

   6.1 Reports
   6.2 Maps
   6.3 Presentations

The tasks of elaborating the different parts of the binder have been divided between project 3.2 and the coordination unit. Work is currently ongoing.

An additional question will be the layout and form of presentation of this binder. Since it will also include references to certain tools such as the ESPON Database, the HyperAtlas, etc, a cdrom might be the best solution. The main text of the binder should, therefore, probably be written in HTML in order to provide the possibility to navigate through the binder

interactively (see figure 1). Any texts could then also be printed on paper if necessary. This will, however, have to be discussed with the coordination unit.

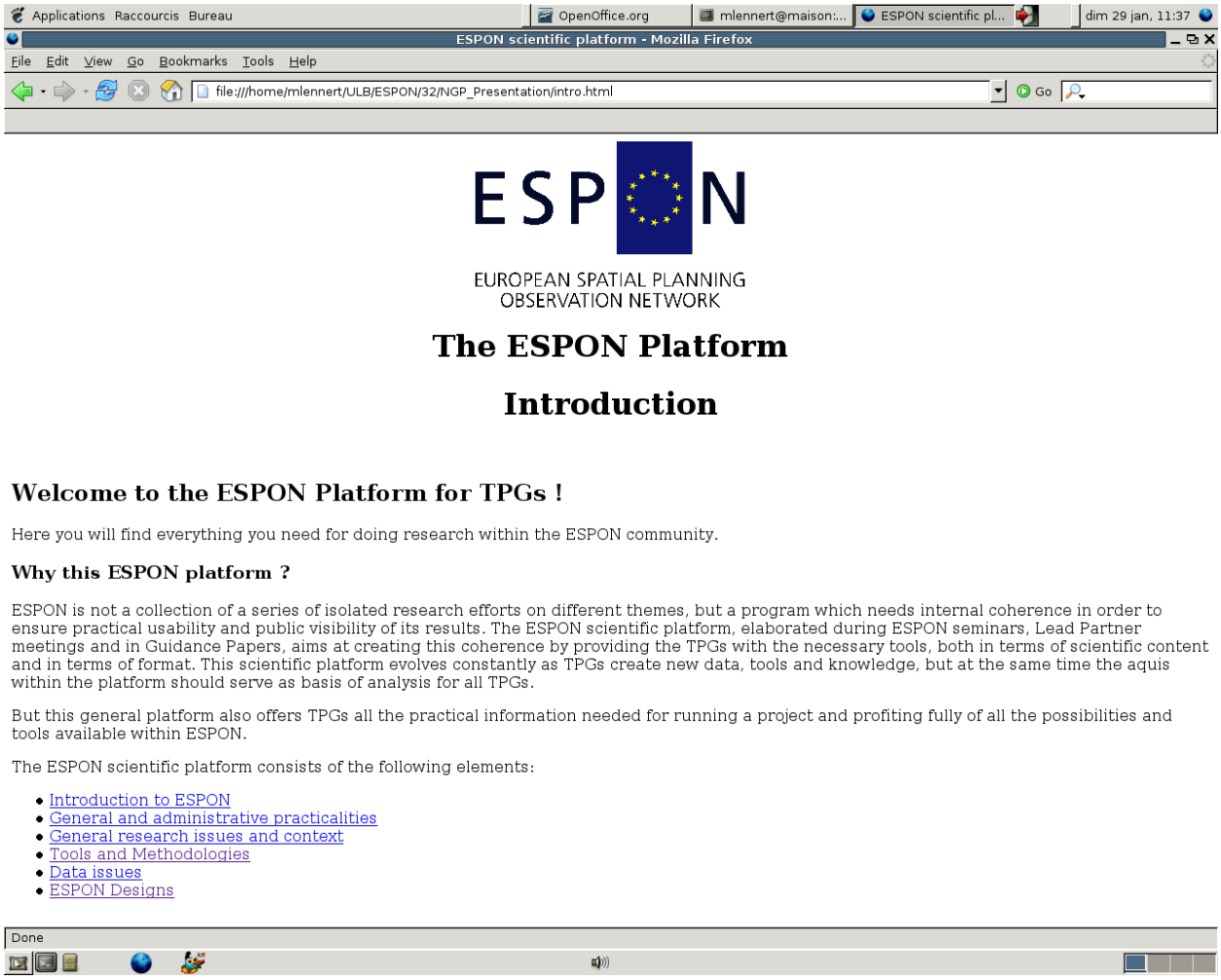

Figure 1 Example of possible interactive form of an ESPON binder

2 ESPON database

Since the presentation of the SIR in March 2005 the work on the ESPON database has been focused on the following issues:

- Collecting new data and updating existing data
- Further developing and improving of the front end (selection tool)

2.1 Collecting new data and updating existing data

The ESPON database covers data from mainly two different sources:

- General data collected by project 3.1/3.2
- Project data provided by the TPGs

New basic data

Eurostat is the most important data source for the ESPON programme, providing a great number of basic data like population structure, unemployment rate and gross domestic product. These data are normally provided for the regions of the EU25. The regions of Romania and Bulgaria have been recently been added to many series in the Eurostat Regio database. Their availability depends on the indicator. For the Swiss and Norwegian regions, data are available for only a short number of indicators. In these cases, project 3.2 will implement the filling-up and, if necessary, conversion by data from national statistical offices. In consideration of the problem of data harmonisation, this has to be done in the most appropriate way. Often, comparable regional distributions are calculated by fitting regional distributions from national sources to national values that are comparable across Europe.

A counting of the new data showed that, since the issue of the last ESPON database in October 2004, 982 new indicators and raw data have been integrated (see table 1).

Most of the new data are basic data provided by project 3.2 with more than 630 new raw data and indicators. Most of those data belong to the thematic field of population with more than 650 raw data. However, the high number of new basic data in this field is due to the division into different age groups and the coverage of several years. Furthermore, a number of new basic data (more than 80) were provided in the field of economic accounts like gross domestic product.

In more than 500 cases, the new basic data were calculated for the NUTS2 level, while only about 60 datasets concern NUTS3 level. The new basic data relate to 2003 NUTS version.

New project data

Project data represent another kind of data delivery for the database. In the framework of their scientific work, projects are required by the CU to provide process-produced data as an outcome of their research work. Project 3.2 has the task to accept these deliveries, to check them in regard to quality, to ask for additional delivery and, if needed, to integrate them into the database.

Since the last ESPON database, 340 new indicators from the TPGs have been integrated, more than 110 of which into the field of spatial typologies. Project 1.1.1, in particular, has delivered new site-related data referring to Functional Urban Areas (FUAs), Potential Urban Strategic Horizons (PUSHs) and Potential Polycentric Integration Areas (PIAs). Moreover, the final data of the Regional Classification of Europe (RCE) from project 2.4.2 make part of the current database. Single indicators as well as RCE indexes have been provided by project 2.4.2.

More than 110 new indicators have also been integrated in the field of population. These data were provided by project 1.1.4 and cover both population structure and population development models. The remaining new project data, each with more than 50 indicators, come from projects 1.3.1 and 2.1.4. Indicators from project 1.3.1 are updated hazard indicators in the field of environment. Project 2.1.4 has provided more than 50 indicators covering energy production and energy consumption.

The regional level of the new project data is in most cases NUTS 2 level. The data from project 2.1.4 are available on the basis of NUTS 0. The new and updated data from project 1.1.1 are related to the location of FUAs, PUSHs and PIAs. Only 59 indicators, mostly the hazard data from project 1.3.1, are available for the NUTS 3 level. The new project data are mostly provided for the 1999 NUTS version. Only the RCE indicators from project 2.4.2 refer to the new 2003 NUTS version.

Integration of the new NUTS classification

In August 2004, changes were made in the NUTS classification due to the creation of new regions and the reorganisation of existing regions. In some cases, those changes only affect NUTS 2 regions, in other cases also NUTS 3 regions. The changes in regions at NUTS 2 level could mostly be reconstructed by aggregation. There are only a few exceptions like Finland and Portugal. The changes in regions at NUTS 3 level cannot be adapted so easily. Latvia and Poland, for example, did not keep the regional border but set new regional delineations, which results in breaks in the data series. Since these first changes in the NUTS, the current data from Eurostat refer to the new classification and geometries. It is the task of project

3.2 to respond to these changes in the data of the ESPON database. This means that in the future, the database will contain each indicator twice: for the old NUTS classification - the '1999 NUTS version' - and for the new NUTS classification - the '2003 NUTS version'. This does not apply to the data based on model calculations from terminated projects.

Current data content of the ESPON database

By now the ESPON database covers around 4000 data. These are raw data, indicators, RCE-indicators, classifications and typologies. Numerically, we count 2501 raw data, 1349 indicators, 84 RCE-indicators, 34 classifications and 23 typologies.

Most of the data (about 3300) are available for the 1999 NUTS version, and 700 for the new 2003 NUTS version.

The current database is ready for download from the ESPON intranet site.

2.2 Further developing and improvement of the front end

One of the most important aspects of the ESPON database is its usability. Simple and fast access to data should be the prior objective. Therefore, a selection tool has been developed and provided to the ESPON projects in October 2004. Through consultation with some of the database users suggestions were collected, which will now be considered while working on a technical improvement. The completed database selection tool will be finalised and provided to the TPGs in May 2006.

One of the most important improvements in the selection tool is and will be a function that makes the search of indicators more comfortable. It was considered unsatisfying that 4 out of the 18 category folders, based on the data navigator categories, were empty: 'Enterprises and Investments', 'Social Situation', 'Housing' and 'Cultural Sites', as well as 21 subthemes. Due to the fact that the structure of the data navigator categories should be kept, a technical solution was developed, which enables the user to know if a category or theme folder is filled or not. Project 3.2 is at present working on the programming of this additional query tool.

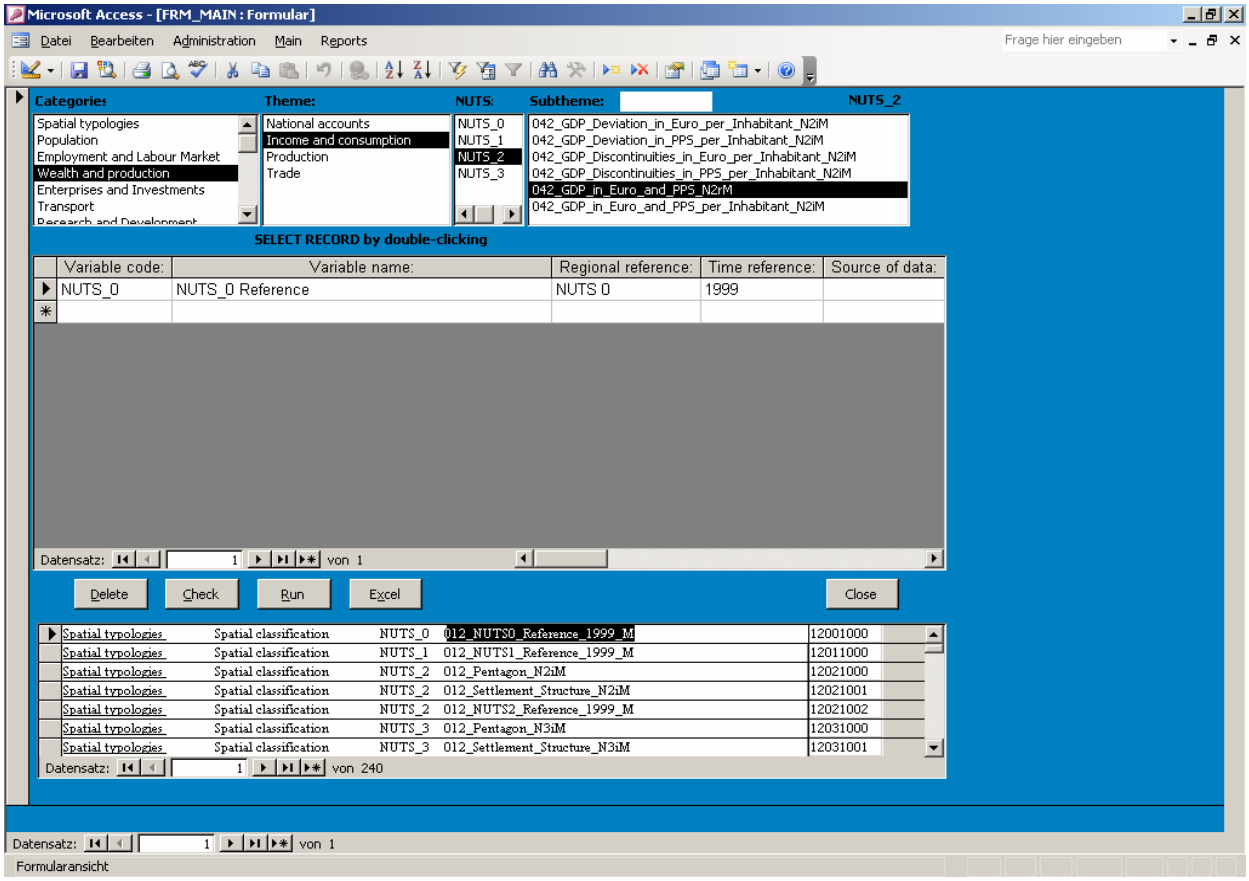

Figure 2 Screenshot of status quo of the ESPON database selection tool

The table in Appendix shows the new and updated indicators in the database.

3 ESPON map kit

3.1 State of the art and adjustments

On the basis of the in ESPON project 3.1 agreed map design, the ESPON map kit was elaborated including shape files of all regional levels for the ESPON countries. The first ESPON map kit has been designed and distributed on the basis of the ESRI software ArcView 3.2. ESPON project 3.1 has provided all the cartographic elements and data which are necessary for the construction of a EU25+2+2 map including an ArcView 3.2 apr-file as a template.

Over the past years many users migrated to the newer ESRI ArcMap software. Project 3.2 has therefore the task to provide both, an apr-file for the ArcView user and a mxd-file for the ArcMap user.

At the beginning of the map kit shape files were based on the 1999 NUTS version. Because of the changes in the nomenclature of the European statistical regions, adjustment and renovation were necessary.

Project 3.2 has integrated those changes continuously and step by step. The integration of the new NUTS geometries applied firstly to the new 2003 NUTS, appeared in November 2003. Those changes affected the NUTS 2 regions of Finland, Hungary, Italy, Poland and Portugal. In addition, NUTS 3 regions in Germany, Latvia and Poland were affected. In some cases, there was only a change in the NUTS codes. This was the case in the NUTS 2 regions of Hungary and Poland. In May 2004, when 10 new member states joined the EU, the regions became NUTS regions. After the accession, some of the new member states (Latvia, Poland and Hungary) decided on a new regional delineation. In Latvia almost all the NUTS 3 regions were affected. In Poland, changes affected the Warsaw and Slaskia regions, and in Hungary the Budapest region. Furthermore, in some countries the NUTS 1 level was introduced. Eurostat published this revision in August 2004. All these changes will be considered in the new NUTS version, which could replace the old NUTS 2003 from mid-January. The old NUTS 2003 version, for which no more data will be published by then, will just be replaced.

3.2 Provision of the new NUTS geometries

In October 2005 Eurostat provided the new GISCO geometries. Project 3.2 has the task to prepare these new files and provide them as new shape files to the TPGs.

Two new versions will be provided: The generalisation in 1:20 million. This more generalised version is suitable for mapping. The generalisation in 1:1 million. This fine generalisation is

for analytical purposes. Furthermore, unprojected files will be provided as well as projected files. The latter are particularly easy to use in ArcView but not only.

Project 3.2 is working on the preparation of those new files. However, there are still some problems with the new geometries. The Gisco geometries do not fit the Eurostat data in the case of Bulgaria. Currently the geometries are being prepared to fit with the Eurostat data. The new geometries will be delivered in the weeks after the submission of this report.

4 ESPON Indicators – the base of a European Continuous Spatial Monitoring

4.1 ESPON core indicators

Through the different rounds of ESPON projects, thematic studies and policy impact studies as well the integrative and scenario oriented projects, the ESPON programme has laid the ground for comparative information and for analysis of spatial structures and development of the European territory, not only the EU 25 Member States, but also the Candidate countries Bulgaria and Romania as well as the neighbouring countries Switzerland and Norway.

One of the aspects within the tasks of the transnational project groups was the provision of thematic related data and indicators based on them. For a first time data was collected systematically across many different fields in this territorial coverage and, thus, the basis for a spatially oriented information system was developed. The data collected so far includes a wide range of indicators for different spatial contexts, allowing for spatial monitoring, analyses of situations and trends as well as spatial policy advice including the assessment of the achievement of political goals.

The ESPON projects resulted in a great number of indicators covering their specific thematic aspect. With the recent updates the ESPON database now includes a total number of 1060 indicators. With respect to the restricted life time of the projects and to allow further continuation and update of the most relevant information the projects 3.1 and succeeding 3.2 elaborated, on the basis of project suggestions, a list of around 100 'core' indicators (which forms part of the ESPON database) of potentially high importance within a spatial information system and the measurement of living conditions in the regions of Europe.

Building upon these efforts, the ESPON database must guarantee a continuous provision of regional and spatial information during the ESPON process and should also lay the ground for the investigation of relevant issues to be considered in the future elaboration and definition of spatial indicators. Especially thinking of the programming period of ESPON and the successive ends of the different projects, the list of ESPON 'core' indicators has a crucial role within the discussion and decision-making processes in European spatial information and regional statistic activities and is one of the fundamental outcomes of the ESPON projects.

The selection of this range of indicators will be a valuable input for the potential maintenance and updating in the future. This must not stick necessarily to the future use of an indicator as such and as it has been defined in detail within ESPON. Especially related to model calculation output this 'core' indicator could be interpreted also as indication of the development and further development of indicators representing the same thematic evidence – maybe in a slightly different algorithm – but in a comparable spatial policy related orientation.

In this respect the list of ESPON 'core' indicators should be completed including the final results of the projects and the TPG's ending in the first half of 2006.

4.2 Spatial monitoring

In the philosophy of spatial monitoring aiming at measuring and analysing spatial phenomena, information is needed not only on the spatial structure, but also on elements that influence and change the spatial reality.

Spatial monitoring must satisfy both

I. demands for an analytical base for sound spatial analysis and
II. varying political demands enabling the evaluation of policy strategies and the assessment of the achievement of policy aims.

A policy-oriented spatial monitoring needs the sound base of a broader selection of the 'core' indicators. The freedom of choice is necessary to cover a detailed and profound demand on information arising from the need of interpretation on different regional levels and also to enable a detailed thematic evidence base.

However, a more general spatial policy-related process targeting to support the discussion of territorial issues could not be done with the complete range of spatial information as this would make the data too complex. The characterisation of the main challenges and the key factors in the context of territorial cohesion and spatial development needs a selection of a smaller number of indicators.

A limited list of indicators related to a territorial agenda - comparable to the elaboration of the short list of indicators related to the Lisbon/Gothenburg agenda - seems appropriate. As the name of this list indicated, it should be a short list. In the ideal case - but not necessarily due the thematic orientations of the ESPON in this programming period – it would represent a subset of the 'core' indicator list.

4.3 Towards a short list of indicators for general spatial monitoring

With the active involvement of Monitoring Committee members and Lead Partners of ESPON projects, a process was, therefore, initiated in order to identify a short list of 'key' indicators which could support a process of continuous monitoring, resulting in periodical reports related to territorial development.

Following the discussion of a proposal at the recent ESPON Lead Partner meeting, it was decided to proceed with the identification of the key indicators by crossing selected themes with agreed spatial policy options and aims.

Based on the current policy debate related to intergovernmental processes, in particular the ESDP and the future document on the Territorial State and Perspectives of the European Union, but also related to European policy objectives and priorities, particularly in relation to Territorial Cohesion and to the Lisbon Strategy, the following territorial policy fields were identified:

- Balanced distribution of population, wealth, cities, etc.
- Assets for global competitiveness
- Innovative knowledge society
- Diversified regional economies
- Sustainable transport and energy
- Sustainable settlement structures
- Socially inclusive society and space

- Healthy environment and hazard prevention
- Diversified cultural heritage and identities
- Territorially oriented governance

The more sector-oriented themes (although obviously also linked to policy priorities) include socio-economic, environment and culture related fields, which are based on ESPON projects:

- Urban development & hierarchy
- Urban-rural relationships
- Demography
- Innovation
- ICT
- Hazards
- Culture
- Transport
- Agriculture, Fisheries and Rural Development
- Energy
- Governance
- Environment
- Social issues
- Economy

The crossing of themes and policy objectives resulted in a matrix (see table) identifying, as a proposal, sets of thematic indicators in their territorial outline representing the short list of territorial indicators.

The 28 indicators included (without taking into account indicator proposals in the field of ESPON projects still running) can be considered 'intersections' of the full set of 'core' indicators with the main general policy needs. The empty boxes in the matrix are not foreseen to be filled in. However, indicators can be replaced with others that might be considered reflecting better an intersection of theme and policy orientation.

The set of 28 indicators that have been identified using the matrix covers all sectors and all identified main policy options with the exception of a) Governance, and b) Agriculture, Fishery and rural development. Suitable proposals to cover these aspects should come from the ongoing ESPON projects.

Also included in the matrix are indicators which can be based an ESPON data, but which have not yet been calculated. Furthermore a few indicators have been included from external sources on themes and policy orientations which could not be covered by projects of the first ESPON programme.

It has to be said that the current work on indicators confirms the continued existence of severe gaps in Europe-wide data at regional scale. One of the outcomes of the further considerations on mechanisms of European spatial monitoring will therefore include recommendations concerning future data collection, once the indicators and methodologies have been further defined and validated by the Monitoring Committee.

		Balanced distribution of , population, wealth, cities, etc.	Assets for global competitiveness	Innovative knowledge society	Diversified regional economies	Sustainable transport and energy	Sustainable settlement structures	Socially inclusive society and space *	Healthy environment and hazard prevention	Diversified cultural heritage and identities *	Territorially oriented governance *
Hazards	Project 1.3.1 'Natural hazards'								Hazard risk typology		
Culture	Project 1.3.3 'Cultural heritage'									Number of cultural sites	
Transport	Project 1.2.1 'Transport trends'; Project 2.1.1 'Transport Policy impact'	Potential time distance to centres of different levels	Multimodal accessibility			Intensity of transport flows by mode		Accessibility by public transport (or just by train – as a proxy)			
Agriculture, Fisheries and Rural Development	Project 2.1.3 'CAP impact'; Project 2.1.5 'Fisheries'										
Energy	Project 2.1.4 'Energy'					Energy consumption per type of user and source					
Governance	Project 2.3.1 'ESDP impact'; Project 2.3.2 'Governance'										
Environment	Project 1.3.2 'Natural heritage'; Project								Fragmentation index / Ground water quality		
Social issues	Project 1.4.2 on 'Social Dimension'	Rank-size index (by household income)		Population by education level							
Economy	Project 3.3 'Lisbon strategy'; Project 3.4.2 'Economy'	Rank-size index (by GDP)	Number of multinational headquarters	Employed in HI-TEC sector	Added value by economic sector (some specialisation index)						
Note: rank-size indices can be done in reference to the EU as a whole, countries, transnational cooperation areas, etc.											

Table 1 Matrix

4.4 The next steps

As the selection of 'key' indicators is relies on the broader base of the 'core' indicators, it seems necessary to put the selection process at the end when the results of all projects can be integrated. The complete list of spatial evidence developed at that point – in form of 'core' indicators will become the heritage of territorial evidence of ESPON for a continuous spatial monitoring and will provide the basis for the extraction of the 'key indicators'.

The identification of key indicators of the European territory has to be a process, subject to revision and adaptation every time main policy aims are revised and/or new knowledge on specific issues is produced, allowing for the identification of a better indicator.

The monitoring tool should also be seen as an integral part of a system, which includes the ESPON database (see section 2) and the entire list of 'core' indicators, the TIA tool (see volume 6) and the continuation of research work indispensable to understand deeper territorial trends and impacts of EU policy (for ex-ante but also for ex-post evaluation).

It also has to be recalled that without an extraordinary effort to collect and maintain territorialized data at NUTS 3 (or at least NUTS 2) level, these attempts to fill the gap in territorial knowledge will hardly succeed. And as explained in volume 4, section 3 (ETCI), some elements of territorial development actually demand even more precise data, going down to the LAU 1 and 2 levels.

During the ESPON seminar on 7-8 November 2005 in Manchester further discussions raised question concerning the following elements:

- What are the most important policy orientations and themes?
- Is the current crossing of themes and policy orientations, and the proposed resulting indicators, considered a good choice?
- Should some indicators be replaced?

This discussion process should be further cultivated within the ESPON community during the next month. The ESPON seminar in Salzburg on 13-14 March 2005 and the Final reports of almost all projects in spring this year provide a schedule to conclude this discussion in parallel to the elaboration of the final list of 'core' indicators.

On this base ESPON 3.2 and the CU will then adjust the matrix and propose the organisation of the further process with the aim of gaining the first experiences from testing in practice a monitoring based on the matrix and its key indicators.

APPENDIX

New and updated indicators for the ESPON database

Category	table	Indicator	NUTS level	NUTS Version	from Project	new / updated	date
01 Spatial typolgies	012_Polycentricity_indicators_N2303_I	Primacy rate	NUTS 2/3	2003	2.4.2	new	Jan 06
		Population density of permanently populated area	NUTS 2/3	2003	2.4.2	new	Jan 06
		Share of population in cities below 50.000 inhabitants	NUTS 2/3	2003	2.4.2	new	Jan 06
		FUA within the region	NUTS 2/3	2003	2.4.2	new	Jan 06
		MEGA within the region	NUTS 2/3	2003	2.4.2	new	Jan 06
	012_Regional_Classification_Europe_-final-_N203_I	GDP per capita in PPS	NUTS 2	2003	2.4.2	updated	Nov 05
		GDPgrowth in PPS per capita 1995-2002	NUTS 2	2003	2.4.2	updated	Nov 05
		Productivity - GDP per person employed	NUTS 2	2003	2.4.2	updated	Nov 05
		Employment rate	NUTS 2	2003	2.4.2	updated	Nov 05
		Expenditures, R&D, all institut sectors, in %	NUTS 2	2003	2.4.2	updated	Nov 05
		R&D BES personnel	NUTS 2	2003	2.4.2	updated	Nov 05
		High education population	NUTS 2	2003	2.4.2	updated	Nov 05
		Unemployment rate 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Developm Unemployment rate 1999-2003 in PP	NUTS 2	2003	2.4.2	updated	Nov 05
		Youth unemployment 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Labour Force Replacement:	NUTS 2	2003	2.4.2	updated	Nov 05
		Number of persons employed per km2 2003	NUTS 2	2003	2.4.2	updated	Nov 05
		Employment in tertary sector	NUTS 2	2003	2.4.2	updated	Nov 05
		Population ages 65 years and more, share of	NUTS 2	2003	2.4.2	updated	Nov 05
		Changes in Natural Growth Potential	NUTS 2	2003	2.4.2	updated	Nov 05
		Percent pop change 1995-2002	NUTS 2	2003	2.4.2	updated	Nov 05
		Artificial surface	NUTS 2	2003	2.4.2	updated	Nov 05
		Natural surface	NUTS 2	2003	2.4.2	updated	Nov 05
		Agricultural intensity	NUTS 2	2003	2.4.2	updated	Nov 05
		Regional average number of flood events	NUTS 2	2003	2.4.2	updated	Nov 05
		Approximate probability of having winter storms	NUTS 2	2003	2.4.2	updated	Nov 05
		Earthquake hazard potential	NUTS 2	2003	2.4.2	updated	Nov 05
		Change of dry spell combination with drought	NUTS 2	2003	2.4.2	updated	Nov 05
		Forest fires hazards	NUTS 2	2003	2.4.2	updated	Nov 05
		Oil hazards	NUTS 2	2003	2.4.2	updated	Nov 05
		Chemical plants	NUTS 2	2003	2.4.2	updated	Nov 05
		Potential Accessibility by Air	NUTS 2	2003	2.4.2	updated	Nov 05

		Potential Accessibility by Rail	NUTS 2	2003	2.4.2	**updated**	Nov 05
		Potential Accessibility by Road	NUTS 2	2003	2.4.2	**updated**	Nov 05
		Time to market meso-scale	NUTS 2	2003	2.4.2	**updated**	Nov 05
	012_Regional_Classification_Europe_-final-_Indices_N203_I	RCE - classified accessibility	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified demography	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified economy	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified labour market	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified lisbon performance	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified naturalness	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified natural hazards	NUTS 2	2003	2.4.2	**updated**	Nov 05
		RCE - classified technological hazards	NUTS 2	2003	2.4.2	**updated**	Nov 05
	013_Functional_Urban_Areas_I	FUA population			1.1.1	**updated**	Sep 05
		FUA DEMOGRAPHIC-MASS_CODE			1.1.1	**updated**	Sep 05
		FUA TRANSPORT_CODE			1.1.1	**updated**	Sep 05
		FUA UNIVERSITY_CODE			1.1.1	**updated**	Sep 05
		FUA DECISION-MAKING_CODE			1.1.1	**updated**	Sep 05
		FUA ADMINISTRATION_CODE			1.1.1	**updated**	Sep 05
		FUA TOURISM_CODE			1.1.1	**updated**	Sep 05
		FUA manufacturing, with two sub-indicators, classification			1.1.1	**updated**	Sep 05
		FUA AVERAGE			1.1.1	**updated**	Sep 05
		FUA CLASSIFICATION			1.1.1	**updated**	Sep 05
	013_Functional_Urban_Areas_MEGAS_I	MEGA_DEMOGRAPHIC-MASS_INDEX			1.1.1	**updated**	Sep 05
		MEGA_COMPETITIVENESS_INDEX			1.1.1	**updated**	Sep 05
		MEGA_CONNECTIVITY_INDEX			1.1.1	**updated**	Sep 05
		MEGA_KNOWLEDGE_INDEX			1.1.1	**updated**	Sep 05
		MEGA_AVERAGE_INDICES			1.1.1	**updated**	Sep 05
		MEGA_DEMOGRAPHIC-MASS_SCORE			1.1.1	**updated**	Sep 05
		MEGA_COMPETITIVENESS_SCORE			1.1.1	**updated**	Sep 05
		MEGA_CONNECTIVITY_SCORE			1.1.1	**updated**	Sep 05
		MEGA_KNOWLEDGE_SCORE			1.1.1	**updated**	Sep 05
		MEGA_CLASSIFICATION			1.1.1	**updated**	Sep 05
	013_Potential_Polycentric_Integration_Areas_PIA_I	PIA population: Number of inhab in municipalities included in PIA			1.1.1	**new**	Sep 05
		Number of PUSH areas in each PIA			1.1.1	**new**	Sep 05
		Rank of PIA main node according to its PUSH population			1.1.1	**new**	Sep 05

		Rank of PIA according to its total population			1.1.1	new	Sep 05
		Rank of PIA, comparing its total pop.			1.1.1	new	Sep 05
	013_Potential_Urban_Strategic_Horizons_PUSH_I	Extent of 45-minute Isochrones;			1.1.1	new	Sep 05
		Ratio between PUSH Area and Isochrone area;			1.1.1	new	Sep 05
		PUSH area population			1.1.1	new	Sep 05
		Ratio between PUSH area population and FUA pop			1.1.1	new	Sep 05
		Number of FUA centres included in each PUSH area;			1.1.1	new	Sep 05
		Number of ESPON countries covered by each PUSH area			1.1.1	new	Sep 05
		Proportion of PUSH area overlapping with other PUSH areas			1.1.1	new	Sep 05
		Total settlement area (in km2)			1.1.1	new	Sep 05
		Number of settlement units within the PUSH			1.1.1	new	Sep 05
		Proportion of settlement area on total PUSH area (in %)			1.1.1	new	Sep 05
		Smallest settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 100 % criterion			1.1.1	new	Sep 05
		Area of the 2nd greatest settlement area in PUSH (in km2			1.1.1	new	Sep 05
		Largest settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Average settlement area in PUSH (in km2)			1.1.1	new	Sep 05
		Standard deviation of settlement areas in PUSH (in km2)			1.1.1	new	Sep 05
		Gini coefficient of settlement areas			1.1.1	new	Sep 05
		Average distance between all settlement areas within a push			1.1.1	new	Sep 05
		Distance between the largest and 2nd largest settlement unit			1.1.1	new	Sep 05
		Maximum standardised area concentration index (PUSH=100)			1.1.1	new	Sep 05
		2nd highest standardised area concentration index (PUSH =100)			1.1.1	new	Sep 05
		Minimum standardised area concentration index (PUSH =100)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 50 % criterion			1.1.1	new	Sep 05
		Average standardised area concentration index (PUSH=100)			1.1.1	new	Sep 05
		Range between max & min standardised area concentration index			1.1.1	new	Sep 05
		Difference between highest & 2nd highest standardised area concent. index			1.1.1	new	Sep 05
		Difference between 2nd highest & average standardised area concentration index			1.1.1	new	Sep 05
		Ratio between 2nd highest and highest standardised area concentration index			1.1.1	new	Sep 05
		Ratio between average and highest standardised area concentration index			1.1.1	new	Sep 05
		Ratio between minimum and highest standardised area concentration index			1.1.1	new	Sep 05

		Settlement structure assignment (1,2,3,4)			1.1.1	new	Sep 05
		Settlement structure assignment (alternative 1,3,4)			1.1.1	new	Sep 05
		Generation of PIAs - first iteration. Code of larger FUA (in terms of population) with which at least 33% of the PUSH area is shared			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 10 % criterion			1.1.1	new	Sep 05
		Generation of PIAs - second iteration. FUA (in terms of population) with which FUA indicated by "PUSH 39" shares at least 33% of its PUSH area.			1.1.1	new	Sep 05
		Generation of PIAs - third iteration. FUA (in terms of population) with which FUA indicated by "PUSH 40" shares at least 33% of its PUSH area.			1.1.1	new	Sep 05
		Generation of PIAs - fourth iteration. FUA (in terms of population) with which FUA indicated by "PUSH 41" shares at least 33% of its PUSH area. (Fifth iteration produces no further merges)			1.1.1	new	Sep 05
		PIA complexity - number of iterations needed to contruct the PIA (0 corresponds to PUSH areas which are not integrated into any PIA)			1.1.1	new	Sep 05
		Area of assigned to the PUSH using the 5 % criterion			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 100 % criterion			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using 50%			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 10 % criterion (threshold adopted for the rest of the			1.1.1	new	Sep 05
		Number of municipalities assigned to the PUSH using the 5 % criterion			1.1.1	new	Sep 05
02 Population	021_Dependency_rates_95-99_N099_I	Dependency rate 1995	NUTS 0	1999	1.4.1	updated	Sep 05
		Dependency rate 1999	NUTS 0	1999	1.4.1	updated	Sep 05
	021_Dependency_rates_95-99_N299_I	Dependency rate 1995	NUTS 2	1999	1.4.1	updated	Sep 05
		Dependency rate 1999	NUTS 2	1999	1.4.1	updated	Sep 05
	021_N2-population_in_decreasing_N3-regions_N299_I	Share of NUTS 2 average population 1999 living in NUTS 3 regions with population decline 1995-1999	NUTS 2	1999	1.4.1	updated	Sep 05
		Share of NUTS 2 area comprising NUTS 3 regions with population decline 1995-1999	NUTS 2	1999	1.4.1	updated	Sep 05
	021_Population_age15-64_model-calculation_N099_I	Population between 15 and 64 years in 2000 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model A)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B1)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2025 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B2)	NUTS 0	1999	1.4.1	updated	Sep 05
		Population between 15 and 64 years in 2000 (%) (Model B3)	NUTS 0	1999	1.4.1	updated	Sep 05

		Population between 15 and 64 years in 2025 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Population between 15 and 64 years in 2050 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_modelA-B_N099_I	Population with 65 and more years in 2050 (%) Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 Model A vs Model B0 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 Model B2 vs Model C4 relative position	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_model-calculation_N099_I	Population with 65 and more years in 2050 (%) (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		PSR in 2050 (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_model-calculation_N299_I	Population with 65 and more years in 2000 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2000 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2025 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_age65_N012399_I	Share (%) of population in the ages 65+ 1990	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
		Share (%) of population in the ages 65+ 1995	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
		Share (%) of population in the ages 65+ 1999	NUTS 1,2,3	1999	1.4.1	**updated**	Sep 05
	021_Population_ageing_depopulation_N299_I	Average score on indirect "ageing"/ "depopulating" indicators	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Average score on indirect "ageing"/ "depopulating" indicators, Grouped (quartiles)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		National Total Fertility Rates 1999-2000 CODE	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_indicators_by_groups_N299_I	Ageing Population (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05

		Ageing "Labour Force" (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		"Labour Force" Replace-ment (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Post-Active Dependency (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Aged People vs. Youth (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Share of children (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Changes in Natural Growth Potential (4 groups)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Population_indicators_by_indexes_N299_I	Ageing "Labour Force" (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Ageing Population (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Aged People vs. Youth (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Changes in Natural Growth Potential (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		"Labour Force" Replace-ment (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Post-Active Dependency (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Share of children (indexes)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Potential Support Ratio_modelAB1B2_N299_I	Potential Support Ratio in 2000 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2000 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model B1)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2000 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2025 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	021_Rural_area-typology_depopulation-category_N399_I	Type of rural area	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Relative depopulation, quartiles	NUTS 3	1999	1.4.1	**updated**	Sep 05
	021_Total_fertility_rate_N299_I	Total fertility rate 1990	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total fertility rate 1995	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total fertility rate 1999	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_External_immigration-rate_N299_I	External immigration	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Internal_external_migratory-balance_N299_I	Internal migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Total migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
		External migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Internal_mobility_N299_I	Internal mobility by region	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Mobility by region relative to national mobility	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_96-99_N2N399_I	Migratory balance between 1996 and 1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05

	022_Migratory_balance_96-99_N299_I	Migratory balance by regions between 1996 and 1999	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Absolute migratory balance	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_by_age-class_N299_I	Migratory balance 17.5 to 27.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Migratory balance 32.5 to 42.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Migratory balance 52.5 to 67.5 years old	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Synthetic cartography of migratory balances for the main age classes, 1995-2000	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_by_age-class_typology_N299_I	Typology of migratory balances by age classes	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Migratory_balance_typology_N299_I	Typology crossing mobility and migratory balances	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_00-50_model-calculation_N099_I	Variation of the population 2000-2050 (%) (Model A)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B0)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B2)	NUTS 0	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B3)	NUTS 0	1999	1.4.1	**updated**	Sep 05
	022_Population-change_00-50_model-calculation_N299_I	Variation of the population 2000-2050 (%) (Model A)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B0)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B2)	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) (Model B3)	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_90-00_N399_I	Popualtion change 1990-2000	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Popualtion change 1990-1995	NUTS 3	1999	1.4.1	**updated**	Sep 05
		Popualtion change 1995-2000	NUTS 3	1999	1.4.1	**updated**	Sep 05
	022_Population-change_model-calculation_indicators_N299_I	Population with 65 and more years in 2050 (%) Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model A vs Model B0 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Population with 65 and more years in 2050 (%) Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Potential Support Ratio in 2050 Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) Model B2 vs Model C4 relative position	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) vs Population with 65 andmore years in 2050 (%) (Model A) 4 categories	NUTS 2	1999	1.4.1	**updated**	Sep 05
		Variation of the population 2000-2050 (%) vs Population with 65 andmore years in 2050 (%) (Model A) 9 categories	NUTS 2	1999	1.4.1	**updated**	Sep 05
	022_Population-change_net-migation_N2N399_I	Total population development 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05
		Natural population development 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05

		Net migration 1996-1999	NUTS 2,3	1999	1.4.1	**updated**	Sep 05
	021_Population_avg_90-03_N303_R	Average Population 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2003	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2002	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2001	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 2000	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1999	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1998	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1997	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1996	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1995	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1994	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, males, 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population, females, 1993	NUTS 3	2003	3.2	**new**	Okt 05
		Average Population 1992	NUTS 3	2003	3.2	**new**	Okt 05

		Average Population, males, 1992	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1992	NUTS 3	2003	3.2	new	Okt 05
		Average Population 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population, males, 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1991	NUTS 3	2003	3.2	new	Okt 05
		Average Population 1990	NUTS 3	2003	3.2	new	Okt 05
		Average Population, males, 1990	NUTS 3	2003	3.2	new	Okt 05
		Average Population, females, 1990	NUTS 3	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1995_N203_R	Population total 1995	NUTS 2	2003	3.2	new	Okt 05
		Population male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 5-9 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 10-14 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 15-19 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 20-24 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 25-29 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 30-34 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 35-39 years female 1995	NUTS 2	2003	3.2	new	Okt 05

		Population 40-44 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 40-44 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 45-49 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 50-54 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 55-59 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 60-64 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 65-69 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 70-74 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 75-79 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 80-84 years female 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years male 1995	NUTS 2	2003	3.2	new	Okt 05
		Population 85 years and more years female 1995	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1996_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1997_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1998_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_1999_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05
	021_Population_by_age-groups_2000_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	new	Okt 05

	021_Population_by_age-groups_2001_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
	021_Population_by_age-groups_2002_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
	021_Population_by_age-groups_2003_N203_R	see "021_Population_by_..._1995…"	NUTS 2	2003	3.2	**new**	Okt 05
03 Employment and labour market							
04 Wealth and production	042_GDP_in_Euro_and_PPS_N003_R	GDP in Millions of Euro 1998	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 1999	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2000	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2001	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2002	NUTS 0	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 0	2003	3.2	**new**	Nov 05
	042_GDP_in_Euro_and_PPS_N103_R	GDP in Millions of Euro 1998	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 1999	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2000	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2001	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Euro 2002	NUTS 1	2003	3.2	**new**	Nov 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 1	2003	3.2	**new**	Nov 05
	042_GDP_in_Euro_and_PPS_N203_R	GDP in Millions of Euro 1998	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 1998	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 1999	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Euro 2002	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 2	2003	3.2	**new**	Okt 05
	042_GDP_in_Euro_and_PPS_N303_R	GDP in Millions of Euro 1998	NUTS 3	2003	3.2	**new**	Okt 05

		GDP in Millions of Purchasing Power Parities 1998	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 1999	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 1999	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2000	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2000	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2001	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2001	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Euro 2002	NUTS 3	2003	3.2	new	Okt 05
		GDP in Millions of Purchasing Power Parities 2002	NUTS 3	2003	3.2	new	Okt 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N003_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1998	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1999	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2000	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2001	NUTS 0	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 0	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2002	NUTS 0	2003	3.2	new	Nov 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N103_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1998	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 1999	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2000	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2001	NUTS 1	2003	3.2	new	Nov 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 1	2003	3.2	new	Nov 05
		GDP in Euro per inhabitant 2002	NUTS 1	2003	3.2	new	Nov 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N203_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 2	2003	3.2	new	Okt 05
		GDP in Euro per inhabitant 1998	NUTS 2	2003	3.2	new	Okt 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 2	2003	3.2	new	Okt 05
		GDP in Euro per inhabitant 1999	NUTS 2	2003	3.2	new	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 2	2003	3.2	new	Okt 05

		GDP in Euro per inhabitant 2000	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2001	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 2	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2002	NUTS 2	2003	3.2	**new**	Okt 05
	042_GDP_in_Euro_and_PPS_per_inhabitant_N303_I	GDP in Purchasing Power Parities per inhabitant 1998	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 1998	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 1999	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 1999	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2000	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2000	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2001	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2001	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Purchasing Power Parities per inhabitant 2002	NUTS 3	2003	3.2	**new**	Okt 05
		GDP in Euro per inhabitant 2002	NUTS 3	2003	3.2	**new**	Okt 05
	042_Regional_specialisation_and_GDP_typology_N299_I	Typologies of regional specialisation and GDP per capita	NUTS 2	1999	1.1.3	**new**	Feb 05
	042_Regional_specialisation_and_GDP_typology_N299_I	Typologies of regional specialisation and GDP per capita	NUTS 2	1999	1.1.3	**new**	Feb 05
05 Enterprises and investments							
06 Transport							
07 Research and development							
08 Utilities	081_Carbon_dioxide_N099_I	CO2 Emissions 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		CO2 intensity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		CO2 per capita 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
	081_Energy_demand_by_sector_N099_I	Final Energy Demand 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Transport 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Commerce & others 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
	081_Energy_demand_by_source_N099_I	Final Energy Demand 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Final Energy Demand Electricity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05

		Final Energy Demand Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Final Energy Demand Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_net_imports_N099_I	Energy Net Imports 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Electricity 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Net Imports Derived Heat 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_prices_N099_I	Electricity Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Natural Gas Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Natural Gas Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Heating Gasoil Prices for Households 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Residual Fuel Oil Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Steam Coal Prices for Industry 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Unleaded Petrol (95 RON) Prices 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Automotive Diesel Oil Prices 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Energy_Production_N099_I	Energy Production 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Energy Production Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	081_Greenhouse_Gas_Emissions_N099_I	Greenhouse Gas Emissions 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Emissions of Acidifying Substances Acidifying Potential 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	082_Electricity_generation_N099_I	Electricity Generation 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Coal 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
		Electricity Generation Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05
	082_Energy_consumption_N099_I	Energy Inland consumption 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	new	Okt 05

		Energy Inland consumption Solid fuels 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Oil 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Gas 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Nuclear 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Renewables 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
		Energy Inland consumption Other 1990, 1995, 2000, 2002	NUTS 0	1999	2.1.4	**new**	Okt 05
09 Communication technology	091_Telecommunication_typology_N299_I	A typology of estimated levels of business telecommunications access and uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	An overall typology of combined household and business telecommunications development	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	A typology comparing levels of household and business telecommunications uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
	091_Telecommunication_typology_N299_I	A typology of levels of household telecommunications uptake	NUTS 2	1999	1.2.2	**new**	Jan 05
10 Household oriented infrastructure	102_Knowledge_indicators_N23i	Students in tertiary education (ISCED 5,6) in % of total students	NUTS 2/3	2003	2.4.2	**new**	Jan 06
		Patent registrations to the EPO per million inhabitants	NUTS 2/3	2003	2.4.2	**new**	Jan 06
11 Land use							
12 Environment	124_Avalanche_hazard_N399_I	Source of the avalance data	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Avalanche_hazard_N399_I	Occurrence of snow avalanches	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Change_of_dry_spell_length_forest_fire_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Change_of_dry_spell_length_forest_fire_N399_I	Change of dry spell length combined with forest fire hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Number of chemical plants in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Density of chemical plants per NUTS2 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Chermical_plants_N399_I	Chemical plants hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Observed climatological average of total annual precipitation	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Present day dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Future dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_dry_spell_length_N399_I	Present day dry spell	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale basins in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale droughts in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Large scale droughts in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Drought_large_scale_N399_I	Change of dry spell between present day and 2071-2100	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Earthquake_pga_acceleration_N399_I	Pga in proportion on acceleration of gravity (with a 10% change of exceedance in 50 years) (raster data size 0.0833 degrees)	NUTS 3	1999	1.3.1	**updated**	Aug 05

	124_Earthquake_pga_acceleration_N399_I	Number of Avg_pgs_ac gridpoints inside a NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Earthquake_pga_acceleration_N399_I	Regional earthquake hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Cold day	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Cold wave (7 day minimum temperature)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Hot day	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Heat wave (7-day maximum temperature)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Extreme_temperatures_N399_I	Extreme temperatures	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_events_average_1987_2002_N399_I	Regional flood hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_events_average_1987_2002_N399_I	Number of floods on remote areas	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_hazard_N399_I	Regional flood hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Flood_hazard_N399_I	Change of precipitation combined with flood hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Number of observed forest fires in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Number of observed forest fires/1000sq. km in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Forest_fire_hazard_N399_I	Forest fire hazard	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted natural hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of all weighted technological hazard values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Degree of natural vulnerability in Europe (fragmented natural areas)	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Damage potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Sum of the vulnerability indicators	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Integrated vulnerability of Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Hazard_and_vulnerability_N399_I	Degree of economical vulnerability in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Known_volcanic_eruptions_N399_I	Volcanic eruptions during the last 10 000 years	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Landslide_occurrence_N399_I	Occurrence of landslides	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Nuclear_power_plants_distance_N399_I	Potential risk of radioactive contamination on NUTS3 regions	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of refineries and depots in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of oil terminals in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Number of oil pipelines in NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Oil_transport_N399_I	Classification of Oil-SUM values	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Storm_surge_hazard_N399_I	Occurrence of storm surges	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Number of airports in a NUTS3 region	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Sum of passangers in NUTS3 region in millions in a year	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Traffic_hazard_potential_N399_I	Air traffics hazard potential	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Tsunami_occurrence_N399_I	Occurrence of tsunami runups and tsunami potential areas in	NUTS 3	1999	1.3.1	**updated**	Aug 05

		Europe					
	124_Vulnerability_N399_I	Degree of vulnerability in Europe	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Winter_and_tropical_storm_hazard_N399_I	Approximate probability of having winter storms and for tropical storms probable maximum intensity	NUTS 3	1999	1.3.1	**updated**	Aug 05
	124_Winter_and_tropical_storm_hazard_N399_I	For tropical storms probable maximum intensity	NUTS 3	1999	1.3.1	**updated**	Aug 05
13 Agriculture							
14 Social situation							
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16 Cultural sites							
17 Tourism							
18 Public sector							
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ESPON
EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

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- **Co-leader:**

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ESPON project 3.2
Spatial Scenarios and Orientations in relation to the ESDP and Cohesion Policy

Third Interim Report
January 2006

Volume 6
Territorial Impact Assessment

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

This basic report exists only in an electronic version.

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Introduction

The ESPON programme has come a long ways in exploring the territorial aspects of European developments and policies. It has, thus, accumulated great amounts of knowledge which, aside from the scientific advances, should offer policy makers a greater pool of information on which to base their decisions. Some efforts have been made to synthesise this information in a more understandable and concrete way (see project 2.4.2, for example, and, obviously, the work on scenarios in project 3.2). However, there still is a need for further operationalisation of this knowledge in order to allow its usage in the day-to-day context of policy making.

One of the tools high on the wish list of territorial policy makers is a tool which should allow non-specialists to organise their thinking about the territorial impacts of particular policy choices and programmes. This tool should offer the necessary framework for decision makers, and stakeholders in general, to help them explore the impacts of any policy on different spatial levels in order to allow informed debate and decision-making processes.

In reference to non-territorialised assessments of the same kind, this type of tool has been baptised **T**erritorial **I**mpact **A**ssessment (or TIA). Since the beginning of the programme, ESPON has attempted to shed some light on what TIA means and what it could look like in practical terms. TIA has been covered by all the priority 2 projects of the programme and some others. Most of the work has been about ex-post assessment of different sectoral policies, but some first attempts at ex-ante assessments also exist.

This report summarises the current state of work and debate in the ESPON programme on territorial impact assessment and presents a proposition of how project 3.2 proposes to advance on that question until the final report on this task which is foreseen for May 2006.

1. Caveat lector – about combining science and policy making in one tool

The interface between scientific research and evidence and policy making is a difficult one. Science is often incapable of giving clear answers to important questions as evidence is shaky and results can be interpreted in different ways. Policy making is often incapable of using scientific results as it operates within many other constraints then just those imposed by the limits of scientific knowledge. Policy will never be scientific as it is not about searching for the 'truth', but essentially about synthesising power struggles. Science will never be policy as it is not about taking decisions, but about asking questions.

Territorial impact assessment as discussed in this report is about finding a compromise between the two worlds by offering to policy makers a tool which is useful in their daily work but which at the same time results out of scientific knowledge. It has to allow the integration of power struggles and conflicts of interest while maintaining a certain solidity based on 'reality' as defined by scientific knowledge.

By definition, impact assessment of policies, especially of territorial policies, cannot be scientific in the positivist sense because of a lack of control groups and because results are not contestable. It is impossible to find exactly identical regions with exactly the same driving forces at work within them and to then apply a policy on some of these and not on the others in order to see the difference made by the policy. Territorial development is too

complex for identical regions to exist, and policy making does not allow for laboratory-type experimentation. This is true for ex-post assessments, and *a fortiori* for ex-ante approaches.

An important consequence of this is that assertions about specific impacts of specific policies cannot be falsified. Just as much as one cannot prove the actual cause and effect relationship between a policy and the evolutions in the territory this policy was applied upon (because of the lack of control groups), one cannot disprove claims about such effects. This makes impact assessment a highly political and - to a certain extent – politicized tool.

Any approach to impact assessment in general, and to territorial impact assessment in particular, therefore has to take this fundamental short-coming into account and has to make as explicit as possible the political aspects of the process.

2. TIA in ESPON

Within ESPON, TIA has been covered mainly by projects with Strand 2, plus some other projects which combine general trends and policy impacts:

- Project 1.1.3 'Enlargement'
- Project 2.1.1 'Transport Policy impact'
- Project 2.1.2 'R&D Policy impact'
- Project 2.1.3 'CAP impact'
- Project 2.1.4 'Energy'
- Project 2.1.5 'Fisheries'
- Project 2.2.1 'Structural Funds impact'
- Project 2.2.2 'Enlargement, Acquis, Pre-Aid, Phare/Tacis'
- Project 2.2.3 'Urban in Structural Funds'
- Project 2.3.1 'ESDP impact'
- Project 2.3.2 'Governance'
- Project 2.4.1 'Environment'
- Project 3.3 'Lisbon Strategy'
- Project 3.4.2 'Economy'

As can be seen from this list, most of these projects cover sectoral policies which are often devised without territorial aspects in mind. The aim of these projects was, therefore, to understand and to explain to policy makers how these policies affect different territories in diverse manners and what this implies for general aspects of the European territory such as its cohesion and structure.

3. Existing general evaluation of TIA in ESPON

ESPON project 3.1 has summarised the current state of TIA in ESPON in its final report, published in October 2004. In the outset they note the difference between classical impact assessment of projects and the proposed TIA of policies, which they propose to rather call 'territorial impact analysis' in order to give it a broader scope than the quite limited notion of assessment in a technical sense.

The authors also noted the difficulty of finding common methodological elements across a wide range of policy fields as shown in the following table from the report which provides an overview over the different approaches and methodologies used:

Table 72 Overview (FR = final report; TIR = third interim report)

TIA Minimum requirements	2.1.1 Transport &TEN (FR)	2.1.2 R&D (FR)	2.1.3 CAP & RD (FR)	2.1.4 Energy (TIR)	2.2.1 SF (TIR)	2.2.2 PreAc. (TIR)	2.2.3 SF urban areas (FR)
Reference to causing policy interventions	no reference to interventions (highly aggregated)	financial actions (RTD Frame, ERDF, ESF)	CAP expenditures	investments, energy infrastructure & energy relations (in 5 'blocks')	EU-funding incl. national co-financing	Phare and pre-accession aid measures	ERDF, ESF, CI Urban (30 interventions)
Hypothesis on cause-effect-relations	several existing complex models	speculations only	- 'direct' regional income - income multiplier	5 types of energy territorial impacts	economic disparities	Economic and social performance	Positive impacts on urban areas
Regional scale (min. NUTS 2)	NUTS 3	NUTS 2 (NUTS 1 for some)	NUTS 2/3 (estimations)	NUTS 2	NUTS 2/3	NUTS 3 (NUTS 2 for some)	NUTS 3/5 for observation NUTS 2/3/5 for analysis
Reference to past & future interventions	reference to past (1981-2001) hypothesis about future impacts (2001-2021)	primarily backwards	only ex-post analysis	review 'way forward'	Meta-evaluation of previous SF interventions	Analysis of past interventions, ex-post analysis	1994-1999 2000-2006
Interventions/ effects registered	accessibility regional welfare	input and context variables	subsidies farm income	energy - investment - production, - consumption,	SF at regional level, regional development trends and changing disparities	Economic and social performance	structure of intervention s

TIA Minimum requirements	2.1.1 Transport &TEN (FR)	2.1.2 R&D (FR)	2.1.3 CAP & RD (FR)	2.1.4 Energy (TIR)	2.2.1 SF (TIR)	2.2.2 PreAc. (TIR)	2.2.3 SF urban areas (FR)
				- service in 5 'domains'			
Quantitative/ qualitative appraisal	Quantitative Scenario analysis	mainly quantitative	mainly quantitative	mainly quantitative	mainly quantitative	Quantitative and qualitative analysis; test of working hypothesis	mainly quantitative
Concepts/ goals referred to	Cohesion, polycentricity efficiency v. equity	balanced development polycentric development competitiveness	cohesion environmental protection, polycentricity	Three ESDP guidelines	territorial cohesion, polycentric development; balanced development,	Balanced spatial competition and equity of economic and social cohesion	missing
Technique of analysis	simulation models classification of regions case studies	aggregate statistical analysis case studies	aggregate statistical analysis case studies	Input-Output model; aggregate statistical analysis case studies	comparing maps of regional distribution case studies	Cluster analysis, gini-coefficient, regression analysis	aggregate statistical analysis of 25 urban areas case studies
Applied understanding of 'territorial'	regional disparities	'Islands of R&D' (regions)	regional disparities	regional disparities	cross-sectoral approach to space	regional disparities	declining industrial urban areas
Territorial reference of outcome	several typologies of regions	typology of regions	typologies of regions	typologies of regions	typologies of regions	Typologies of all regions	typologies of regions

Figure 1 ***Overview of assessment approaches*** **- October 2004 (ESPON project 3.1, final report, Part C2, pp. 435-6, table 72)**

The project also developed a set of 'minimum requirements' defining the necessary elements of any TIA within ESPON (project 3.1, final report, pp. 453-455):

Elements constituting the analysis/assessment of territorial impacts of EU policies and programmes

Scoping

(1) Reference to policy interventions
Designation of the causing interventions assignable to EU budget lines
e.g. EIB grants for rail network element development
R&D support grant
direct income payment for farmers
ERDF expenditures co-financing government aids or public investments
Question to be answered: What is causing the impacts?

(2) Hypothesis on cause-effect-relations
Basis: hypothesis concerning cause-effect-relations (with varying empirical proof),
e.g. economic growth caused by improved accessibility,
increased innovation capacity by new R&D jobs,
lower unemployment by subsidising farms,
increasing GDP per capita by ERDF expenditures
Question to be answered: What is changed by the intervention(s)?

(3) Regional scale of observation
Designation of geographic reference to be used: regions concerned by intervention/effect; territorial level(s) of observation; covering all or selected (by what criteria) regions cause-effect-relations
e.g. NUTS 5, 4, 3, 2 regions
types of regions
Question to be answered: Level of observation and analysis?

(4) Reference to past and future
Cause-effect relations in the past as the basis for predicting the effects of future interventions; empirical experiences as well as outlooks to the future crucial for analytic treatment and political perception
e.g. past transport infrastructure investments (improvement of accessibility) and economic performance of regions; future scenarios of agriculture
Questions to be answered: What has happened, what may happen in future?

Analysing

(5) Interventions and effects measured
Implementation of the hypothesis concerning cause-effect-relations
e.g. relationship development investment amount accessibility changes,
R&D expenditures employment growth,
indirect payments changes of average farm income,
ERDF expenditures increasing GDP per capita
Question to be answered: What is registered, measured, appraised?

(6) Quantitative/qualitative appraisal
Designation of type of indicators selected

e.g. statistical variables
survey data
qualitative appraisals (ranking)
Question to be answered: By what kind of indicators the topic is described?

(7) Technique of analysis
Designation of type of analysis used
e.g. correlation analysis
simulation model
case studies
classifying regions
Question to be answered: How is the analysis performed?

Assessing

(8) Goals referred to
Designation of criteria for evaluation derived from the two ESPON key concepts focusing on the spatial dimension
Polycentric spatial development
at European level: several metropolitan regions as global integration zones instead of only one
at transnational level: enforcement of a polycentric system of metropolitan regions, city clusters and city networks
at national level: systems of cities including the corresponding rural areas and towns
open for application at lower levels, e.g. for the development within city regions (intra-regional)
(polycentric development at one level does not necessarily go along with the same at the other levels)
Cohesion
Economic: balanced territorial development concerning economic performance
Social: balanced territorial development concerning employment, income, education, population change
Territorial: fair access for citizens and economic operators to services of general economic interest; balanced distribution of human activities
Other goals derived from official documents may also be taken into account if they are related to types of regions or particular spatial entities mentioned below (9)
Question to be answered: What goals are referred to?

In the following section we will describe the practical approach proposed by project 3.2, taking into account the framework defined by the minimum requirements.

4. TEQUILA – a proposal for a general TIA methodology

4.1 The TIA / Territorial Cohesion link

A TIA methodology has necessarily to start by linking up with a sound theoretical and operational definition of Territorial Cohesion (TC) (cf. *Assessment* part of the minimum requirements).

TIA in fact means assessment of the impact of EU policies on the dimensions which are implicit in the general goal of Territorial Cohesion.

Unfortunately, up to now the Commission (and the ESPON project) were not able to agree on a defined and shared set of quantitative indicators enabling measurement of territorial cohesion and even its definition and content evolve continuously in parallel with the continuous deepening of the European reflection on possible territorial strategies.

While in another part of the present ESPON 3.2 Project an operational definition of TC is proposed in terms of geographical indicators (see vol.4, section 3 'ETCI'), in this part of the project the need for a theoretical definition is felt as crucial for the construction of a methodology for territorial impact assessment on a sound basis.

4.2 A theoretical definition of Territorial Cohesion

The very concept of territorial cohesion still remains somehow fuzzy and deserves clarification and logical consistency. In the Third Cohesion Report the Commission refers to it as a synonym for 'more balanced development', for 'territorial balance' or 'avoiding territorial imbalances' (CEC, 2004a, p. 27), elements that do not add much in definitional terms. As a further objective, the Commission states that 'the concern is also to improve territorial integration and encourage cooperation between regions', an important indication that may be placed though in a second rank in terms of priorities for policies.

More telling is the subsequent specification of the aspects that the new concept encompasses, at the different territorial levels: the excessive concentration of economic activity and population in the European 'pentagon', the imbalance between the main metropolitan areas and the rest of the countries, the growing congestion and pollution and the persistence of social exclusion in the main conurbations, the presence of rural areas suffering from inadequate economic links and peripherality, the sprawling nature of urban growth, the accumulation of natural and geographical handicaps in outermost areas. These are the main results of the effort engaged through the ESDP, that are now included in a policy document like the Cohesion Report.

A more thorough presentation of the concept of territorial cohesion is given by DG Regio in a subsequent report, the 'Interim Territorial Cohesion Report' (CEC, 2004c) devoted specifically to the subject, taking advantage of the early results of the ESPON program and of other Commission studies. According to the Report, territorial cohesion is complementary to economic and social cohesion, meaning 'the balanced distribution of human activities across the Union'; more importantly, 'it translates the goal of

sustainable and balanced development assigned to the Union into territorial terms' (CEC, 2004c, p. 3). The subsequent exemplification of the fields of application is similar to the one of the main Cohesion Report.

Subsequent policy documents and political statements on the subject did not develop the concept any further. The Presidency conclusions of the Informal Ministerial Meeting in Rotterdam (November 2004), explicitly devoted to territorial cohesion, states in fact that '…territorial cohesion adds to the concept of economic and social cohesion by translating the fundamental EU goal of balanced and sustainable development into a territorial setting'. In spite of the persisting fuzziness of the concept, the reference to a 'territorial setting' allowed Ministers to engage themselves until 2007 in a proper identification of '…the contribution of integrated spatial development approaches towards enabling regions and cities to exploit their potentials more effectively': the reference is to a future document on 'the territorial state of the Union', a second ESDP with a stronger policy emphasis.

The Scoping document on this new perspective was presented at the Informal Ministerial Meeting in Luxembourg, May 2005 (Luxembourg Presidency, 2005a). The definition of territorial cohesion remains the same, but it acquires a new 'practical' meaning when it is included in a direct policy frame: 'In practical terms territorial cohesion implies: *focusing regional and national territorial development policies* on better exploiting regional potentials and territorial capital – Europe's territorial and cultural diversity; *better positioning of regions in Europe* .....facilitating their connectivity and territorial integration; and *promoting the coherence of EU policies with a territorial impact*....' (p. I; emphasis in the text).

Relevant innovations are present in this passage. First, traditional 'spatial development policies' are called 'territorial', using a neologism in the English language that suggests the exploitation of territorial specificities going beyond pure location and distance in space. Second, the concept of territorial capital is used for the first time, implicitly underlining the fact that territory is a resource, potentially generating productivity increases ('higher return for specific kinds of investment') and utility flows to local communities.

Once arrived at this stage of comprehension of the content of territorial cohesion, a further step forward is necessary to reach a proper theoretical definition of the concept.

In our opinion, if the concept of territorial cohesion has to add to the content of economic and social cohesion, it must necessarily link with the sustainability issue. In a word, *territorial cohesion may be seen as the territorial dimension of sustainability*. And similarly to the concept of sustainability, it bears at the same time a positive and a normative sense (i.e., it defines a condition and policy goal) and operates by integrating different dimensions: the economic, the social and the environmental one (Camagni, 2005a and b).

The preceding definition may be explained in the following way. Considering both the positive and the normative side, sustainability conditions (and sustainability goals) refer to (and can be reached by operating through) four main (policy) dimensions (Camagni, 1998; Camagni, Capello, Nijkamp, 2001):

- the *technological dimension*, governing production processes,
- the *behavioral dimension*, determining life-styles, consumption habits and also organizational models of production (e.g. transport intensive models like just-in-time),
- the *diplomatic dimension*, referring to the international strategies to assure co-

operation among countries at different development levels, with different development expectations, and
- the *territorial dimension*, residing in an ordered, resource-efficient[1] and environmental-friendly spatial distribution of human activities.

In our opinion, territorial cohesion refers directly to the last dimension[2].

Taking this reflection further, we can envisage three main components of territorial cohesion, namely:

- *Territorial quality*: the quality of the living and working environment; comparable living standards across territories; similar access to services of general interest and to knowledge;
- *Territorial efficiency*: resource-efficiency with respect to energy, land and natural resources; competitiveness of the economic fabric and attractiveness of the local territory; internal and external accessibility;
- *Territorial identity*: presence of 'social capital'; capability of developing shared visions of the future; local know-how and specificities, productive 'vocations' and competitive advantage of each territory.

These objectives may be reached through an integrated approach, securing the virtuous integration and positive co-evolution of the three sub-systems mentioned above - the economic, the social and the physical-natural systems - in their spatial manifestation or phenomenology (Figure 1). This means maximizing the synergies and the positive cross-externalities from each sub-system and all the others, and minimizing the negative externalities (Camagni, 1998)[3].

The integrated, multidimensional nature of the sustainability concept provides a rationale for an integrated approach to territorial cohesion policies. But other elements push in the same direction, namely:

- the fragmentation of decision making powers, both in the public and the private spheres, with a diffuse presence of veto powers. This fact calls for the necessity of an integration and a co-operation, both vertical and horizontal, between the different tiers of the public government structures (usually engaged in different policy fields) and between the different departments of the same administration acting on the territory;
- the evidence of growing problems and concerns in specific territorial contexts, which call for complex, multidimensional interventions: metropolitan development, peri-urban settlement structure, coastal development, development through wide industrial corridors, sensitive environments like mountain areas crossed by international mobility corridors, … What really matters is the overall result of an equilibrated spatial development process, not the single dimensions through which such an equilibrium can be reached (infrastructure efficiency, proper land-use, smart development policies).

Territorial efficiency, quality and identity represent objectives and values in

1 We are referring to land resources, energy, natural and landscape resources.

2 One also has to bear in mind that the sustainability concept refers and links the need for ecological equilibria to the needs of the entire society, and therefore addresses a correct integration or co-evolution of the natural, the economic and the social system. Here we can find the link with the term 'cohesion'.

3 As an example among others: economic development in peripheral areas may be advantageous to the environment if a long term perspective on the use of local natural resources is taken and if it provides the (public) financial resources that may be channelled towards the betterment of environmental infrastructure; at the same time it may guarantee the permanence of the local population and the strengthening of its production culture and sense of belonging.

themselves; no modern society can do without them, as they are at the base of local collective wellbeing. But they are at the same time preconditions for local competitiveness and no conflict exists in this sense between the needs of the local population and the needs of the economic fabric, at least not in the long run. This element is conceptually utilized in recent EC's documents (Luxembourg Presidency 2005a and b) in order to justify compliance and consistency between cohesion policies and the Lisbon strategy.

While the first two objectives are rather familiar, the third, namely territorial identity, may be seen as rather surprising, but is in our opinion crucial and will become increasingly central for European policies. Territorial identities incorporated in local culture, know-how, social capital and landscape are the basic constituents of the territorial realm as, at the same time:

- they represent the ultimate glue of local societies,
- are linked with the spatial division of labor and in many cases determine its evolution,
- facilitate processes of collective learning and consequently boost the efficiency of the local production fabric.

Identities evolve but may be easily destroyed by spatial processes such as those of economic decline and desertification, peripheralization and lack of accessibility, destruction of the natural heritage, trivialization of territorial landscape through sprawling settlements. For these reasons they are fundamental constituents of territorial cohesion.

An important step in this direction is made by the already mentioned recent Scoping document of the Luxembourg Presidency (2005a), where natural but also cultural values are indicated as part of the endogenous potential of the different areas, worth a full exploitation. Furthermore, it is worth mentioning that the ESDP begins and ends with a reference to culture, cultural variety and cultural heritage as a characteristic feature of the European identity.

What situations and issues deserve attention from the new territorial policies and possibly from the new European structural policies? They may be found and described in the documents mentioned earlier, particularly in the ESDP, and may be summarized as in Figure 2. Reference to the main ESDP goals represents a must for any TIA methodology, as is well indicated in the 'minimum requirements' list presented before, in the 'assessing' part (point 8); our method is therefore consistent with these requirements.

The main issues encompassed by territorial efficiency, quality and identity may be indicated in rough terms as follows (but they will be more precisely detected and listed in the next phase of the research work.

Territorial efficiency:

Efficient and polycentric urban system

Inter-regional integration

Development of city-networks and medium cities

Resource efficiency: consumption of energy, land, water….

General accessibility

Sustainable transport: share of public transport and absence of congest.

Quality of transport and communication services
Compact city form, reduction of sprawl
Reduction of technological and environmental risk

Territorial quality:

Conservation and creative management of natural resources
Access to services of general interest
Quality of life and working conditions
Multiethnic solidarity and integration
Reduction of interregional income disparities
Reduction of poverty and exclusion
Cooperation between city and coutryside
Employment performance
……..

Territorial identity:

Conservation and creative management of cultural heritage
Development of region-specific know-how and knowledge
Development of territorial 'vocations' and 'visions'
Development of social capital; shared behavioural rules
Accessibility to global knowledge and creative 'blending' with local knowledge
……..

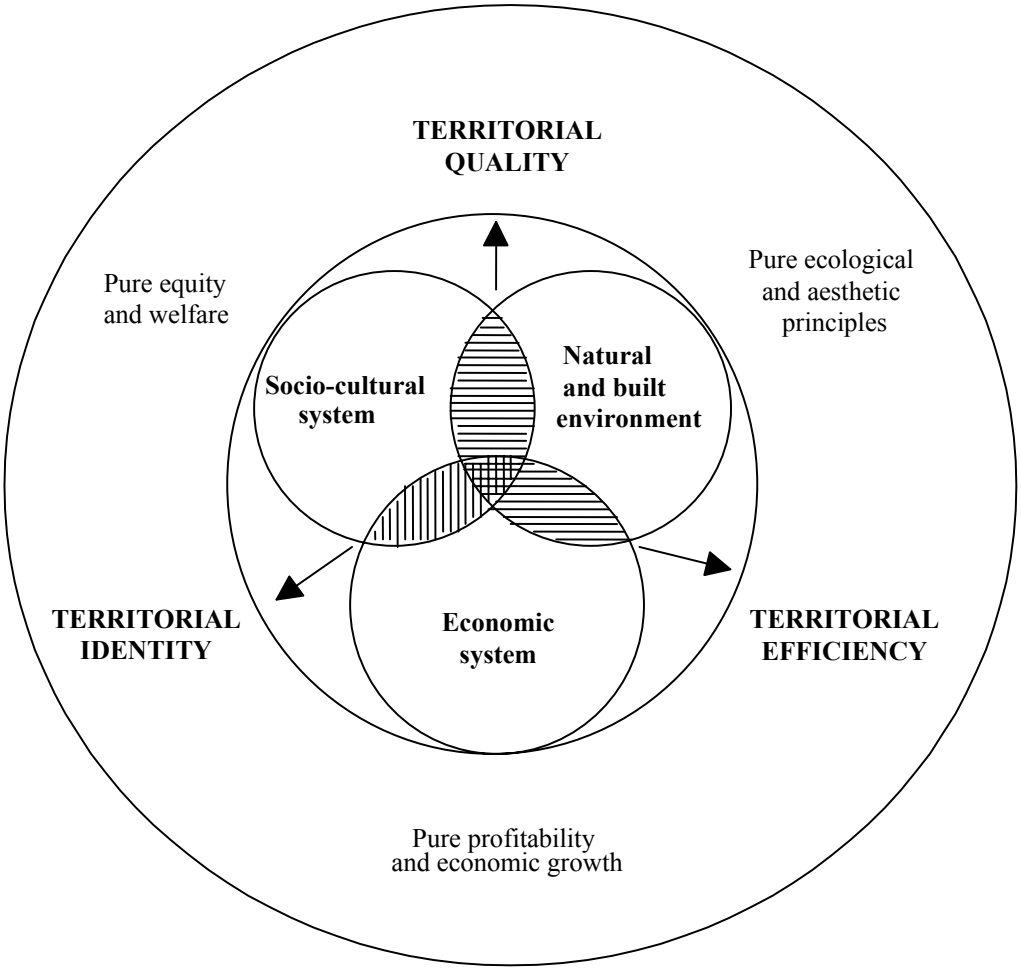

Figure 2 The components of territorial cohesion

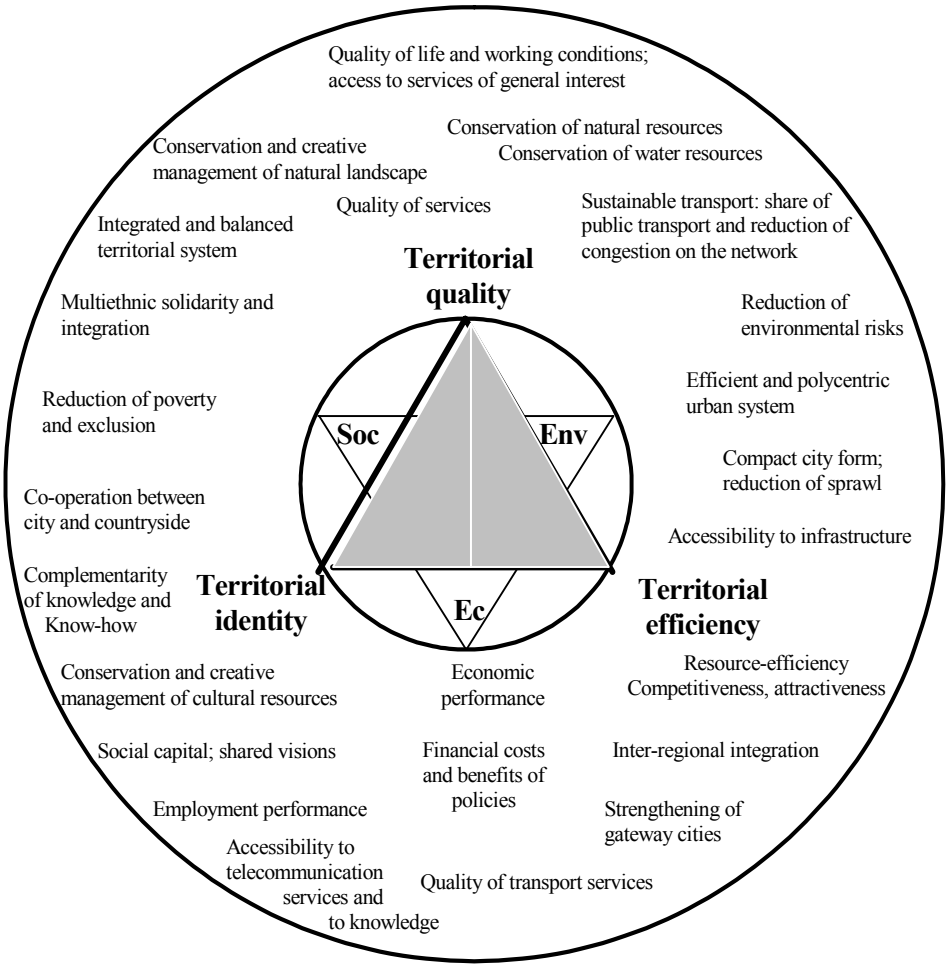

Figure 3 An integrated strategy for territorial cohesion: objectives and assessment criteria

Territorial quality: quality of living and working conditions; comparable living standards across territories; similar access to services of general interest and to knowledge

Territorial efficiency: resource-efficiency with respect to energy, land and natural resources; competitiveness and attractiveness; internal and external accessibility

Territorial identity: presence of "social capital"; capability of developing a shared vision of the future; know-how, specificities, productive "vocations" and competitive advantage of each territory

4.3 The General Assessment model: the TEQUILA Model

The theoretical definition of TC and its three main dimensions represent the basis elements on which the assessment methodology is built, the TEQUILA Model:

Territorial
Efficiency
QUality
Identity
Layered
Assessment
Model

The model will be built in operational terms in the next phase of project 3.2., but its main characteristics may be indicated now in the following points.

1. TEQUILA is a Multicriteria Model for the Territorial Impact Assessment of EU policies. As the 'dimensions' of territory are multiple, this well known assessment approach looks the most appropriate. (cf. *Analysing* part of the minimum requirements)

2. The 3 components of the T.C. concept and their sub-components become the *criteria* in the *General Assessment Model*

3. The *weights* of the 3 components and sub-components are defined in a multiple and flexible way:
   - determined inside ESPON 3.2. or ESPON in general, through an internal expert discussion
   - determined (or evaluated) by the ESPON Monitoring Committee
   - discussed with DG 16,
   - defined through Delphi inquiries, or else.

   In principle, they should not vary with respect to the policies analysed. Inside single assessment experiments, sensitivity of results with respect to change in weights will be tested. This is where the power relationships and the priorities of different interest groups mentioned in the 'caveat lector' section come apparent and are treated transparently (as long as the process of weighting is public).

4. The general impact of EU policies on each component/criterion will be defined using ad hoc studies and/or expert judgements. Cause/effect relations will be inspected (in accordance to minimum requirement n. 1-2) (points 2, 4, 5, 6 and

7 of the minimum requirements)

5. The methodology will accommodate in consistent and statistically sound ways both qualitative and quantitative impacts (in accordance to minimum requirement n. 6)

6. A method for combining quali-quantitative impact indicators inside the multi-criteria analysis will be supplied.

4.4 The Territorial Assessment model

The TEQUILA Model will supply us with a General Assessment of the impact of EU policies on the overall European territory (1st layer).
This assessment refers to an abstract territory, and the impact may be seen as a 'potential impact' (PIM) (cf. points 2 and 5 of the minimum requirements).

This 'general' assessment has to be made truly 'territorial', considering the specificities of the single European regions, as:

- the *impact* could be diversified according to regional specificities
- the *intensity* of the policy application may be different on different regions
- the *relevance* of the different 'criteria' of the assessment method is likely to be different for different regions (e.g.: the same increase in income has a different relevance according to the development level already achieved by the single regions)
- a region may not be subject to a specific policy

A **Territorial Impact Model** will be built, for assessing the impact on single regions r (2nd layer). It will be simple, operational and straightforward:

$$\mathbf{TIM}r = \sum_c \theta c \,.\, \mathbf{PIM}c \,.\, \mathbf{S}r,c \,.\, \mathbf{PI}r \,.\, \mathbf{Pa}r$$

TIM = territorial impact
c = criterion/dimension of the multi-criteria method
r = region
θc = weight of the c criterion/dimension
PIM = potential impact of policy (abstract, coming from Tequila model)
Sr,c = sensitivity of region r to criterion/dimension c (a weighted sum of regional indicators)
PI = policy intensity (in region r)
PA = policy applicability (a 0/1 variable)

Sr,c will be a vector (weighted sum) of regional characteristics, coming mainly from the ESPON data base.

4.5 Operational steps

The following operational steps will be performed in the next research phase:

1. Criteria: definition of criteria and sub-criteria, and their specific weight

2. Policies: selection of 2 EU pilot policies in different fields (e.g. infrastructure, R&D, social policy) to be used for the assessment exercise

3. Impact: definition of the logical link between each policy and the impact on criteria and sub-criteria

4. Model: construction of the full TEQUILA model: management of quali/quantitative impacts; sensitivity analysis of the model reaction to weight changes

5. Sensitivity: construction of the regional sensitivity indicators, for each policy

6. Mapping: experimental exercise on 2 policies

7. Evaluation of results with the Monitoring Committee

8. Revision (if necessary)

Once built and applied to two types of policies, the TEQUILA model will be (almost) ready for application to other EU policies. The only application-specific elements of the methodology are PIM, the potential impact of policies, that have to be evaluated case by case, and PI, namely policy intensity in each region (a much easier task with respect to PIM).

Regional scale of observation is in principle NUTS 3 (NUTS 2 in Germany), providing a good balance between data availability and internal homogeneity of regions (minimum requirement n. 3).