

# Diversity within the European territory

## A selection of new European maps



ESPON Briefing 1

November 2004



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# Introduction

The European Spatial Planning Observation Network (ESPON) is set up to support policy development and to build a European scientific community in the field of European territorial development. The main aim is to increase the general body of knowledge about territorial structures, trends and policy impacts in an enlarged European Union. The ESPON programme commenced in 2002.

This document includes a selection of recent results from the ESPON programme. Its purpose is to inform a wider public of interested European citizens about a few of the new key findings supporting our understanding of the European territory, its trends, imbalances and potentials.

For this purpose a selection of 10 European maps on different spatial development issues is presented here, providing a comprehensive picture of the new Europe embracing the territory of 25 EU Member States, Norway, Switzerland, Bulgaria and Romania.

The maps and the text related to each map, to a large extent, present new information about European spatial development, based on new data collected and analysed by ESPON. They provide important new perspectives on Europe, some using innovative methodologies and mapping tools.

The maps and findings presented here have been taken predominantly from the first final reports of ESPON projects. The ESPON programme is making significant advances in four fields – finding new facts on spatial development trends, analysing the spatial impacts of EU policies, generating scenarios about the future development of the European territory and contributing to the development of new analysis tools in the field.

Acknowledgement must be given here to the many researchers from all over Europe working together in more than 20 transnational project groups, each of which explores different aspects of territorial development in Europe. This document is based on the findings of these researchers from over 100 institutes throughout Europe. Full information on the institutions participating in the transnational project groups can be found on the ESPON website.

The ESPON website offers full details of the work undertaken and reports produced thus far. It is the primary source for comprehensive information about the ESPON programme – [www.espon.lu](http://www.espon.lu).

This first ESPON Briefing follows a very simple structure. Each map is accompanied by

- A short explanation of the concept, methodology and measurement behind the map,
- An interpretation of the map, highlighting the main patterns including imbalances and/or potentials for development, and
- Key conclusions.

The flow of the 10 maps presented moves from simple thematic maps towards more integrated, innovative and experimental maps. This shows the range of ESPON activities and the challenges ahead of developing new territorial indicators, scientific concepts and operational tools.

As the document is communicating findings from research projects undertaken by teams of researchers, it has to be underlined that the text and maps included do not necessarily reflect the opinion of the ESPON Monitoring Committee.

# The dynamics of economic performance

## Concept/methodology/measurement

GDP per capita is one of the main indicators of European Cohesion Policy used for illustrating the state and pace of economic convergence. Current debates on the economic performance of countries illustrate that it is not only the absolute values of GDP per capita that are of interest here, but also their dynamics and development rates. The map reflects the average annual change in GDP per capita for the time period 1995 to 2001.

## Map findings

Within the EU 15, the four Cohesion Countries of Greece, Ireland, Portugal and Spain are dominated by regions with comparable high annual change rates, i.e. mostly above 6 percent. Ireland in particular stands out here with almost all of its regions showing growth rates above 10 percent, though in Greece too, a considerable number of regions had growth rates of 10 percent or more. Note should also be made here of the fact that regions with such high growth rates are rare in other parts of the member states of the EU 15.

Another observation deriving from the map is certainly the higher than average growth rates in regions of the new EU Member States compared to regions of the former EU 15. It seems here that the capital regions of the new EU Member

States in general are doing well. In addition, in a few countries such as Poland, Lithuania and Slovakia other regions can be characterised as having a good performance and overall having a balancing effect on the national territories.

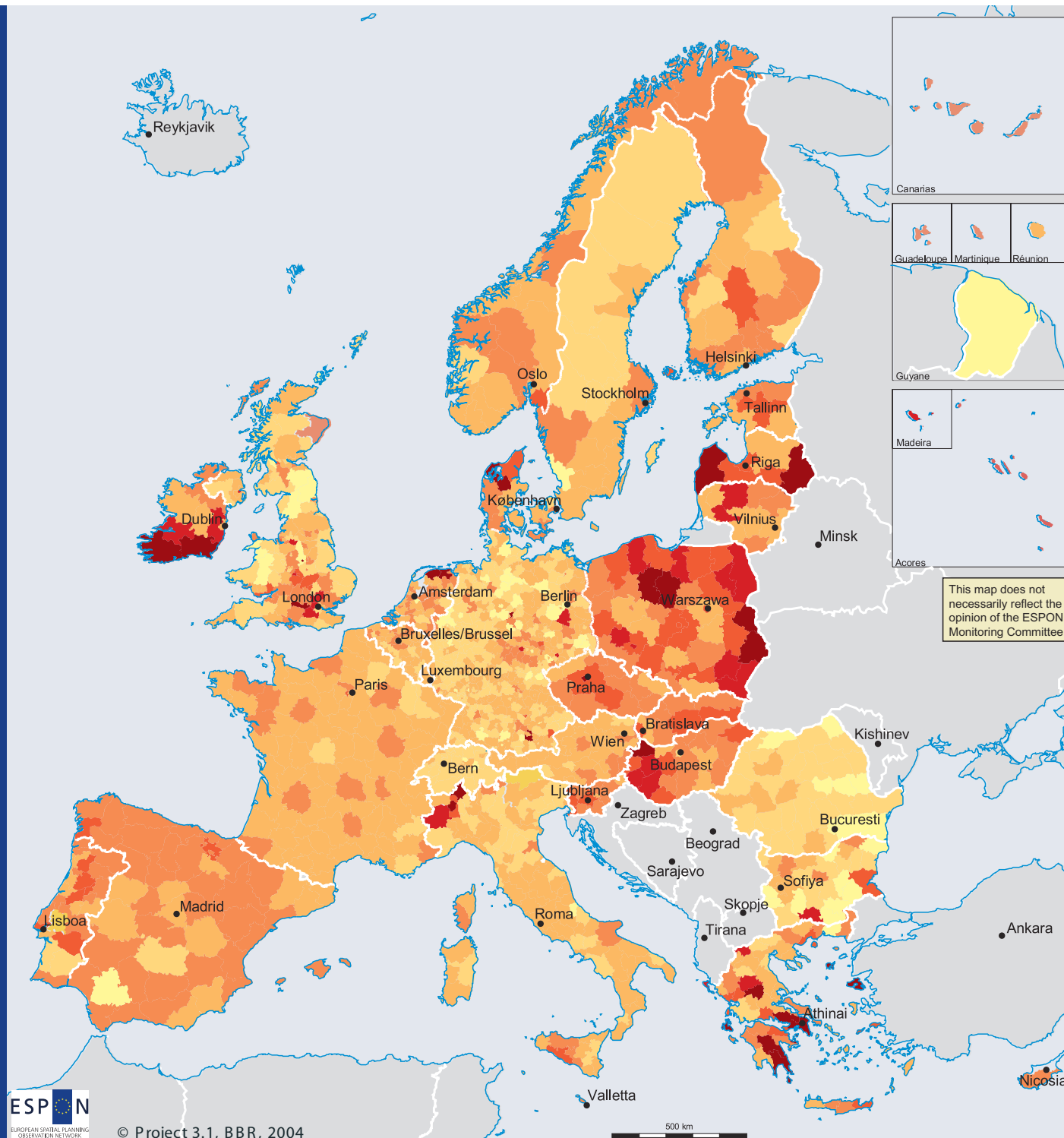
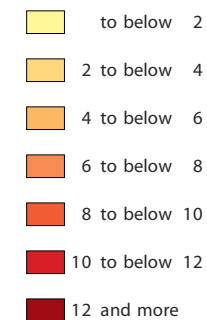
As regards the accession countries, the growth rates of Romania have the lowest values as compared to Bulgaria, where the regions also start from a rather low level, however the annual growth rates are somewhat higher.

## Conclusions

Considering not only the nominal GDP per capita, but also the dynamics in terms of annual growth rates, helps to better illustrate which regions are in the process of 'catching up', while also pointing out those where there are potential concentration zones of wealth (regions with high GDP per capita and high growth rates). This information is of particular interest for understanding other aspects of territorial development, which are themselves often interlinked with the economic performance.

## Development of the gss domestic product, 1995 - 2001

Average yearly development of GDP per capita in Purchasing Power Standards in percent 1995 to 2001\*



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Origin of data: Eurostat - Regio online, National Statistical Offices

Regional level: NUTS 3  
\*Romania 1998 - 2001

Source: ESPONDatabase

# Hotspots of demographic change

## Concept/methodology/measurement

Demographic development is in particular related to three factors: (1) fertility rates, (2) age structure and (3) migration, each of which shows different spatial patterns.

Fertility rates and age structure together compose the natural population change. They are interrelated, as generally low fertility rates will result in unbalanced age structures with ageing as the central component in the long run.

The timing and pace of changes in fertility rates vary substantially between different types of local authorities and regions, for instance with regard to rural or urban status or centre-periphery location. At the end of the 1990s, fertility rates fell below the replacement rate in every country within Europe and this was also the case looking at the regional level – only some regions in Finland and Norway had fertility rates above the reproduction rate.

Population ageing will increasingly occur together with the stagnation and decline of the European population. This is a result of both the low fertility rate and longer life expectancy. With regard to natural population change, the ageing process seems to be particularly significant in Southern Europe, where ageing and low fertility rates seem to reinforce each other. It is only in the Nordic countries (with Norway as an exception) where a connection between ageing and net-migration can be observed in the way

that regions with an ageing population are also regions of out-migration. Earlier out-migration has contributed to the imbalance in age structures at the regional level, with an increasing predominance of elderly people.

Migration has important regional, extra-national and extra-European components. The current picture reveals that even former out-migration areas (mainly in the EU 15) are becoming attractive again in term of migration, for example Greece and Ireland. In a number of countries however rather different trends can be observed. In Poland larger urban agglomerations and the western border areas represent immigration areas, whereas most other parts of the country are out-migration areas. In Italy as well as in the UK, there is a clear North-South divide, while in France the South-West of the country remains an immigration area whereas the North-East is predominantly an out-migration area.

Metropolitan areas are the most attractive areas for external immigration. In addition, some tourist areas have become areas of immigration because of the high quality of life, attracting retired persons (grey-migration), and people from economically disadvantaged countries and regions.

## Map findings

Current demographic developments pose a significant challenge to Europe as population becomes more geographically concentrated.

Putting together the salient factors with regard to demographic development trends (natural population development and migration) we can then see that some areas are losing population due to both natural population change and migration (dark blue) as e.g. large parts of Sweden, Eastern Germany, Scotland, Estonia, Latvia, Hungary, Romania, Bulgaria or the Spanish inland area. On the other hand, some areas are gaining on both demographic factors (dark red) as e.g. Ireland, large parts of Southern UK (predominantly England), Southern Spain, Benelux and Southern Germany. The majority of European regions, however, face increasing challenges as regards total population development.

The typology in the map is based on data for the years 1996-99, which is the most recent period data provisions allow for. Therefore, the map does not reflect the very latest movements. For this, the availability of more recent data must be awaited.

## Conclusions

Long-term forecasts based on the current developments indicate that Europe faces increasing challenges in respect of depopulation in certain parts of its territory. These challenges are often associated with people tending to concentrate in highly urbanised areas, thus further contributing to the already existing imbalances in population density patterns.

## Components of population development, 1996-1999

### Population development by components

#### Population increase with

- positive migratory balance and positive natural balance
- positive migratory balance and negative natural balance
- negative migratory balance and positive natural balance

#### Population decrease with

- negative migratory balance and positive natural balance
- positive migratory balance and negative natural balance
- negative migratory balance and negative natural balance

no data

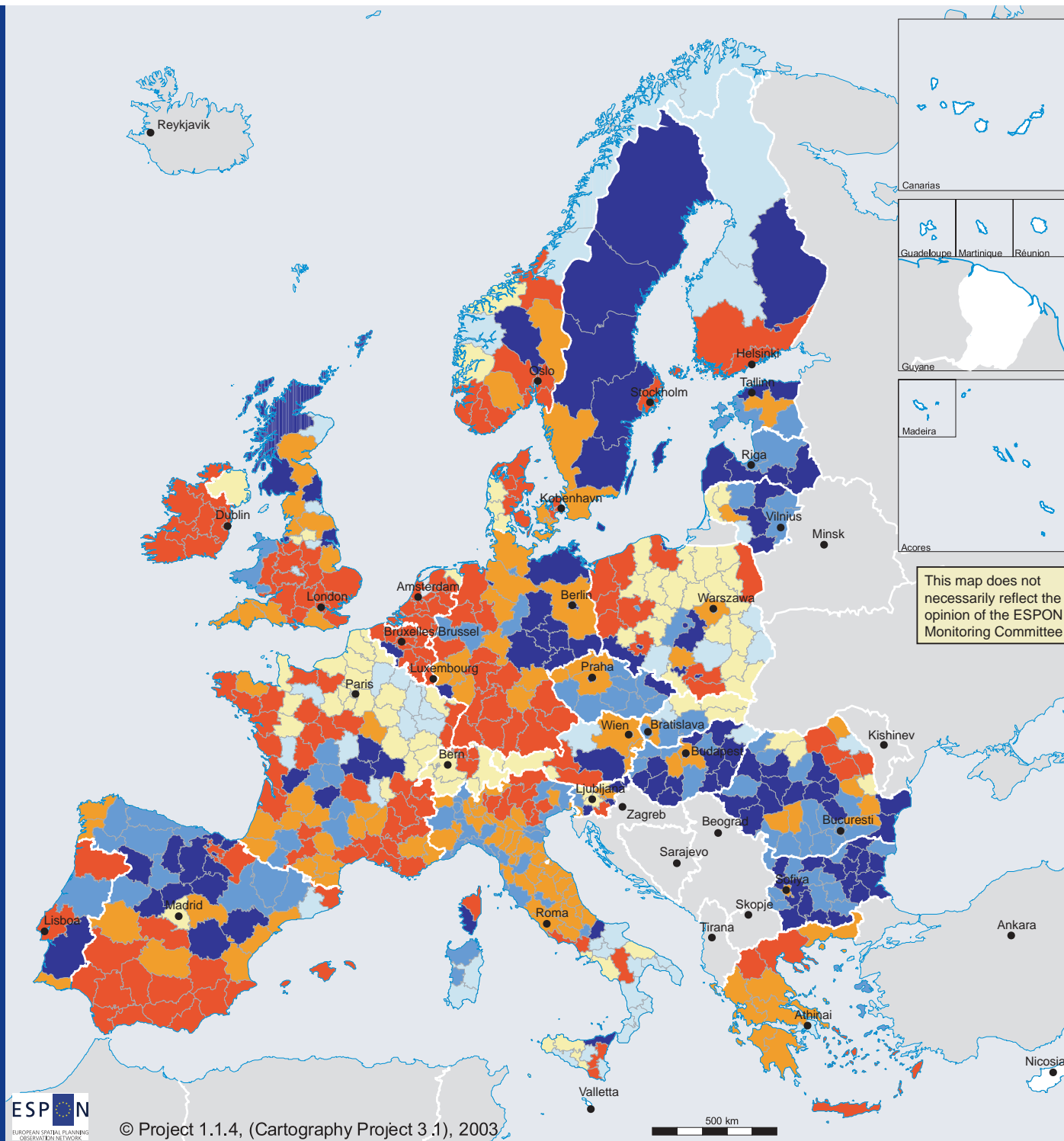
**NB: Cyprus and Malta are not covered by this map as there is no comparable migration data available for the period 1996-99.**

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Origin of data:  
EU15 and CC's: Eurostat, Norway and Switzerland:  
National Statistical Offices

Regional level:  
NUTS 2 for AT, CH, DE, FI, GR, MT, NL, PT, SE, UK  
NUTS 3 for other countries

Source: ESPON Database



# Polycentricity in the European urban system

## Concept/methodology/measurement

The basic description of the European urban system developed by ESPON defines 1595 functional urban areas (FUA), delineated on the basis of national definitions of travel-to-work areas.

An analysis of the functional urban areas in Europe reveals a considerable concentration within the core of Europe. The 76 most powerful functional urban areas measured by demographic mass, competitiveness, connectivity and knowledge base are defined as Metropolitan European Growth Areas (MEGA). Many of the strongest MEGAs are situated in the core area or Pentagon defined by London, Hamburg, Munich, Milan and Paris. Outside this core area, Madrid, Barcelona, Rome, Vienna, Berlin, Copenhagen and Stockholm can currently provide this high level of functions.

Dense urban networks, which subsequently could develop into highly integrated regional polycentric systems are, however, found in a wider area, circumscribed by Manchester, Berlin, Venice, Genoa and Paris stretching further towards the east, in particular including MEGAs such as Prague, Bratislava and Budapest.

Outside this dominant area a number of functional urban areas have a certain potential to challenge the predominance of the Pentagon, including cities such as Athens, Dublin, Helsinki, Oslo and Gothenburg. Among the several important capital cities and major urban areas in the new Member States, Warsaw currently shows the best potential in this regard.

A wide range of cities however have the potential to increase their demographic mass through increased cooperation with neighbouring areas, forming polycentric urban areas. Basically, territorial cooperation between neighbouring cities can improve their position in the European urban system based on a joint exploration of comparative advantages. Such strategic cooperation, including a greater number of inhabitants in the polycentric urban area, makes it possible to attract or establish a higher level of services. The use of this cooperation model can, in principle, support a better territorial balance and polycentric development.

## Map findings

Polycentric integrated areas will often have a European ranking that is different to each of the individual functional urban areas within it. Analysing the difference between the European ranking of the individual functional urban areas and that of the corresponding integrated area illustrates the real potential of regional polycentric cooperation to enrich and better balance the system of functional urban areas.

The map highlights the potential synergies from cooperation between neighbouring cities measured as the difference between the ranking of the individual cities and ranking of the joint polycentric area. The coupling of cities is based on their proximity.

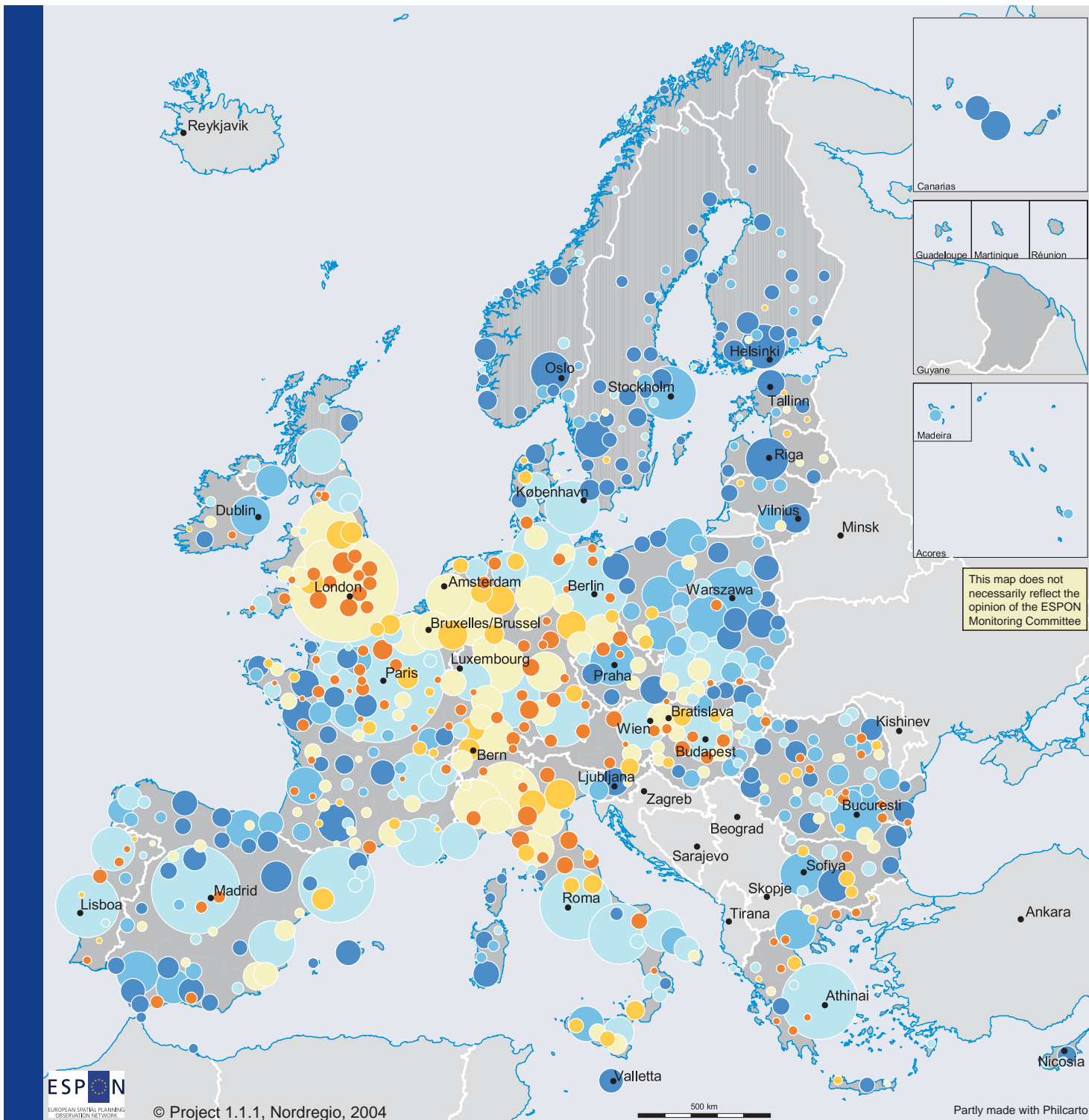
Cities located in the arc stretching from the UK Midlands via the Ruhr-district to Northern Italy, with some extensions into Hungary, the Czech

Republic and Slovakia can most easily increase their European standing by establishing regional polycentric cooperation patterns. Outside the core of Europe, there are a number of regions with high demographic potentials, such as the Ostrava-Katovice area, the areas around Dresden-Prague-Wroclaw and Vienna-Nitra-Budapest, and, more moderate, the Mediterranean axis from Valencia to Naples, and the Atlantic coastline from Lisbon to La Coruña. At a more regional/local scale, potentials can for example be identified in the Glasgow-Edinburgh region, as well as around Lyon and Nantes in France. In contrast, the relative large distances between the major cities in the Northern Peripheries, in central Spain outside Madrid, as well as in parts of Greece, Bulgaria, Romania and the Baltic countries would appear to increasing the challenges inherent in such efforts at territorial cooperative attempts in these more peripheral regions.

## Conclusions

The analysis reveals opportunities and contrasts in the potentials for improving the comparative position of urban areas across Europe. More research effort is needed to be able to see functional development potentials in greater detail, which can nourish strategic territorial cooperation. Integration on the basis of proximity is only one of several preconditions. Note here should also be made of the fact that networking seems to play an important role in enabling areas and cities to activate their potentials and territorial capital successfully.

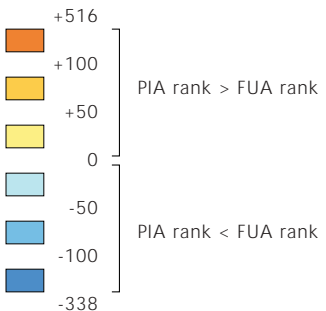




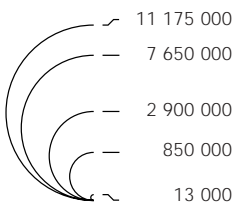
### Potential polycentric regions in Europe

Difference between the European rank of individual cities and the European rank of the corresponding Potential Integration Area (PIA) considering the main city of each PIA only

The Potential Integration Area includes neighbouring cities with overlapping potential commuter areas, which could gain from co-operation and a common use of comparative functional advantages



### Population of cities according to national definitions of functional urban areas.



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Origin of data: Eurostat, National Statistical Offices, national experts, Nordregio

UTH delimitation: RRG  
PIA identification: Nordregio

Source: ESPON Database

# The diversity of rural-urban relations

## Concept/methodology/measurement

In many parts of Europe, rural areas are perceived as being the opposite of urban areas. In some parts this is still a justifiable interpretation. However, in a time of increasing inter-dependence between urban and rural areas, a process of 'rurbanisation' is taking place in many areas, where the traditional distinction between rural and urban is becoming increasingly blurred.

Contributing to the understanding of this phenomena, ESPON has established a European-wide classification of rural and urban areas that reflects the diversity of some relations between rural and urban territories. This classification is based on two main dimensions reflecting the inter-dependence of rural and urban areas: (1) the degree of urban influence is defined according to population density and a European ranking of the urban centres according to their functional importance, (2) the degree of human intervention as defined by the actual land use, i.e. the relative share of artificial surfaces and of agricultural land in a region. The classification includes 6 categories resulting from the inter-meshing of these two indicators.

## Map findings

At the European level, predominantly urban areas of high human intensity can be seen to stretch along a corridor running from Northern England through the Benelux countries and Western

Germany to Northern Italy and partly down the Italian coasts. A Second East-West oriented corridor stretches through Southeast Germany, along Southern Poland and the northern areas of the Czech Republic into Hungary.

The level of diversity across different types of rural areas is significant. In most parts of the EU15 countries and Switzerland, rural areas are mainly characterised by low and medium levels of human interventions. The degree of human intervention in rural areas is generally higher in the new EU Member States and Bulgaria, Romania, Eastern Germany and Denmark. Moreover, Hungary, Romania and Bulgaria in particular are characterized by having a significant expanse of rural areas with low urban influence and high human intervention.

## Conclusions

Rural-urban relations reflect the profound diversity of Europe. In general, medium-sized and small towns benefit from the increased demand for services resulting from the new (changing) rural population. A number of rural areas also benefit from the out-migration of population and activities from larger cities. Other rural areas show inherent economic potentials, such as cultural diversity and natural assets that can be further exploited to increase their attractiveness for business and leisure purposes.

## Urban-rural typology

Urban-rural typology, based on population density, ranking of Functional Urban Areas and land cover

- High urban influence, high human intervention
- High urban influence, medium human intervention
- High urban influence, low human intervention
- Low urban influence, high human intervention
- Low urban influence, medium human intervention
- Low urban influence, low human intervention
- no data

**NB: Cyprus, Malta and Norway are not covered by this map as there is currently no comparable data on land cover available (cf. CORINE database).**

This map does not necessarily reflect the opinion of the ESPON Monitoring Committee

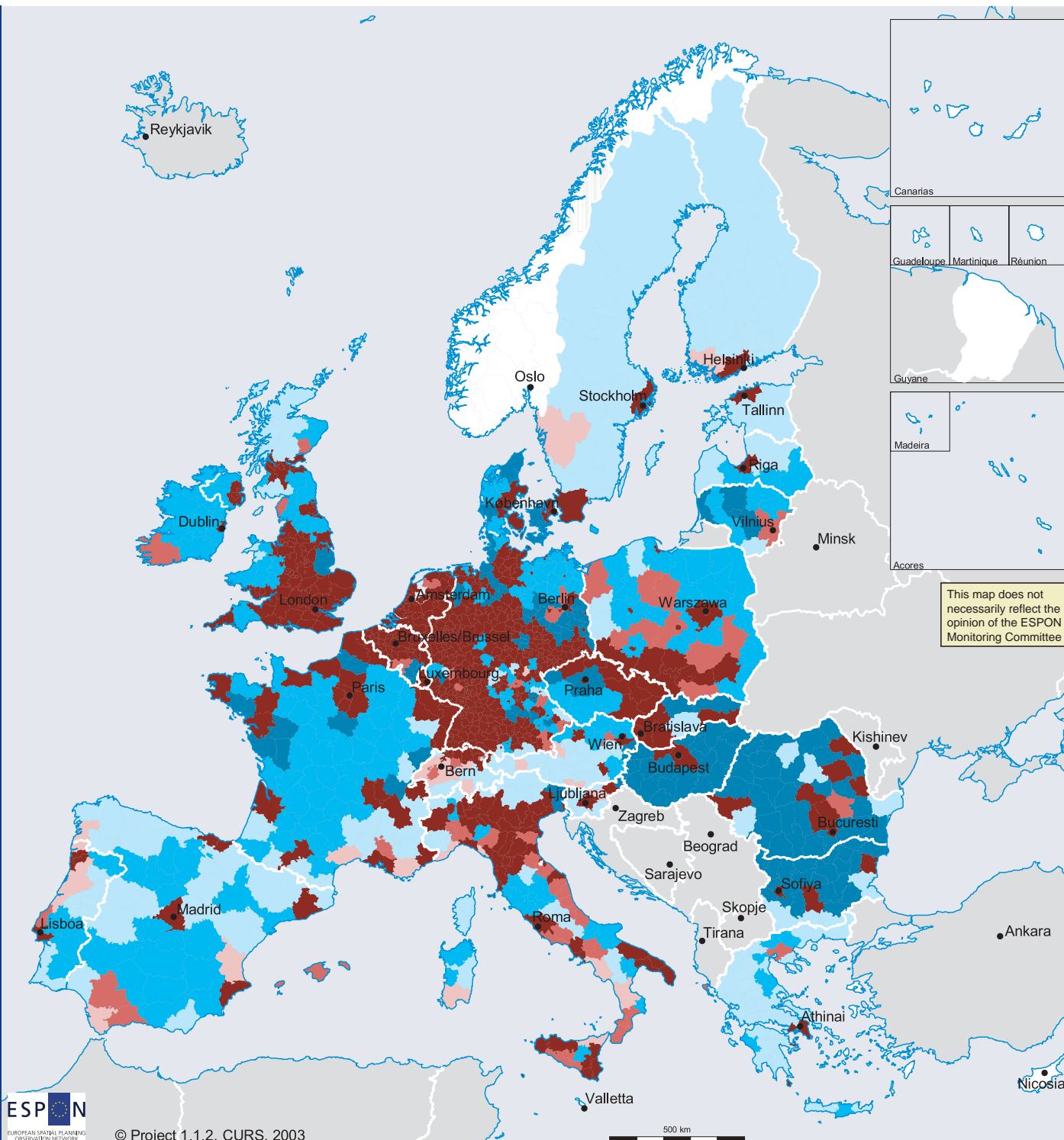
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Ranking of Functional Urban Areas (FUAs):  
Origin of data: Eurostat, National Statistical Offices, national experts  
**Source: Nordregio, ESPON Database**

Population density:  
Origin of data: EU25: Eurostat, Norway and Switzerland: National Statistical Offices  
Time reference: 1999

Land cover types:  
Origin of data: EEA, Corine Land Cover

**Source: ESPON Database**



# Accessibility – complex core-periphery patterns

## Concept/methodology/measurement

Accessibility is one of the most important indicators used here to describe the territorial aspects of the transport system. Accordingly, the quantity and quality of a region's infrastructural endowment, as well as distance to population and/or economic centres, plays an important role. The concept of potential accessibility has been developed in order to cover these aspects in one indicator: the opportunities to be reached (population or GDP or income, in this case population) in a certain territory (in this case the entire Europe) weighted by the effort in terms of distance, time or cost (in this case time).

Thus, an accessibility indicator describes the relative location of an area and illustrates the benefits that accrue to households and firms in an area in terms of the available transport infrastructure and the available transport services. Multimodal accessibility expresses the combined effect of alternative transport modes, i.e. an aggregated picture of road, rail and air accessibility (including waterways to some extent) for a certain location.

## Map findings

Regions with a high level of multimodal accessibility which is clearly above the European average are mainly located in an arc stretching from

Liverpool and London via Paris, Lyon and the Benelux regions, along the Rhine in Germany to Northern Italy. However some urban agglomerations outside the central areas, such as Madrid, Barcelona, Dublin, Glasgow, Copenhagen, Malmö, Göteborg, Oslo, Rome, Naples, Thessalonica and Athens are also equipped with good or medium multimodal access, largely because of the existence of international airports. Should one only consider road and rail, these two modes of transportation show clear core-periphery patterns.

At the same time, poor access levels in European terms can also occur in regions usually considered to be central. Several regions in Germany, Austria and France face below average accessibility, while some can even be viewed as extremely peripheral. Many regions in Portugal, Spain, Ireland, Scotland, Wales, Norway, Sweden, Finland, southern Italy and Greece have very low accessibility levels mainly due to the fact that these regions do not have good access to international air links.

In addition, nearly all regions of the new EU Member States plus Bulgaria and Romania have accessibility levels that are below average. The only exceptions here are the capital cities, and to some extent their surrounding regions, once

again because of international airports. For all other regions the combined effects of the low capacity of the land transport infrastructure and the lack of air links leads to low multimodal accessibility.

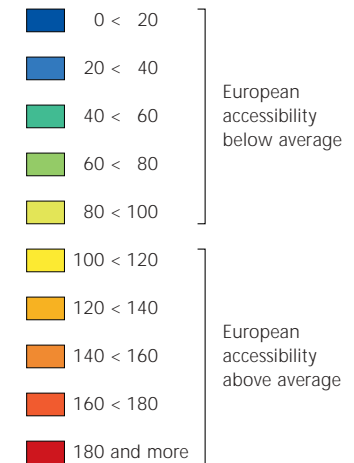
In general, the enlargement of the European Union has led to a decrease in the average accessibility, as the average level of accessibility in the new EU Member States is lower than the average level of the EU 15. However, accessibility is now being improved by new EU trans-European transport projects.

## Conclusions

In terms of accessibility Europe shows two overlapping core-periphery patterns, at the national and the European levels. At the European level, most of the core regions enjoy better accessibility in comparison to the European periphery. At the national level, central areas show a higher accessibility than more peripheral coastal or border regions within most countries. This is related to the fact that road and rail networks reflect a core-periphery pattern both at the European and the national levels, while air transport displays a much more balanced picture at the European level.

## Potential accessibility multimodal, 2001

Accessibility index (EU25+2 = 100)

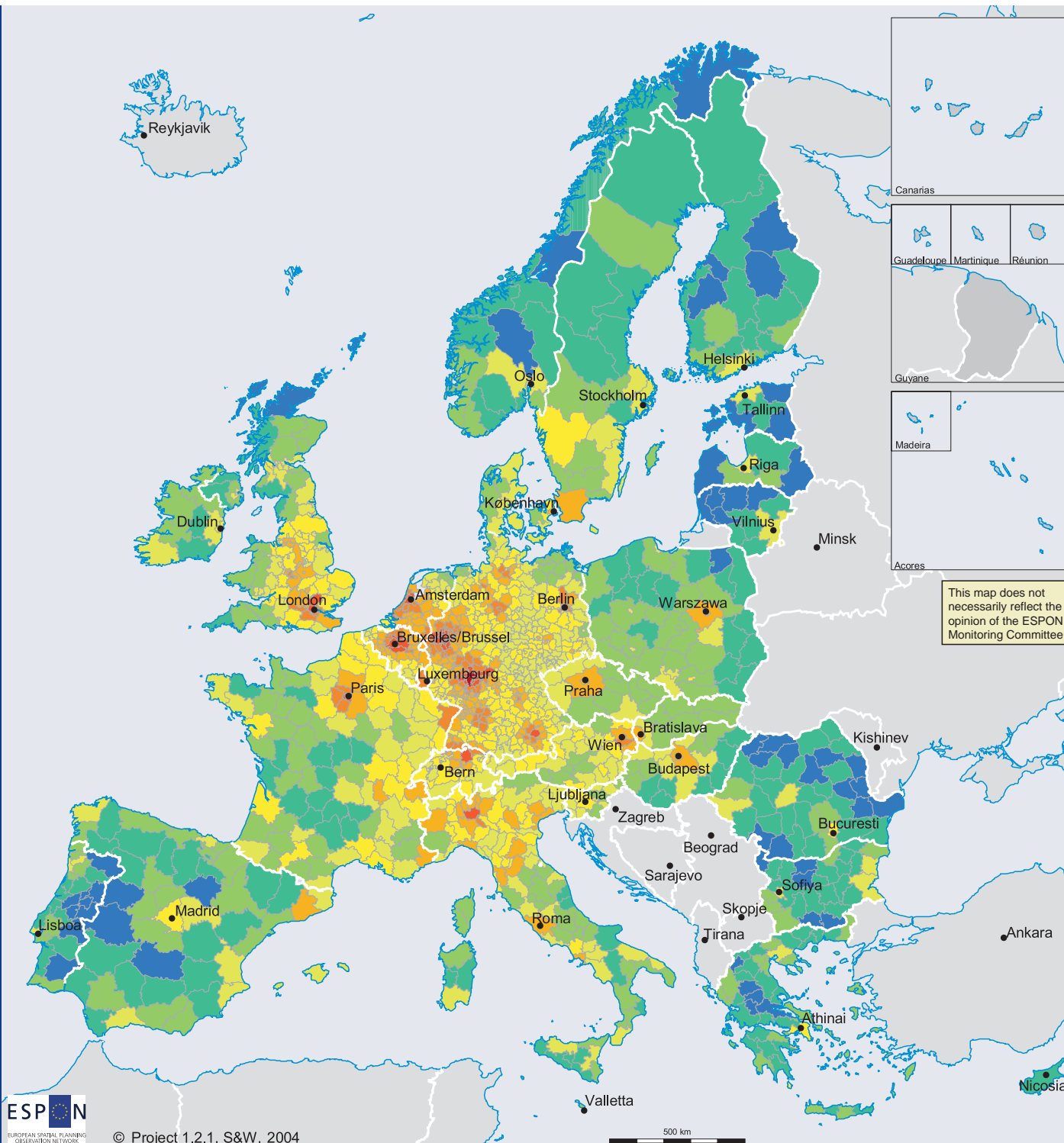


In this map, potential accessibility describes the opportunities (population) to be reached in Europe, weighted by the time it takes to reach them. Multimodal accessibility expresses the combined effect of alternative transport modes, i.e. an aggregated picture of road, rail and air accessibility for a certain location.

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Origin of data: Spiekermann & Wegener (S&W)

Source: ESPON Database



# The diverse impacts of EU transport projects on cohesion

## Concept/methodology/measurement

ESPON has also undertaken territorial impact assessments of EU transport policies, the Trans-European Networks (TEN), and the Transport Infrastructure Needs Assessment – for the new EU Member States (TINA). A series of transport policy scenarios has been developed and assessed regarding the policy impacts on accessibility and economic development.

One of the scenarios shows the regional economic impacts of (a) a full implementation of trans-European network projects including the corresponding infrastructure in Norway and Switzerland and (b) an increase in transportation costs (cf. road pricing) for all transport modes representing the additional social costs of transportation that are not included in current transport prices. The assumption here being that all modes are charged an additional price of ten percent of the present costs of transportation.

## Map findings

The 2021 scenario of building all planned TEN and TINA projects and applying a pricing system for road, rail and air transport would positively contribute to the further development of a European polycentric pattern. The immediate benefits for more central regions resulting from pricing systems seem however to be counter-balanced by the higher long term benefits which the TEN and TINA projects offer for areas outside the core of Europe after 2021.

Focusing on the equivalent income change measured in GDP per capita in this transport

scenario, the core of Europe can expect a slight loss above the average of Europe. The most disadvantaged areas in this scenario are located in Southern Ireland, the East and West coasts of the UK, large parts of coastal Norway, Northern Sweden and Finland, South Eastern France, and single areas in France, Germany, Denmark and Italy. Apart from Sicily, most of the areas benefiting from this scenario are located in the new EU Member States and in Bulgaria and Romania, with an emphasis on regions in Poland, the Czech Republic and Slovakia. In EU 15 a few benefiting regions are located in Greece, Portugal, Spain, Western France, Southern Italy and Southern Sweden plus spots in Southern Denmark and North-East Germany.

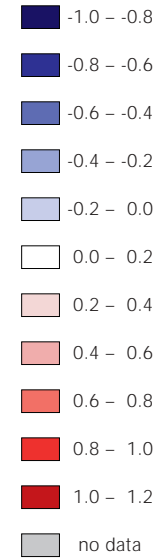
The effects of the scenario with regard to the type of settlement structure suggest that rural regions would benefit the most, while dense urban agglomerations would benefit the least.

## Conclusions

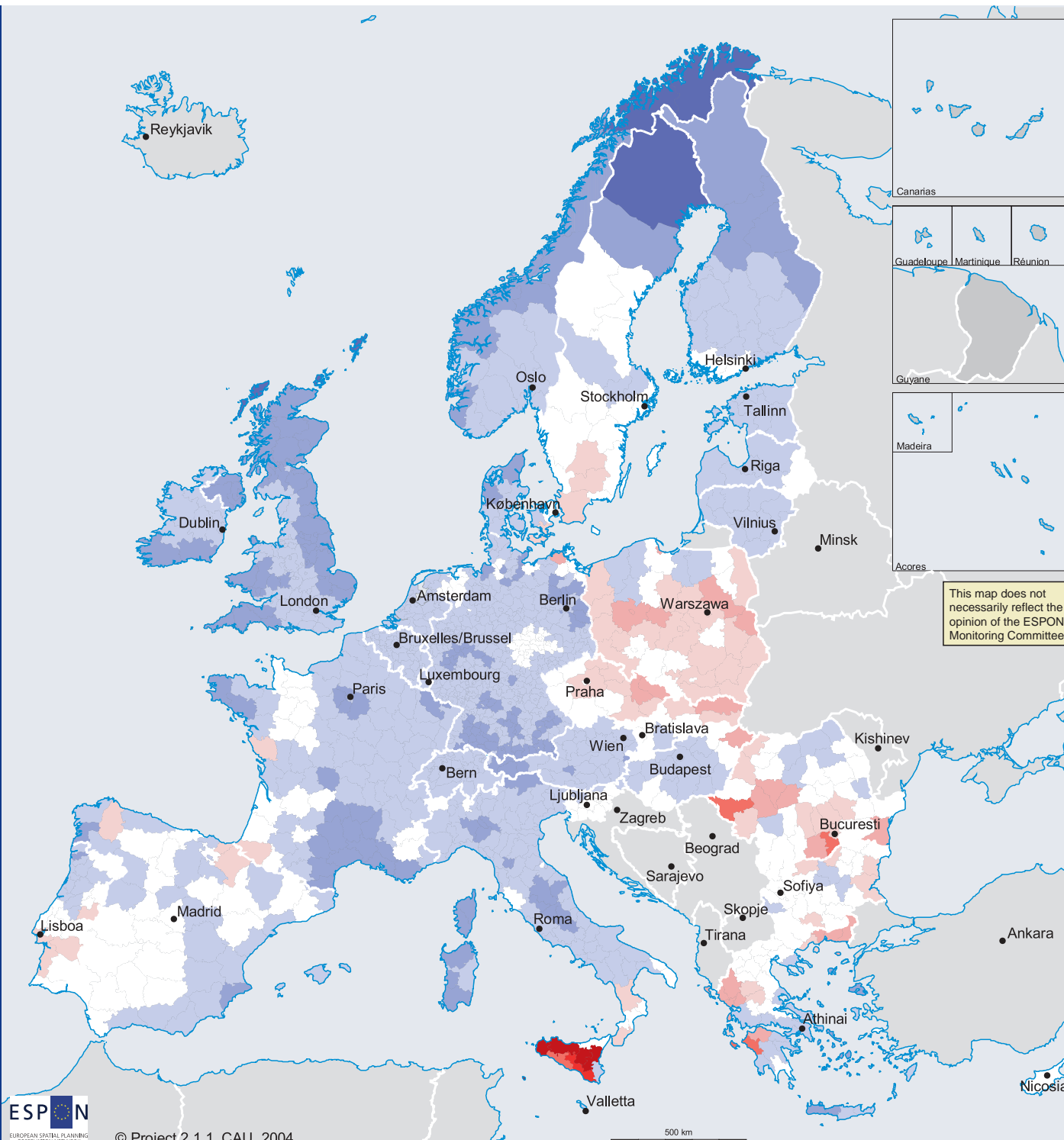
Scenarios are built on assumptions about the future and show possible spatial impacts. Implementing the envisaged European transport projects with a slight increase in transport costs could be a plausible scenario with a neutral spatial effect. Without increasing transport prices the new EU member states and areas away from the core areas will gain the most in terms of supporting balance and territorial cohesion at the European scale.

## Change of GDP per capita when implementing TEN/TINA and higher transport costs, 2001-2021

Change of equivalent variation in % of GDP



This map does not necessarily reflect the opinion of the ESPON Monitoring Committee



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Origin of data: CGEurope model results

Regional level: NUTS 3

Source: ESPON Database

# The roll-out of Information and Communication Technology

## Concept/methodology/measurement

Information and communication technology (ICT) is a complex and highly dynamic sector. Spatial patterns depend on technical solutions, which reflect national differences in telecommunication cultures. Indeed national specificities remain crucial in understanding territorial differences across Europe. Furthermore, patterns differ between household and business uptake of telecommunication technologies. It has to be noted that telecommunications is an exceptionally fluid sector where things change rapidly. Thus the picture presented today could be rather different tomorrow, as countries currently thought to be leading the field may be bypassed by others within a short period of time.

This requires special attention as new information from outside the ESPON programme shows that France, the UK and Germany had a considerable growth in broadband uptake between 2002 and 2004, and thus bypassed some of the countries leading in 2002.

ESPON has provided a regional ICT typology based on data from 2002, with a focus on households, combining fixed telephones, mobile phones, PC access, internet access and broadband internet access. The map brings together

both real data and modelled data based on regression analysis.

## Map findings

In general, the countries of Denmark, Sweden, Norway and Switzerland plus certain regions in the Netherlands, UK, Belgium and Finland enjoy a clear leading position.

The main factor in this pattern is the strength of the Scandinavian countries, which lead in almost all technologies. A number of other countries join these, but normally only within a particular technology.

The moderately high scores for the Mediterranean countries are mainly related to mobile telephones. In this particular field, the Mediterranean countries outpace the core of Europe.

The new Member States are, on average, running behind in ICT applications. However, differences do occur, and these become visible when considering the single factors behind the overall typology presented in the map. For instance, Malta, Slovenia and Estonia are positioned ahead on leading edge technologies and applications such as broadband and e-commerce. The EU accession countries, Bulgaria and Romania, can

however be identified as lagging across all technologies and applications.

Another finding, which is only apparent in specialised analysis of the data behind the map, is that at the local and regional levels there are clear disparities between metropolitan, urban and rural areas regarding internet related technologies, in particular in broadband uptake. This is not a surprising finding as currently the most commercially developed forms of broadband technologies are highly driven by demand and thus primarily serve areas of high population density.

## Conclusions

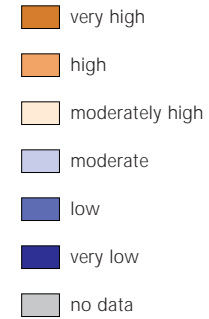
A European core-periphery picture found in many other fields does not hold true for information and communication technologies. In general, it is obvious that national differences in telecom cultures have a clear impact on the services available in different parts of the European territory.

The strength of the Nordic countries is currently dominating. However, in respect of some specific technologies the Southern European countries are more advanced than the core of Europe.



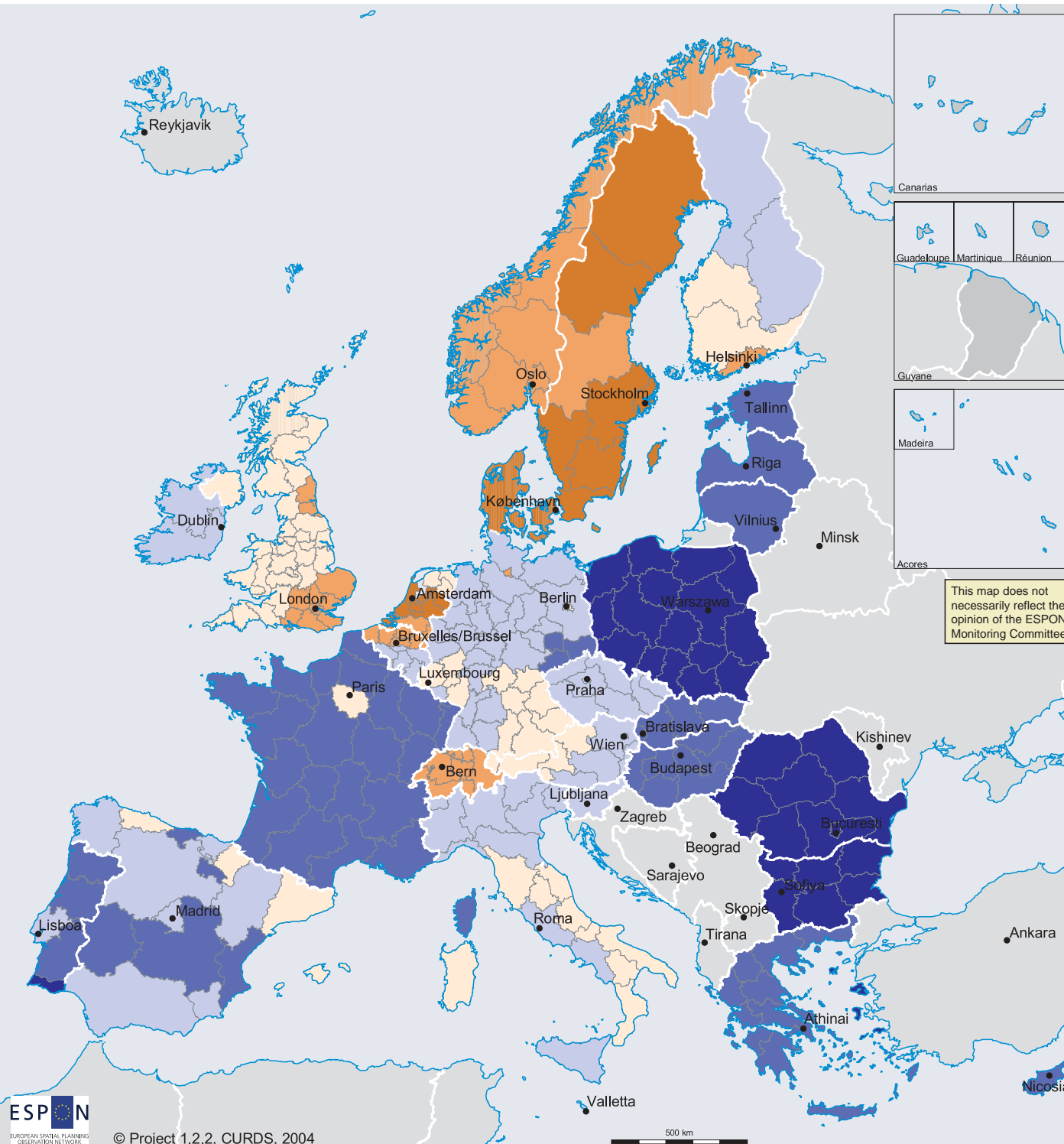
## Households telecommunications uptake, 2002

### Level of telecommunications uptake



The map focuses on households, combining fixed telephones, mobile phones, PC access, internet access and broadband internet access.

This map does not necessarily reflect the opinion of the ESPON Monitoring Committee



# Innovation capacity and R&D with high diversity

## Concept/methodology/measurement

Innovation capacity is another key issue in the current debate about spatial specialisation and territorial capital. The Research and Development (R&D) intensity of an area is an interesting component in this context. With regard to mapping the importance of R&D in European regions, standardised R&D indicators have been brought together addressing R&D expenditure and personnel.

R&D expenditures are reflected as the share of R&D expenditure of GDP, Gross Domestic Product. R&D personnel include the number of researchers in the Business Enterprise Sector (BES) and the total R&D personnel calculated as a share of the total employment in a region. As such, both the importance of R&D employment in general as well as of the private sector is considered.

## Map findings

R&D intensity varies across Europe. At a European scale, the regional figures for R&D intensity demonstrate the weaker position of the EU periphery, with the exception of the Nordic Countries. The areas with the lowest R&D intensity are to be found outside the core of Europe, e.g. in a number of Greek and Polish regions, South-East Austria, Southern Italy, and Northern Hungary, as well as in Bulgaria.

Denmark, Finland, Luxembourg and Switzerland are the only countries, in which all regions have

a R&D profile above the average of the EU 27 plus Norway and Switzerland. The entire territory of Switzerland and Luxembourg, as well as Northern and Southern Finland are clearly among the areas of the highest R&D importance. Other significant areas of the highest R&D importance are Midi-Pyrénées, Ile-de-France, South-Eastern England (except London), the North-Western Netherlands, large parts of South-West Germany plus some other scattered areas in Germany, large parts of Southern Sweden (up to Stockholm), Oslo and Mid-Norway.

Only three areas in the new EU Member States show an R&D importance above the average, these are the urban regions of Prague, Bratislava and Budapest. In Romania, Bucharest also exhibits an R&D importance level that is above the average.

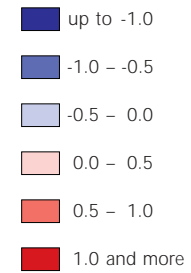
## Conclusions

Many regions and large parts of the European territory are lagging behind in terms of their R&D intensity. In relation to the ambitions of the Lisbon strategy it seems that more nations and regions may strive to improve their knowledge base. However, not every region has a high potential as regards the knowledge economy, and some might therefore actually do better by exploring other endogenous potentials.

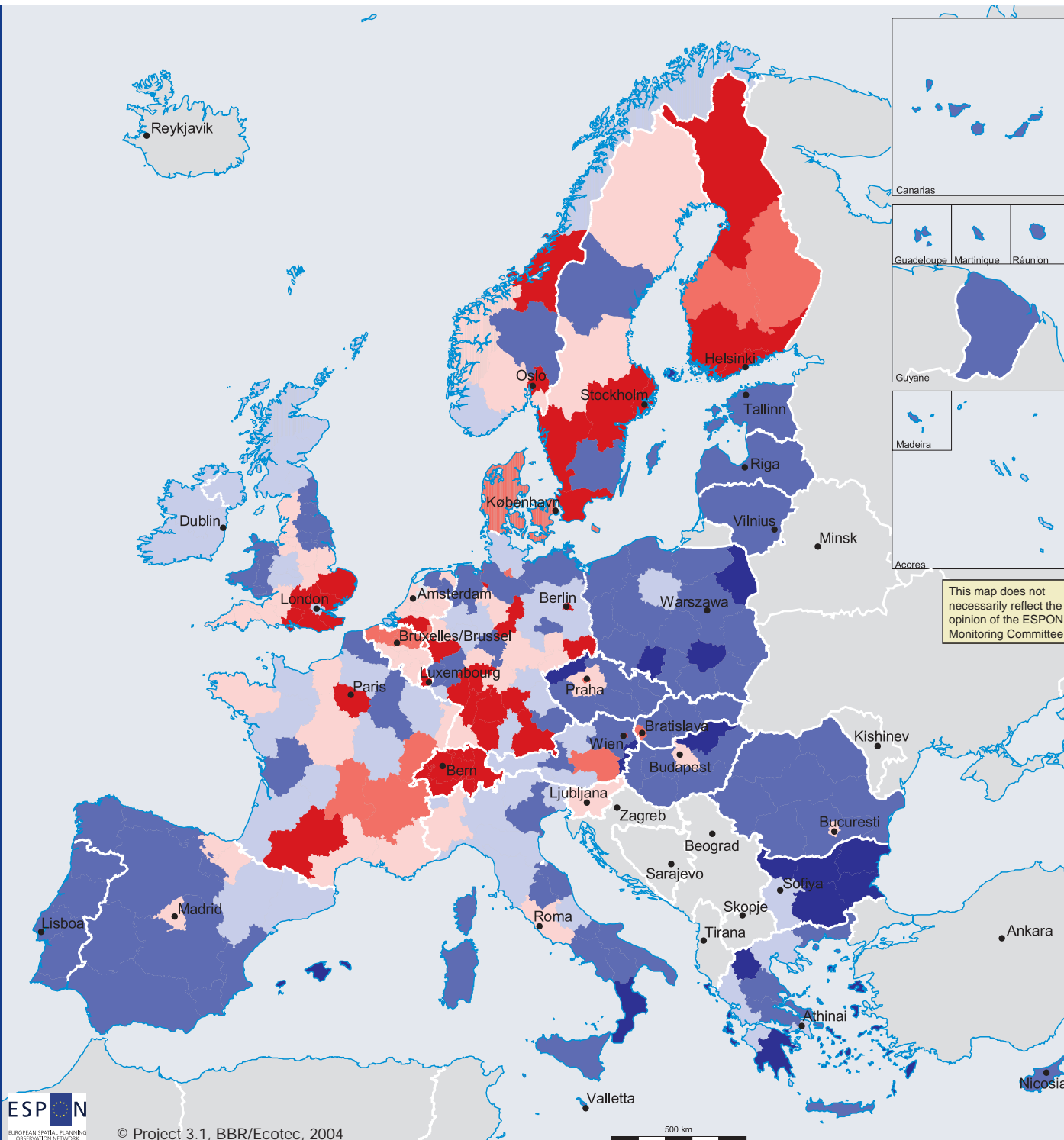
## The importance of Research & Development, 2002

Additive combination of standardised R&D-indicators: R&D personnel total, personnel in BES and expenditure on R&D

Average of EU25 + N + CH + BG + RO = 0



This map does not necessarily reflect the opinion of the ESPON Monitoring Committee



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Origin of data: Eurostat, National Statistical Offices

Regional level: NUTS 2

Source: ESPON Database

# Areas of concentrated risks and hazards

## Concept/methodology/measurement

Natural hazards such as flooding and droughts are of growing concern. Their increasing occurrence is generally attributed to climate change.

ESPON is working on the analysis of several natural and technical hazards, their recurrence and magnitude as well as their potential impact on European regions, developing risk and vulnerability typologies covering Europe for a number of topics. Among natural hazards studied are earth quakes, flooding, droughts and forest fires. Technical hazards addressed comprise maritime oil spills and hazardous waste deposits as well as a number of other hazards.

The selected map shows a hazard recurrence based on the average number of flood events on the NUTS 3 level during the period 1987-2002. Each NUTS 3 region has been allocated an average of their large flood events. The first category, encompassing "very low hazard intensity" includes only those regions without large flood events during the observed time period. It is important to note for the interpretation however that the risk has to be seen in relation to the potential damage level, which is obviously not the same for all regions.

## Map findings

The largest number of large flood events during the period 1987 to 2002 was concentrated in North-Western Romania, South-Eastern France, Central and Southern Germany and in the East of England.

Areas with very high river flood event occurrence are found in North-Western Romania, Eastern Hungary, South-West Germany, North-West Italy and Southern France. Most of these areas are cushioned by areas with high river flood event occurrence. Such areas are also found in the East of England, Western Germany, Western Belgium, Switzerland, Southern Poland and South-East Spain.

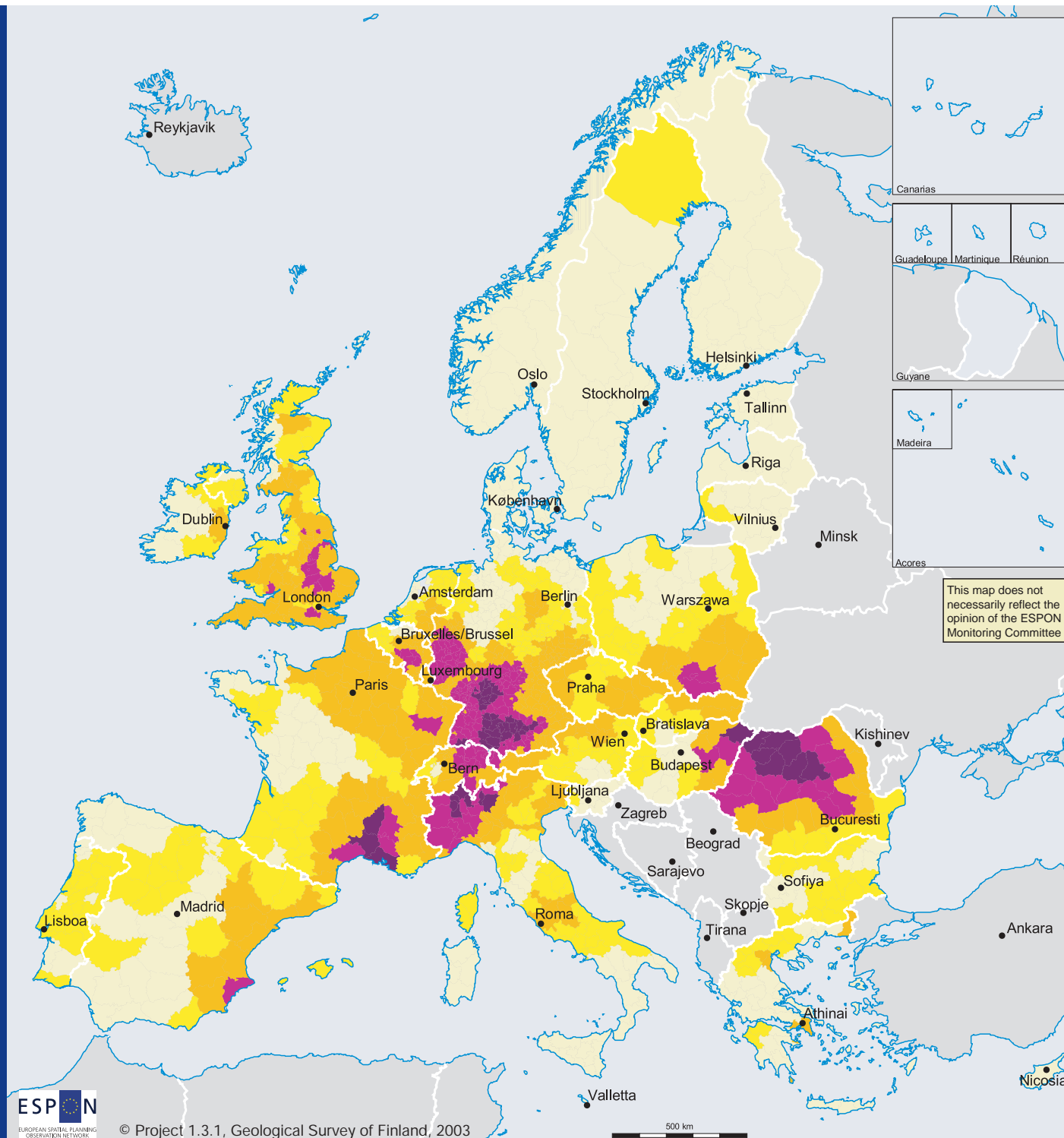
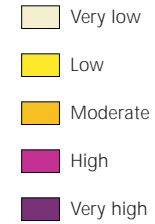
Relating the findings presented in the map to other ESPON analyses, it is interesting to note that the areas with very high river flood event occurrence in Romania and Hungary are at the same time the areas that have experienced the highest problems in terms of hydrological droughts. Thus, floods and droughts go hand in hand in these areas.

## Conclusions

Environmental challenges for territorial development derive either from the degree of human intervention damaging local environments, or through environmental and partly even technical hazards. Concerning human intervention related to flooding the main aspects are related to the change of the natural course of the river through straightening and canalisation. In densely populated areas the general sealing of the soil surface is also an important factor here as it prevents rainwater seepage from returning to the ground water, instead canalising it towards the rivers where it becomes an additional water source.

## Large river flood events recurrence, 1987-2002

### Flood recurrence



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Origin of data:  
 Large flood areas © Dartmouth Flood Observatory  
 Flood areas © ESA - Earth observation - Earth online  
 Rhine Atlas 2001 IKRS-CIPR-ICBR

Regional level: NUTS 3

Source: ESPON Database

# An initial analysis of Europe's global competitiveness

## Concept/methodology/measurement

The geographical position, differences in population developments and age structures, the socio-economic potential and the environment all pose significant challenges to the competitiveness of Europe in the global context. Territorial structures such as the functionality of urban areas and global transport connections define those areas of the European territory that will play a particular role as gateways for Europe to the wider World.

With reference to the Lisbon/Gothenburg Strategy, which set the target for Europe to become the most competitive, knowledge-based "region" in the world, while at the same time aiming at a sustainable development path, the global perspective needs to be further developed.

Europe (i.e. the combined territory of the EU 27 plus Switzerland and Norway of the ESPON programme) covers one of the largest markets in the world. This territory is one of the most populous and densely populated regions in the world with almost 500 million inhabitants living in an area of 4.7 million square kilometres. The

total GDP of about 11.600 billion \$ is one of the highest in the world, and can be compared to the 12.300 billion \$ of the NAFTA zone, 4.300 billion \$ of Japan, and only 620 billion \$ of ASEAN and 580 billion \$ of Mercosur.

An initial attempt to illustrate the spatial patterns of global economic potentials has been developed by analysing GDP located in a neighbourhood defined by a Gaussian differential geometry.

## Map findings

Smoothing methods, applied to the geography of economic potential show the world as a triad, i.e. three main hotspots. Wealth measured by GDP in US dollars in 1995 is concentrated in simple patterns, a large northern triad (United States and Canada, Europe and the Near-East, East Asia), and a small Southern triad (Brazil-Argentina, South Africa, Australia-New Zealand). Minor concentrations of wealth can be observed in Nigeria and peaks in the Pacific (Hawaii, French Polynesia).

In terms of the geographical concentration of wealth, measured in GDP, Europe is significantly

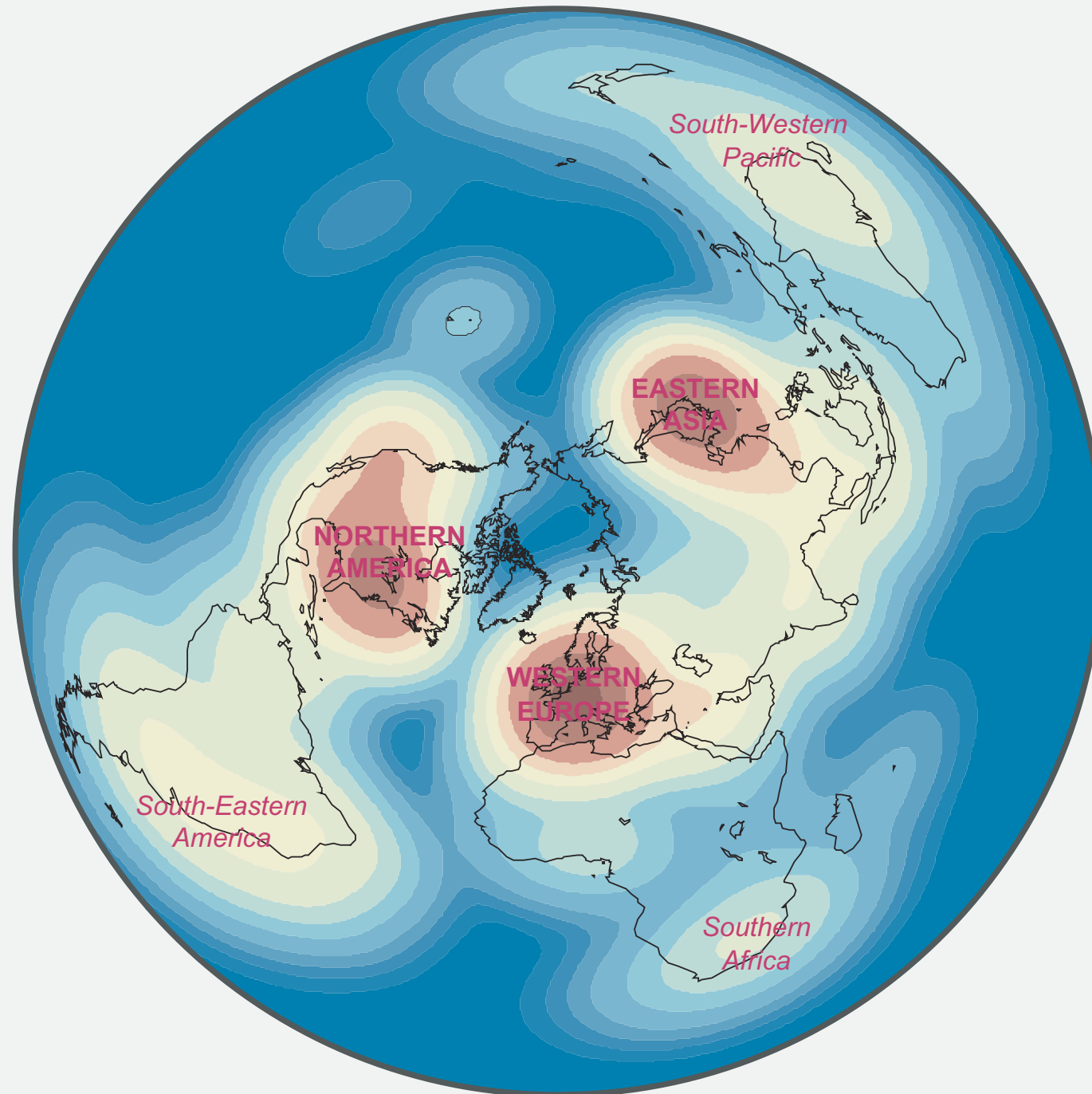
ahead of East-Asia and also North America. Indeed, as regards Europe, 24% of the world's wealth can be found within a circle with a radius of 1,000 km, while the corresponding figures for East-Asia and for North-America are 18% and 13% respectively.

## Conclusions

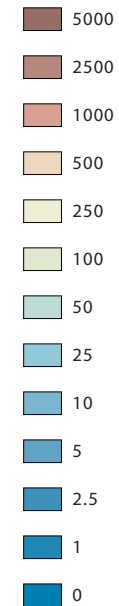
Preparing for the efficient use of, and improvement in the spatial structures that support the flows that make Europe a more integrated, cohesive and competitive territory, it is important to understand the territorial development trends and global services in particular that make a multitude of European MEGA's important international players.

Further studies on Europe in a global context have already begun within ESPON focusing on flows and structures, comparing Europe with other continents. A particular focus here will be set on relations with the EU's new neighbouring countries in Eastern Europe and the Mediterranean area.

## World economic potential



GDP 1995 located in a gaussian neighbourhood span of 1000 km in billions of US \$



The economic potential of a point at the surface of the earth is the sum of all local economic concentrations of GDP weighted by a decreasing function of distance. The function used in this analysis is a gaussian function  $f(d) = \exp(-\lambda \cdot d)$  where  $f(250 \text{ km}) = 0.5$

Map contour and projection: SAS-MAP revised by UMR Géographie-cités

Source of data: World Bank - World population datasheet  
Computation of potential ID-IMAG / The Hypercarte Project

Source: ESPONDatabase

This map does not necessarily reflect the opinion of the ESPON Monitoring Committee

# Concluding remarks

The ESPON programme will seek to further develop the knowledge available on both the wider trends and the actual impacts of policies. The maps and interpretations presented in this briefing therefore present examples of research activities and studies that may potentially support policy development at the European as well as the transnational, national and regional/local levels.

As the recently adopted (but still not ratified) EU Constitution mentions territorial cohesion as an objective for the European Union, it thus becomes a challenge to consider the provision of thorough and continuous knowledge and monitoring of the dynamics of the European territory.

The initial findings of ESPON have been included in policy documents such as the Third Cohesion Report, published by the European Commission, and in documents related to meetings organised by countries holding the EU Presidency. The variety of ESPON research themes decided upon by the ESPON Monitoring Committee is intended to support further policy development and to detail the new concept of territorial cohesion.

Applied territorial research and other connected studies are the building blocks of a systematic

observation of territorial trends and policy impacts, which allows us to deduce well-founded policy recommendations and implement policy making that relies upon a broad knowledge base.

The ESPON programme will strive to provide a solid and innovative framework for a European research network in the field of territorial development. The participation of more than 100 research institutions has fertilised the ESPON approach and broadened the roots of ESPON thinking and activities throughout the European research community that has shown a broad interest in the European territorial research themes as defined in the ESPON programme.

An ongoing necessary is however the maintenance of a continuing dialogue with policy makers, practitioners and scientists on the final ESPON research results, as this is crucial for ensuring that the ESPON results are of practical use to policy makers and practitioners.

As part of this dialogue you are welcome to consult the ESPON website on the full reports ([www.espon.lu](http://www.espon.lu)) and to state your views and proposals in relation to this first ESPON Briefing by e-mail, to [info@espon.lu](mailto:info@espon.lu).



Information on the ESPON programme, the full project reports and the partners involved can be found on [www.espon.lu](http://www.espon.lu).

The web site provides the possibility to download and examine the most recent document produced by ongoing ESPON projects.

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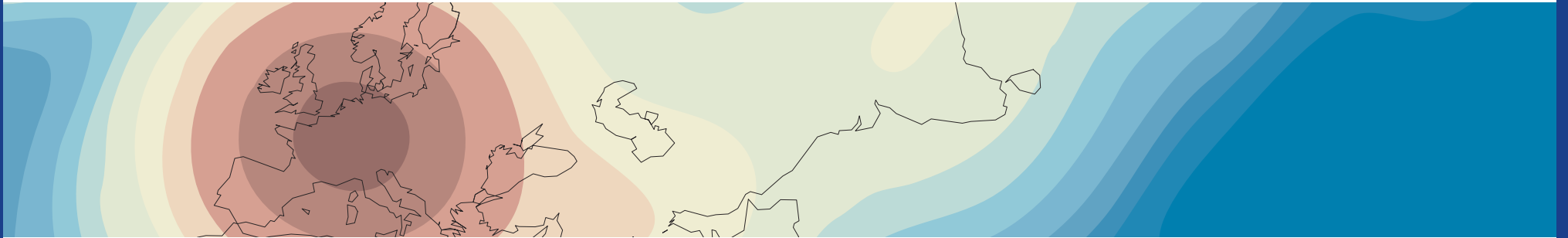
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Disclaimer:

The content of this document is based on the research results provided by the transnational teams of researchers taking part in the ESPON programme. As such, the maps and their corresponding texts do not necessarily reflect the opinion of the ESPON Monitoring Committee.



The European Spatial Observation Network (ESPON) is set up to support policy development and to build a European scientific community in the field of territorial development. The main aim is to increase the general body of knowledge about territorial structures, trends and policy impacts in an enlarged European Union. The ESPON programme commenced in 2002.

The purpose of this first ESPON Briefing is to stimulate a dialogue on ESPON results. As part of this dialogue you are welcome to state your views and proposals by e-mail to [info@espon.lu](mailto:info@espon.lu).