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TIPTAP: Territorial Impact Package for Transport and Agricultural Policies

Applied Research Project 2013/1/6

Final Report – Part C

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This report presents the draft final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

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This basic report exists only in an electronic version.

C Scientific report

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INTRODUCTION

The aim of this Scientific Report is to detail on the methodology, the scientific basis, research strategy and choices that have driven the TIPTAP project.

This Report is articulated in five main sections.

The first section provides the conceptual background that inspired, shaped and directed the research.

The second section details the methodological changes introduced with respect to the previous version of the TEQUILA model.

The third section describes the two sectoral policies (i.e. transport and agricultural policies) that provide the test bed for the new upgraded version of the TEQUILA model.

The fourth section reports on the experts meetings organised to assess the methodology and the key component of the TEQUILA model for both policies.

The fifth section comments on the key results and maps of the research.

The sixth section details options for policy development.

The seventh section suggest further extensions of analytical work and research.

1. TERRITORIAL IMPACT ASSESSMENT: THE GENERAL APPROACH

1.1 Territorial Impact Assessment: The institutional engagement

The necessity of developing a consistent methodology for TIA emerged during the preparation of the ESDP documents, 1995-1999. The final ESDP draft, approved by the Ministers of Spatial Planning in 1999 (CEC-CMSP, 1999), refers to TIA in many respects, and in particular in cases where the different preference or decision dimensions have to find a difficult equilibrium point. In the sphere of transport policies, confronted with an accessibility/environment trade-off but also with the challenge of a spatially equilibrated infrastructure endowment and provision: "Comprehensive integrated spatial development strategies" are needed, and "in the future, *territorial impact assessment* should be the basic prerequisite for all large transport projects" (par. 109). In the sphere of natural resource management, where a wise balancing of protection and development is needed: "The conservation and management of natural resources call for appropriate integrated development strategies and planning concepts as well as suitable forms of management. This ensures that nature conservation and the improvement of living conditions of people are taken into consideration equally. *Spatial and environmental impact assessment* can provide the necessary information basis for this" (par. 138). In the sphere of water resource management, where surface and ground water policies should integrate with preventive measures for the reduction of waste water and careful spatial and land use planning: " The impact of large water exploitation related projects should be examined through *territorial and environmental impact assessment*" (par. 145). In all these three cases, TIA is recommended explicitly in the policy options paragraphs (policy options n. 29, 42, 52), and in a final recommendation: "Member States should intensify the exchange of experience on *territorial impact assessment*" (par. 185).

The engagement to develop a coherent methodology for TIA was subsequently taken up at the Informal Ministerial Meeting in Tampere, September 1999, with the *ESDP Action Programme*. Three Strands of Action were decided, and inside the first strand, addressed towards the promotion of "a spatial dimension in Community and national policies", the action concerning *Territorial Impact Assessment*: "*The development of a common concept for territorial impact assessment (TIA) is necessary to support spatial development policies. The concept shall be of a cross-sectoral nature and include socio-economic, environmental and cultural indicators for the territory in question*".

Three elements have to be highlighted: the fact that no common concept for TIA does in fact exist at present; the multisectoral nature of the methodological approach; the fact that impact should refer to specific territories, those addressed to by development policies and not just to the general EU territory.

Along similar lines, in 2002 the Commission introduced a new Impact Assessment (IA) procedure, designed to contribute to a more coherent implementation of the Sustainable Development Strategy through the assessment of the potential impact of policy options (CEC, 2002), subsequently applied to a number of Commission's proposals. Impact assessment is conceived as "a set of logical steps which structure the preparation of policy proposals" at the European level (CEC, 2005, p. 4), cutting across and integrating different sectors and dimensions (economic, environmental and

social) and replacing all previous single-sector type assessments (environmental, gender, business, health assessments) (CEC, 2004a).

The general goal of integration of the different dimensions on which impacts may be evaluated, going beyond Strategic Environmental Assessment and other mono-dimensional assessment tools, is similar to the TIA one; the main difference regards the aggregate perspective in terms of territorial impacts of IA, as its main level is a comprehensive, Europe-wide one, with possible indications only of differential impacts on specific typologies of regions (e.g. urban/rural) (CEC, 2004a, p. 11), while TIA should apply both to the general and the specific territorial level.

The necessity of developing a new concept for TIA was subsequently taken up by the ESPON Programme 2006. General indications and requirements for a TIA approach were developed inside ESPON Project 3.1., but only at the end of the ESPON 2006 experience a consistent and operational proposition of a TIA methodology was developed and applied to the priority TransEuropeanNetworks projects inside ESPON Project 3.2, with the Tequila model.

1.2. The scientific base: the TEQUILA Model

The methodology and the general philosophy of the present project builds on the scientific and operational achievements of the TEQUILA model, fully developed as a simplified and prototype model for the ESPON 2006 Programme. The Final Report on "*Territorial Impact Assessment of the Union's policies – TIA: a methodological proposal and an application to TENs policies - The TEQUILA Model*" inside ESPON Project 3.2. was presented in July 2006[1].

The TEQUILA model provides the general logical and methodological framework that can be used in order to carry on the Territorial Impact Assessment of public policies. At its present state, is a simplified prototype: some complexities of the multi-criteria model were taken outside and managed in a transparent but simplified way. The value functions, for instance, were just decided by the model developer. The present project refines the existing version of the model, both in its methodological and its operational aspects to achieve a fully operational model: TEQUILA 2. In order to do so, the existing version is simultaneously tested and assesses by experts having experience on policy-assessment studies in the field of European transportation and agricultural policies.

The basic features of the TEQUILA model are fully consistent with the Terms of Reference concerning ESPON Applied Research Project 2013/1/6 – Territorial Impact Assessment of Policies. In fact:

A. it assumes the territorial dimension as an integrated and comprehensive frame, encompassing multiple sub-dimensions that are altogether crucial for a modern and wise policy making;

[1] The full description of the TEQUILA model is presented in the ESPON website, Project 3.2: "Spatial scenarios and Orientations in relation to the ESDP and Cohesion Policy", Third Interim Report January 2006, Volume VI on territorial impact assessment/analysis (TIA):
http://www.espon.eu/mmp/online/website/content/projects/260/716/file_1256/3.ir_3.2-full.pdf .
Its theoretical and methodological foundations are presented in Camagni (2006).

B. it interprets the general objective of a Territorial Impact Assessment of sectoral policies as an assessment of the impact of these policies on the general "territorial cohesion" objective of the Union;

C. it shows how differentiated in terms of territorial impact might be the effects of sectoral policies which "hardly take account of territorial objectives";

D. it takes directly into consideration "the economic, environmental, social and cultural fields" as the dimensions on which impacts of policies should be assessed;

E. it acquires and makes most from existing knowledge and scientific results concerning the assessment of the impacts of specific European policies, in particular the research works developed inside the ESPON programme;

F. it is in a measure to host both qualitative and quantitative judgements, supplying a consistent scientific and operational framework for a "*summative*" evaluation of the territorial impact of policies, guaranteeing at the same time a separate evaluation of the impacts on each single field (or sub-dimension).

In conclusion, the TEQUILA model offers a logically sound starting point to the present research, as it couples scientific rigour and operationality. The methodology, based on a multi-criteria (MC) approach, though simplified and user-friendly, looks consistent; and the operational package – the so called Tequila-SIP: Interactive Simulation Package – has proved to supply promising results assessing the territorial impact of priority TEN projects (defined in 2000-01) on European NUTS 3 regions, a territorial level that looks particularly appropriate when territorial specificities have to be taken into account.

1.3. The Multi-Criteria framework

The presence of irreconcilable interests and qualitative information in decision-making situations generally precludes a meaningful application of unidimensional evaluation and decision techniques, like e.g. cost-benefit ratios, etc. Consequently, in the past decades much attention has been developed to the development of multidimensional evaluation approaches, such as multicriteria or multi objective evaluation methods.

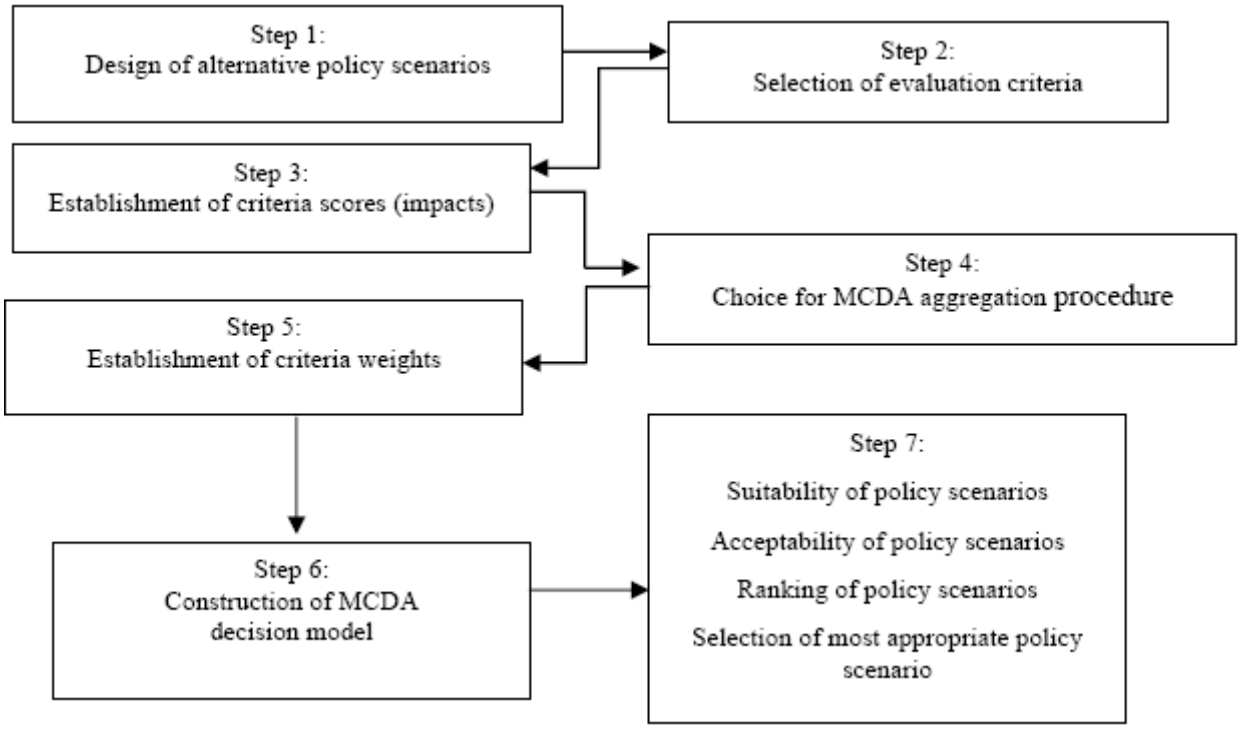
These methods aim at taking into account heterogeneous and conflicting dimensions of complex decision problems. Despite the rich variety of these methods, they all have one element in common, viz. the use of multiple judgement or evaluation criteria. In this regard, multidimensional evaluation has become an important way of thinking, especially as the methods are able to take account of a wide variety of divergent aspects inherent in any decision situation. Besides, the methods offer an operational framework for a multidisciplinary approach to various planning problems.

Given the nature of policies focussing on Territorial Cohesion, it is reasonable to expect that many conflicting objectives and interests may emerge in the decision-making situation. This implies that the use of multiple criteria methods offers some interesting opportunities.

Seven steps may be defined in the MC framework (Figure 1.3.1). In general, the first three steps of MC decision assessment procedure involve the definition of policy alternatives, the selection of evaluation criteria and the associated scores (i.e.

impacts). The assessment of impacts entails the measurement of changes in welfare of all stakeholders by the policy concerned. Part of these effects can be measured in monetary terms, part not; this especially applies to environmental or safety effects, etc. The result of these steps is the construction of a dataset consisting of the impacts the alternatives considered have on a selection of relevant criteria. Furthermore, the dataset is analysed. Questions like: "what type of data is at hand (ordinal, cardinal, etc.)?", "is the dataset complete?", "can relationships among the data be found?", "can the dataset reduced without losing information?", etc are addressed. The result of this step is the assemblage of a structured information table that forms the input for an evaluation method and thus for the final evaluation of the alternatives.

Fig. 1.3.1. – The seven steps in Multi Criteria Decision Assessment procedure



The fourth step involves the choice for an evaluation method to be applied, capable of comparing impacts on different dimensions/criteria. There is clearly no single evaluation method that can satisfactorily and unequivocally evaluate all complex aspects of TIA-policies. The choice for an evaluation methods (or combination of methods) is therefore dependent on the features of the decision problem at hand, on the aims of the analysis, and on the underlying information base.

The TEQUILA model is based on Weighted Summation and has its roots in Multi Attribute Utility Theory. Though very simplified, the main advantage of the TEQUILA Model appears the transparent aggregation procedure it incorporates. Instead of being a black box to non-experts, the applied method is easy to understand by decision-makers and other stakeholders.

Up to now, the weights in the TEQUILA model were defined "from above", by the model builder, though within a totally transparent procedure which allows interactive change of the weights (during technical meetings, arenas, …). In the present project the weights have been defined with a mixed procedure, through experts meetings and "from below", under the suggestion of end users (policy makers at any level).

In the research, another MCDA-method also plays a relevant role, namely the Flag Model. As the TEQUILA model is based upon Weighted Summation, in principle, a very bad score on one criterion could be compensated by a good score on another. Should we allow that a very negative score on the environmental dimension can be compensated by a good score on other dimensions? Or should we establish, in consultation with experts, critical threshold values (CTVs) which may not be exceeded? A simple rule can then be applied: in case the impact of a policy alternative exceeds a critical threshold value in some regions, it should not be compared or averaged with impacts on other dimensions/criteria and taken into consideration in the decision-making procedure; the case should be inspected per se and compensation interventions should be envisaged.

The Flag Model is a highly attractive method for pre-screening impacts by means of a CTV analysis. We discuss this method in more detail in the following sections.

Step 5 consists of establishing the priority weights that may be assigned to the evaluation criteria selected to reflect the impacts of the policy alternatives by the decision-makers. These priority weights should reflect the preference structure of the decision-maker. In this research project we make use of expert panels to establish the priority weights. Through these groups of experts we not only assess the priority weights but also the value functions associated with the other components of the assessment model, namely the desirability of the dimensions/criteria for different categories of regions and their vulnerability to particular "potential" impacts. In fact, vulnerability of the single regions to differentiated impacts and desirability of different territorial objectives; these plays an important role in the logical structure of the model In the subsequent sections we discuss this approach in more detail and how the TEQUILA model has been strengthened in this regard.

Step 6 consists of the construction of the model which is essentially based upon averaged mean of single dimension impact by applying the weights defined in Step 5.

Step 7 consists of the analysis of the results obtained through Steps 1 to 5 and allows for the assessment and the suitability of the policy scenario examined.

1.4. Territorial cohesion: from principle to reference for policy assessment

As it was said before, the definition and operationalisation of territorial goals, on which territorial impacts will be assessed, will be related to the concept 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, 2004b, 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, pg. 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, 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" (Dutch Presidency, 2004). 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 the subsequent document on "the territorial state of the Union", a kind of 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).[2]

Once arrived at this stage of comprehension of the content of territorial cohesion, a further small 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*.

[2] 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.

And similarly to the concept of sustainability, it bears at the same time a positive and a normative sense (i.e., defines a condition and a policy goal) and operates by integrating different dimensions: the economic, the social and the environmental one.

This 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[3] and environmental-friendly spatial distribution of human activities.

In our opinion, territorial cohesion refers directly to the last dimension[4]. 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.

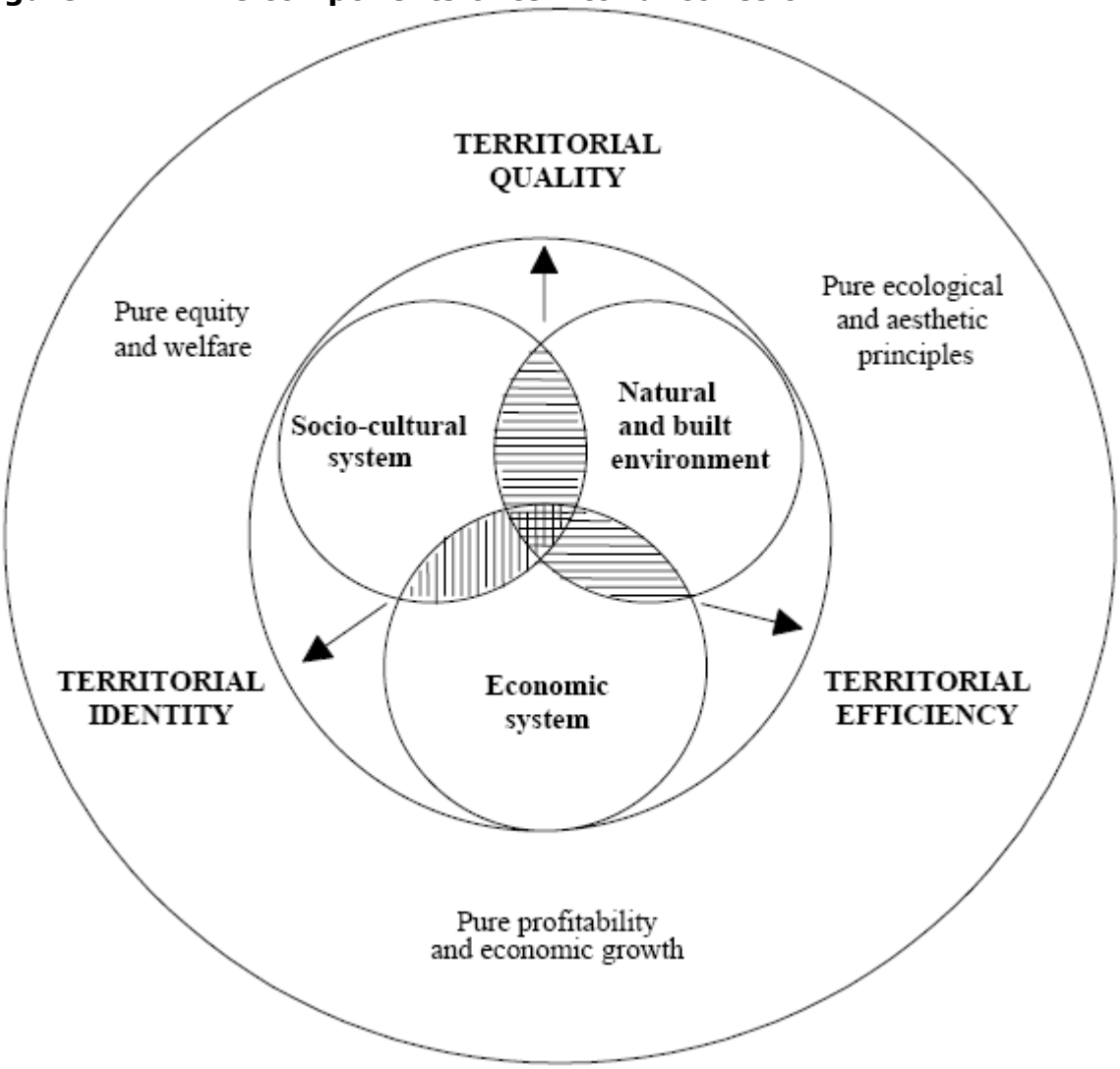
These objectives may be reached through an integrated approach, securing the virtuous integration and positive co-evolution of the three sub-systems mentioned above - the economic, the social and the physical-natural systems - in their spatial manifestation or phenomenology (Figure 1.4.1). This means maximizing the synergies and the positive cross-externalities from each sub-system and all the others, and minimizing the negative externalities (Camagni, 1998)[5].

[3] We are referring to land resources, energy, natural and landscape resources.

[4] 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".

[5] 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.

Figure 1.4.1. The components of territorial cohesion



Territorial quality: quality of living and working conditions; comparable living standards across territories;
similar and fair 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 and relational capital; capability of developing a shared vision of the
future; know-how, specificities, productive "vocations" and competitive advantage of each territory

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 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; this may be considered a strong political point, but it incurs nevertheless the risk of leaving the quality of life element in the backstage.

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:

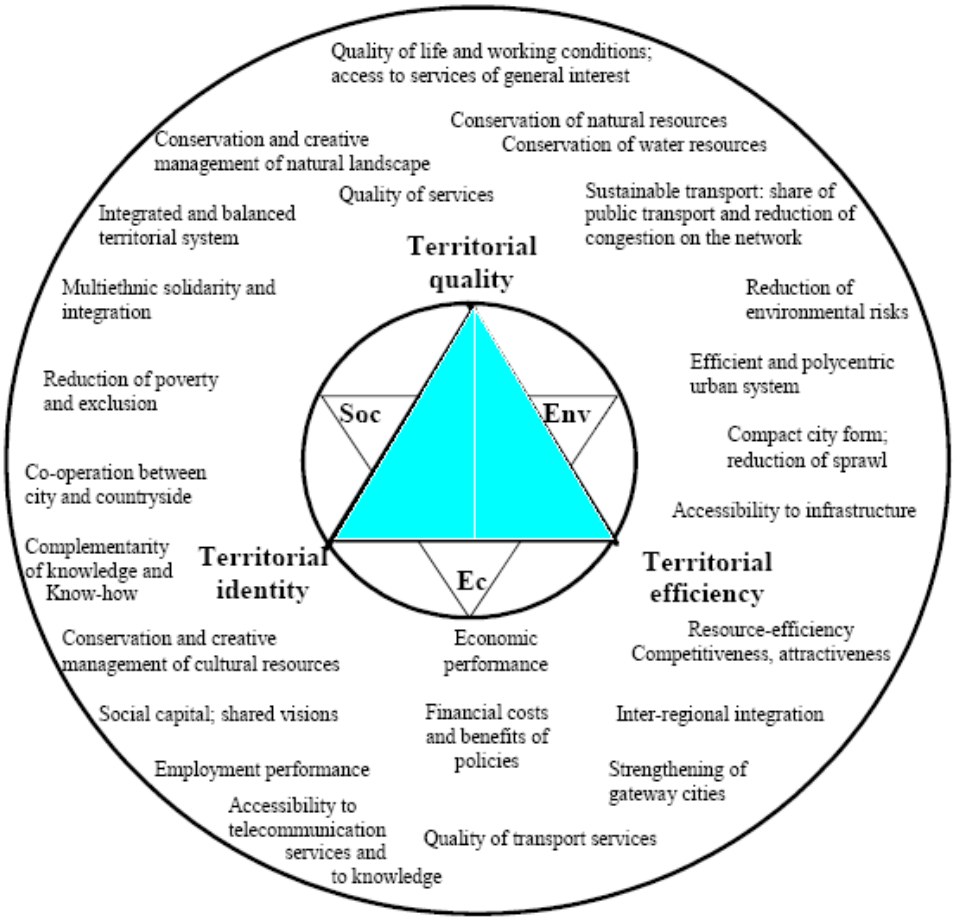
- they represent the ultimate glue of local societies,
- are linked with the spatial division of labor and in many cases determine its evolution,
- facilitate processes of collective learning and consequently boost the efficiency of the local production fabric.

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[6].

[6] 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.

Which issues deserve attention from the new territorial impact assessment (TIA) point of view? They may be found and described in the documents mentioned earlier, particularly in the ESDP, and may be summarized as in Figure 1.4.2.

Figure 1.4.2. An integrated strategy for territorial cohesion: Objectives and assessment criteria



2 THE METHODOLOGY: FROM TEQUILA 1 to TEQUILA 2

2.1. Basic features of the TEQUILA 1 model retained in TEQUILA 2

Some basic features of the earlier TEQUILA model (TEQUILA 1), which come from the past in depth reflection on both the scientific and operational foundations of a TIA procedure, have been retained in this new version, i.e. TEQUILA 2. In fact, these reflections were in a measure to provide a fully developed, workable model for TIA, something that was not readily available elsewhere. The main elements that have been retained may be listed as follows:

1. **The multi-criteria approach**: in fact, territorial impacts are so widely differentiated and touch so many different dimensions (economic, social, physical, environmental, cultural, …), that a unique expression in monetary terms (such as in Cost-Benefit Analysis) looks impossible.

2. **The possibility of providing** at the same time **a *single-dimensional impact*** (SDI)- the impact on a single dimension of the assessment problem (e.g. on economy, society, environment, landscape) – **and a *summative impact*** (SI), generated by an appropriately weighted summation of the impacts on single dimensions.

3. **The possibility of combining qualitative and quantitative impact measures**, in order to take advantage of most existing quantitative evaluations and "fill the holes" with qualitative expert judgements. This goal is achieved through a unique scaling procedure of the single impact measures, that resolves at the same time the problem of variables standardisation. Single-dimension impact (SDI) refers to single impact indicators of the policy examined, ranging from economic growth to environment to social elements; summative impact (SI) refers to the three above-defined macro-components of territorial cohesion - Territorial Efficiency, Territorial Quality and Territorial Identity - as well as on a generalized Summative Territorial Impact. This assessment implies comparison, averaging and compensation among different impacts.

4. **Evaluations of impacts on single territorial "dimensions"** (*single-dimensional impacts*) are implemented by utilising the best and most suitable techniques, for both sectoral policies. These assessments have been carried out by the project partners and the lead partner. On the other hand, the comprehensive **summative model** has been managed by the Lead Partner together with Partner 3; restructuring and improvement of the previous operational package, the Tequila Sip, has been managed by Subcontractor 2 to LP.

5. **Territorialisation** of potential impacts has been drawn by considering the following:

- the *intensity* of the policy application may be different on different regions;
- the relevance of the different fields or "criteria" is likely to be different for different regions, according to their *utility function* (e.g. the same impact on employment may have a completely different meaning in an advanced and in a lagging region),

- the *vulnerability* of the different regions to similar "potential" negative impacts is likely to be different (e.g. an urbanised region is more vulnerable to a chemical catastrophe than a desert region)
- the *desiderability* of the different regions to similar "potential" positive impacts is likely to be different (e.g. an entrepreneurial region is likely to benefit more from public incentives to R&D than a "dependent" region),
- a region may not be subject to a specific policy.

6. **The rationale for the "territorialisation" of potential impacts** lies on **a symmetry with the risk assessment procedure**. As in risk assessment, where *risk = hazard* (potential risk) x *vulnerability*, here the territorial impact is the product of a *potential impact* (PIM) times a *sensitivity* indicator linked to the specificities of each territory.

The TEQUILA 2 model is aimed at assessing the territorial impacts of various policies. The model is based on Weighted Summation, which finds its roots in Multi Attribute Utility Theory and incorporates the three main components of territorial cohesion, namely Territorial Efficiency, Territorial Quality and Territorial Identity.

For each Single-dimension impact, Territorial impact (TIM) on each region *r* is defined as within the TEQUILA 2 model as follows:
$TIM_r = \Sigma_c \theta_c . S_{r,c} . PIM_{r,c}$
Where:
TIM = territorial impact
PIM = potential impact of policy
r = region considered
c = criterion
θ_c = weight assigned to criterion c $0 \leq \theta_c \leq 1$; $\Sigma_c \theta_c = 1$
$S_{r,c}$ = sensitivity of region r to criterion c $0 \leq S_{r,c} \leq 1$

TIM is thus the product of a Potential Impact - PIM (defined for each region using statistical indicators or a simulation model) times an indicator of Desirability - D (in order to take into account the fact that, for example, the same employment growth has a different priority in advanced and lagging regions) and an indicator of Vulnerability – V (in order to take into consideration the higher vulnerability of urban areas to pollution or of natural areas to landscape fragmentation). D and V together represent the *sensitivity* of the single regions to each typology of impacts. Various criteria (c) are included in the TEQUILA 2 to measure the impact of a policy (i.e. either transport policies or CAP) on *Territorial efficiency, Territorial quality* and *Territorial identity*. Each category consists of three or four criteria and their definition and measurement units are specified in Table 3.2.3.1 (for transport policies) and 3.1.4.1 (for CAP). It is worth mentioning that the scores on these criteria, measured in different units, are integrated into the TEQUILA model by means of weights and normalisation processes by computing a region-specific utility function that transforms the values of $PIM_{r,c}$ in a 0-1 interval, i.e. $TIM_{r,c}$.
In case of Summative Impacts, the TIMs are averaged through a weighted sum of impacts on different criteria *c* (e.g.: impacts on regional GDP, jobs, accessibility). This procedure is carried out in two steps: single-dimension impacts are summarized into the three macro-dimensions (TIM-Efficiency, TIM-Quality and TIM-Identity) and then summed up into the general Summative Impact [7].

[7] $SI_r = \Sigma_c \theta_c . TIM_{r,c}$ where θ_c are the weights of the single impact criteria.

However, the actual impact of a policy can differ across European regions, according to their internal characteristics (i.e. regions perceive differently single impacts). The TEQUILA 2 model takes these differences in impacts into consideration by means of Sr,c which is a vector of regional characteristics defining:

- the vulnerability of a region to single types of impacts (Vr,c);
- the desirability of the impacts for a region (Dr,c)

Sr,c can then be specified as: Sr,c = Dr,c . Vr,c.
In particular, the greater the value of Sr,c, the greater the sensitivity (i.e. absorptive capacity) of region r to policy measures impacting on criterion c. Vulnerability refers to negative impacts and desiderability to positive impacts.
As a matter of example, lets think about a policy measure aimed at promoting education and occupation in S&T. This is highly desirable per se in all types of regions, however remote rural ones will benefit little of the returns to this investment (i.e. they are not vulnerable, receptive to this measure). On the other side, lets think about a policy measure entailing a cut in transfers from national or European funds. In this case, all types of regions will be highly vulnerable (i.e. receptive) but the measure considered is far less desirable for advancing regions than for developed ones because of their more limited financial autonomy.

In the present project, the different components of TEQUILA 2 have been assessed by means of expert knowledge. This applies especially to the value functions and the weight values of each criterion, as well as the Dr,c, and Vr,c components of the model, in order to understand differentiated regional impacts (advanced/developing, eastern/western/southern/northern, urbanised/rural regions).

7. The basic structure of the TEQUILA 1 model has been **renovated** in multiple directions:

- first of all, in order to comply with the requirements and desiderata of the Commission and the ESPON terms-of-reference;
- secondly in order to strengthen the methodological base of the model (number of criteria/indicators for impact assessment; improvement of the vulnerability and desiderability indicators; weighting system and commensurability of the different criteria; possibility of non-compensatory approaches; territorial utility functions).

In particular, two methodological aspects have been explored in depth and represent operational and methodological improvements with respect to the previous TEQUILA1 model:

1. the weighting system, which captures preferences on different policy priorities and goals. It represents a crucial part of any Multi-criteria analysis as refers to values and political priorities felt by the concerned populations. It was built addressing both policy makers and sectoral policy experts[8]; Tables 1 and 2 show the preferences assigned to the SDI and the SI as expressed by different panels of experts interviewed for both policies[9].
2. value functions, which translate impacts (PIMs) expressed in their own units into values ranging between 0 and 1, according to the form of the utility function. Sectoral policy experts have been consulted also to gather this specific knowledge.

[8] Weights to be attributed to each impact criterion and macro-criterion can be interpreted as relative preferences and priorities. Sectoral experts have been consulted in specific meetings and policy-makers through a questionnaire delivered at the ESPON Prague Conference in June 2009.
[9] It is evident that experts assign a much lower relevance to the Identity dimension, especially for what concerns CAP policies where the economic and efficiency goals prevail.

Also, the previous TEQUILA SIP Package (Interactive Simulation Package) has been reconsidered and enlarged in TEQUILA 2 in two main directions:

1. it considers both impacts on single dimensions (economy, society, environment and climate change, …) and summative impacts (on territorial efficiency, quality and identity), as already said;
2. it integrates mapping procedures directly inside the computational machine, in order to avoid transfer procedure from a statistical elaboration tool to the mapping tool. Results of the assessment procedure are fully automated and integrated into a unique software package, allowing instant simulations and mapping in a way that could be useful for direct interaction with scientists and policy makers.

A last very important innovation was included in the new model. In order to take into consideration the fact that some very high negative impacts (e.g. on environment) cannot be compensated by some other positive impacts, for example on economy, an appropriate model was used, the FLAG model, and applied to three different kinds of impacts of transport policies (emissions, congestion, safety). In this case, for the regions in which an excessive impact is shown, compensation and weighted summation with other impacts is not allowed and the map shows a "flag".

2.2. The Multicriteria framework: value functions and compensations among criteria

The simplified structure of the value functions used in the TEQUILA 1 model, allowing the definition of weights and of the "territorial utility functions", has been strengthened in the present project, by including complex methodological refinements and by using selected expert judgements.

2.2.1. Assessment of the TEQUILA model components

In the present project, the different components of TEQUILA have been assessed by means of expert knowledge. This applies especially to the value functions for the three criteria, the weight value of each criterion, Dr,c, and Vr,c components of the model.

Three experts meeting have been organised to respectively assess:

1. the components of the TEQUILA 1 model. This expert meeting was actually meant to test the methodology to be implemented to analyse the two sectoral policies (i.e. transport and CAP).
2. the components of the TEQUILA 2 model in the case of transport policies;
3. the components of the TEQUILA 2 model in the case of CAP.

To assess the above mentioned components of TEQUILA we made use of the so-called value functions for these components.
The value function theory is a branch of a more general theory based on the concept of utility maximisation. The fundamental assumption in utility theory is that there exists a real-value function, called utility function, which transforms the impacts of an alternative into a utility score. This utility score is what the decision-maker wants to maximise. Value functions do also translate the impacts (scores) of a policy into a single score, usually this score is normalised from 0 to 1, where 0 and 1 values represent the worst and best situations attainable. The TEQUILA model above can be interpreted as a combination or aggregation of such value functions. For each policy

alternative the model aggregates, in a weighted manner, the value attached to each criterion score. The construction of such a multi-attribute value function model requires five steps:

1. The selection and specification of evaluation criteria;
2. The definition of the range of scores (*Ri)* for each criterion *(Xi)*;
3. The assessment of value functions for each criterion;
4. The assessment of weights;
5. The combination of value functions into a value function model.

The specification of the ranges of scores defines the evaluation domain. The set of best and worst scores for all attributes determine the best $x^* = (x_i^*, .., x_n^*)$ and worst $x_* = (x_{i*}, .., x_{n*})$ situations (alternatives) attainable with regard to the fulfilment of the decision objectives.

The value functions are used to translate the score of a policy on a criterion into a value between 0 and 1. The calculated value represents the relative preference/performance of that policy on the criterion concerned in comparison with the best and worst scores attainable.

Weights are used to combine the value functions into a value function model. In the value function model, the weights represent the relative importance of each attribute (criterion) to the others.

The components of the TEQUILA model have been assessed during various expert sessions aimed at establishing the appropriate form of the value function model (additive, multiplicative, etc.), and at assessing the value function and weights for each criterion included in the model on the basis of expert knowledge.

Within this research project we make use of both holistic scaling and decomposed scaling to assess value functions. In decomposed scaling, the marginal value functions and weights are assessed separately and the value function model is constructed by combining these parts through the additive combination. Various techniques exist for assessing value functions by means of decomposed scaling. Amongst the most frequently used are: direct rating, curve selection, bisection, difference standard sequence, parameter estimation and semantic judgment. The most common assessment techniques for weights are: the swing method, rating, pair-wise comparison, trade-off method and qualitative translation. On the other hand, holistic scaling is based on overall value judgements of multi-attribute profiles. These profiles can be real alternatives or artificial profiles designed for the assessment and experts are asked to judge these profiles. Based on obtained judgements, weights and value functions are then estimated through optimal fitting techniques, such as regression analysis or linear optimisation, and are the best representation of the assessors' implicit value functions and weights. The Utilité Additives (UTA) method makes use of linear optimisation to estimate value functions and has been implemented in this project since it is amongst the most frequently used approaches for holistic scaling (Jacquet-Lagrèze and Siskos, 1982).

2.2.2. Assessment strategies applied during each expert meetings

During each expert meeting three assessment exercises have been conducted. The next sections provide details on the organisation and goals of each assessment exercise.

First exercise: Weight values for Territorial efficiency, Territorial quality, Territorial identity

During the first assessment exercise expert knowledge was gathered and used to assess the weight values for the main categories of criteria, *Territorial efficiency,*

Territorial quality and Territorial identity. This was done by applying the Analytic Hierarchy Process (AHP).
AHP is a decision support tool that is often used in complex decision problems. The method uses a multi-level hierarchical structure of objectives, criteria, sub-criteria and alternatives. In particular, the Saaty method, developed by Thomas Lorie Saaty in the 1970s (Saaty, 1977), is based on ordinal pair-wise comparisons aimed at obtaining the weights of the decision criteria, and the relative performance measures of the alternatives in terms of each criterion. In other words, it addresses preference statements. For each pair of criteria the decision-maker is asked to which extent a criterion is more important than another one. By means of such a comparison the method defines the relative position of one criterion in relation to all the other criteria. By using an eigenvalue matrix technique, quantitative weights can be assigned to the criteria.
This method is based on three important components:

- The hierarchy articulation of the elements of the decision problem;
- The identification of the priority;
- A check of the logic consistency of the priority.

After defining the hierarchy articulation of the elements, the second step consists of assessing the value of the weights related to each criterion through the pair-wise comparison between the elements. The comparison of the criteria is carried out using a questionnaire, where for each couple of criteria the relative preference is expressed).
The Saaty method employs a semantic 9-point scale (Table X) for the assignment of priority values. This scale relates numbers to judgements, which express the possible results of the comparison in qualitative terms. In this way, different elements can be weighted with a homogeneous measurement scale.
Through this method, the weight assigned to each single criterion reflects the importance attached by every party /agent /group involved in the project to each criterion. In addition to this, the method verifies the fit between the components of the weight vector and the original judgements. From the pair-wise comparison a 'comparison matrix' is derived from which, through the eigenvector approach, it is possible to calculate the weight vector under investigation. Finally, the method is able to check the consistency of the matrix through the calculation of the eigenvalue.
Other strategies to assess weights could have been the Swing method; in this case the experts would have been provided with a multiattribute profile which reflects the worst possible outcome (e.g. lowest scores considered). He or she is then asked to indicate which attribute provides the highest value increase when switched to its best state. This attribute is attached the highest weight value. The process continues with the remaining attributes and the last attribute swung is assigned the lowest weight. The Swing method results in an importance ranking of attributes. The method can also be adjusted to obtain numerical estimation of the weights.
Another option is weight rating; it can be applied to obtain the weights for (sub-)criteria of the considered themes for territorial impacts. In this method the expert is asked to first rank the criteria and then to attach a weight value to the least important criterion that then functions as a references. The other attributes are judged by the experts against this reference criterion and given points. Another option is to rank the criteria and then assign a fixed number of points (e.g. 100) to the criteria while respecting their relative importance.
AHP has been preferred for its intuitive approach, ease of use and implementation through computer-based questionnaires.

Second exercise: Value functions and weights for sub-criteria

For each main category of criteria, i.e. territorial efficiency, territorial quality and territorial identity a multi-attribute value function model was assessed separately. The multi-attribute value function model for each indicator contained value functions for the associated sub-criteria and weights.
The assessment strategy used is holistic scaling and the respondents were asked to state their preferences over various fictitious alternatives. The resulting rankings of alternatives were then used to assess the value functions and weight values for the criteria considered. The fictitious alternatives used are described by differing scores on three criteria. To construct the fictitious alternatives different scores on the criteria are combined.
Various so-called designs are available such as the factorial, fractional and bi-attribute designs are the most frequently used. To limit the number of fictitious alternatives, we used the orthogonal design, the most commonly used fractional design in holistic scaling (Currim and Sarin, 1983 and 1984; Scannella and Beuthe, 2001). Within an orthogonal design each attribute level is combined with another level only once. In case *n* attributes are used and *r* levels are selected per attribute, the number of multi-attribute profiles being created is equal to r^2. This implies that in with three criteria and four levels, the respondent is asked to evaluate sixteen fictitious alternatives, which is a significant reduction. Furthermore, sixteen observations are sufficient for UTA to produce a statistical assessment that is precise and of a good quality.
Various techniques can be used for assessing the reference alternatives such as, profile ranking, profile rating, and pair-wise comparisons. Since the number of pair-wise comparisons was too large for a consistent and meaningful assessment, we opted to apply profile rating and ask the respondent to assign a value between 0 and 10 to the profiles while taking into account the complete set of (three) criteria. The participants were asked to state their preferences over 16 fictitious policy alternatives and to assign a value between 0 and 10 to the alternatives while taking into account the scores on the complete set of (three) criteria. In each of these 16 fictitious alternatives, each criterion can take on the minimum or the maximum or an intermediate score (e.g. the first sub-criterion takes on the maximum value, the second the minimum and the third the minimum too) [10].
The obtained ratings were converted into a ranking that is verified by the respondent during the choice experiment.
The choice experiment was structured as follows. First, an introduction was given to the main objectives of the research as well to the assessment procedure. Furthermore, the various criteria used in the choice experiment were described as well as the associated score ranges. During the choice experiment, the respondents were shown descriptions of the multi-attribute profiles and asked to rate these, while taking all criteria scores into account.
Once the rating was completed, the respondent was asked to indicate which criteria were decisive in his or her decisions; this produced a ranking of attributes. The final step in the assessment procedure concerned a consistency check. The respondent was shown a ranking of multi-attribute profiles, which was based on the ratings given and asked to comment on it. In case an inconsistency exists in the ranking, the respondent was given the opportunity to adjust the rating given to a profile. The resulting ranking was used by UTA to construct the multi-attribute value function model of the respondent.
This exercise produced three multi-attribute value function models containing value functions and weights for *Territorial efficiency, Territorial quality* and *Territorial*

[10] In other words, each fictitious policy alternative is associated to a combination of the possible scores of each criterion (within each main criterion). Experts were asked to assess these fictitious alternatives, while taking all criteria scores into consideration.

identify. These three models were next integrated into one model by means of the weights values obtained in the first exercise.

Third exercise: Weight values for Dr,c and Vr,c
We assessed parameters in terms of weight values which are region specific. During the assessment session experts were asked to make pair-wise comparisons (AHP method) which form the foundation for the calculation of weight values for Dr,c and Vr,c. This exercise was aimed at understanding to what extent impacts may differ across different types of regions endowed with different fragilities and potentials. This is a relevant step to proceed to the mapping of impacts for different types of regions.

2.2.3. Compensation among criteria: the FLAG model

The main purpose of the Flag Model, developed by Nijkamp, Ouwersloot and Vreeker (Nijkamp and Ouwersloot, 1997; Nijkamp and Vreeker, 2000), is to analyse whether one or more alternatives can be classified as acceptable/sustainable or not. The Flag Model does so by comparing impact values with a set of reference values (labelled as Critical Threshold Values in the model).

The input for the Flag Model consists of an impact matrix (e.g. structured information table) with a number of *n* variables; this matrix is formed by the values that the selected criteria assume for each considered alternative. The Flag Model requires the identification and selection of relevant indicators, according to the problem which is addressed.

For each indicator a critical threshold value (benchmark value) has to be established. An important problem faced in practice is the fact that a benchmark value is not always unambiguous. In certain areas and under certain circumstances different experts and decision-makers may have different perspectives on the precise level of a CTV. Based on the indicator score of an alternative and the CTV specified, coloured flags are assigned: green = no reason for preoccupation, yellow= be alert, red=reverse, black=bad.

An important component of the model, the evaluation module, provides a number of instruments for the analysis of alternatives. This analysis can be conducted in two manners. The first type of analysis is the confrontation of a single alternative with the reference system. The second type of analysis concerns the comparison of two alternatives. In the former procedure, we decide whether an alternative is acceptable or not in all regional cases, and in which case should policy be readdressed. In the latter case, by comparing two alternatives, we are able to decide which alternative performs better in the light of the selected critical threshold values. This last option can be interpreted as a basic form or MC analysis.

In order to define the critical threshold values for indicators used in the TIA, expert panels will be have been consulted.

3. THE TWO SECTORAL POLICIES

The two sectors policies considered in the TIPTAP project are TRANSPORT and ARICULTURAL policies. For both of them this section details the following points:

1. The precise elements and policy measures that have been assessed.

2. The intensity of each policy measure in each region, either actual or forecasted.
3. The criteria and sub-criteria for impact assessment.
4. The impact indicators for each criterion and sub-criterion they refer to and the source for such data.
5. A clear description of the logical chain that links policy measures to impacts.
6. The description of the methodology chosen and, eventually, implemented to compute policy impact measurement.
7. Key results and maps on SDI and SI.

3.1. Impacts of the Common Agricultural policy

3.1.1. The policy measure to be assessed

The CAP is structured in 2 Pillars, Pillar 1 supporting farm incomes through direct The CAP is structured in two Pillars: Pillar 1 supporting farm incomes through direct payments to farmers and market support measures and Pillar 2 supporting agri-environment and rural development objectives. Following the 2003 CAP reform, the majority of direct payments paid to farmers under Pillar 1 are made as Single Farm Payments (SFP), in return for which farmers must comply with fairly minimal environmental and production standards. The SFP is significant in decoupling the level of direct support from the level of output, with a clear break with respect to the past.

Under Pillar 2, payments are available to farmers (and some other rural actors) in support of the production of conservation, amenity, recreation and environmental goods (CARE) and for rural development. Aggregate expenditure under Pillar 1 far exceeds that under Pillar 2. However, within EU-15 countries, a small but increasing percentage of the Pillar 1 budget is compulsorily transferred to Pillar 2, through the process of modulation, permitting a small shift in emphasis within the CAP budgetary discipline.

Modulation (also known as degressive reduction of direct aid) is an instrument that permits the transfer of funds for direct aid and market payments to farmers under Pillar 1 to be transferred to rural development activities under Pillar 2. Modulation is not a new idea and voluntary modulation was included in the Agenda 2000 CAP reforms though subsequently the mechanism was used by only a few member states. Compulsory modulation was introduced by the 2003 reforms where it had to be applied to all farmers in the EU apart from the very smallest. The rationale behind modulation is that an examination of the distribution of direct income support among farmers reveals that a relatively small number of farms receive a high proportion of the payments. In fact, EC (20007) suggested that in the EU-25 20% of the farms received 80% of the payments. Thus, a proportionately higher reduction in direct aid to these often larger farms should not compromise the objective of income support and at the same time should free up significant funds to support rural development activities required under Pillar 2 to meet new challenges faced by society such as climate change and the need for better water management and investment in bio-energy (EC, 2009).

Among the measures approved under the recent CAP Health Check were increases in the level of compulsory modulation. According to Council Regulation (EC) No 73/2009 the level of modulation should be applied in relation to the magnitude of the payments made to individual farms. Modulation will also increase over time until it reaches a set

threshold. Modulation will not apply to the EU-12 until 2012 when it will be introduced at a lower rate for those farms attracting the highest payments, with the measure being fully implemented in 2013 at the same level for all countries in the EU-27. Table 3 illustrates the changes in modulation rates the will take place during the period 2010 to 2013.

Table 3.1.4.1. Modulation rate of direct payments per farm for the EU member states (%)

Category of reduction	Zone of modulation	2010	2011	2012		2013	
		EU-15	EU-15	EU-15	EU-12	EU-15	EU-12
<5,000 €	0	0	0	0	0	0	0
5,001-299,000 €	1	8	9	10	0	10	10
>300,000 €	2	12	13	14	4	14	14

Source: Council Regulation (EC) No 73/2009

Furthermore, modulation implies also a different distribution of resource in each member state. However, any member state concerned shall receive at least 80% of the total amounts generated in that state. In addition, those member states with more large scale farming will be more affected by modulation than those where average farm sizes are smaller.

Up to now, the new amount of EU expenditure for CAP policy for the period 2007-13 is established and allocated among Member States, but the regional allocation and the decisions concerning distribution to the different axes of Pillar 2 are left to the national and regional authorities. As a consequence, no sound basis for defining policy intensity and resource allocation to the single regions exists at present, on which to build a territorial impact assessment of presently forecasted policies.

Therefore, the policy scenario chosen for assessing a territorial impact is concerned with *increasing the level of modulation of funds from Pillar 1 to Pillar 2 of the CAP.* In fact, levels of modulation were introduced in the 2008 Health Check were substantially lower than had been originally proposed. The original plan was for a more radical introduction of Progressive Modulation which would:

- increase the current rate of modulation of 5% per annum for payments >€5,000 and < €100,000 by 2% per year in each of the four years 2009-2012 to a total of 13% by 2012;
- apply an additional 3%, 6% and 9% per year to payments > €100,000, €200,00 and €300,000 respectively, in each of the four years 2009-2012 resulting in a total of 16%, 19% and 22% by 2012 respectively

The higher levels of modulation proposed above form the basis for this study to use TEQUILA2 to investigate the impacts of a greater than proposed reduction in Pillar 1 payments. However, unlike the progressive modulation suggested under the Health Check this exercise investigates a more radical scenario where rather than modulation alone, significant levels of funding are withdrawn from Pillar 1 and only a proportion are transferred to Pillar 2 (i.e. a reduction in the overall CAP budget but with an icrease to the Pillar 2 budget).

In particular, the elements which have been included are as follows:

1. Compared with the baseline year of 2006, there will be a 20% reduction in the SFP received by farms in the EU-15;
2. at the same time, an increase in funding for Pillar 2 of one fourth[11] this amount will occur, composed of modulated SFP funds plus a similar sum made available by individual member states through the process of co-financing. It is important to note that farmers do not automatically receive Pillar 2 funds in place of SFP; in order to receive them they must agree to undertake certain forms of land management or diversify their business, and in some cases they must compete with other farmers for funds. The remaining unmodulated part of the SFP reduction will result in a reduction in the CAP's overall budget. It is postulated that this transfer will occur in EU-15.
3. As far as EU-12 New Member States are concerned, their condition is different, as they are still far from a similar availability of the CAP resources with respect to Old Member States. Therefore it is assumed only a 10% reduction in the SFP and a parallel increase in funding for Pillar 2 of half this amount[12].

The logic of this policy scenario runs as follows. It implies a reduction in farm income resulting from the reduction in SFP. Some farm managers may accept the income reduction; others will respond by allocating the farm's resources differently in an effort to maintain the original income level. The nature of the shift in resources will depend on the relative profitability of the various options available and the farmer's own preferences. The available options for food production in poor agricultural areas (for example those designated Less Favoured Areas) are often very limited and are often confined to extensive livestock rearing methods. By contrast, in fertile lowland areas there is much greater flexibility of land use allowing switching between livestock and arable activities.

One particular change which farmers might make is to enter agri-environment agreements under Pillar 2 by which they will receive direct payments in return for adopting extensive land management practices or making other positive improvements to the environment. Under the policy scenario it is envisaged that additional funds will be made available for such agreements. Entry to these schemes is most attractive to farmers when returns from commodity production are comparatively poor or volatile, in which case diversification into a guaranteed revenue stream is attractive. Such schemes will be most attractive to LFA farmers who have few options to intensify production. Non-LFA farmers will find them most attractive in the event of a decrease in the value of commodity sales. In non-LFA areas, extensification of production would be expected under agri-environment schemes, resulting in fewer livestock (see PIM_Q3 below), lower yields and lower use of external inputs such as agrochemicals.

Another important strategy will be to reduce average costs by reducing labour or by gaining economies of scale through farm expansion, or through capital investment (e.g. in new buildings) to increase intensity and efficiency. These strategies will typically lead to less labour use and increased farm size.

[11] We kept a more conservative scenario as compared to the one presented in the Interim Report where only 5% as compared to 10% of P1 is modulated into P2.
[12] Differently from the proposal stated in the Interim Report, we decided to resort to one single scenario and not two scenario (i.e. a buoyant economy case and a low growth case). Given the present global economic crisis and uncertainty, we decided not to make any assumption on the general economic climate in order to not introduce in our framework further elements of uncertainty. Also, we propose a different scenario on EU15 and EU12. EU12 is expect to have a longer transition period regarding direct payments and modulation, which we take into account by envisaging a smaller reduction in SFP while keeping the same percentage level of modulation. Therefore, In the maps, the border EU15-EU12 is emphasized.

A crucial process likely to be exacerbated by intensification is global warming. Agriculture has both positive impacts on climate change – for example by 'locking up' carbon in soil - and negative effects. Agriculture is a significant contributor to overall greenhouse emissions and these would be expected to change in the event of livestock numbers changing.

Some farm managers will be unable to adapt their activities to compensate for the income loss, and marginal farms will no longer be viable. Factors contributing to the lack of viability will be small physical area, lack of capital, and a lack of human capital (management skills). Typically the farms affected will be very small and occupied by elderly farmers and the land will either be abandoned or incorporated into another farm. Stereotypically, the agricultural land which is least valued for its landscape quality is intensively farmed, has large fields and is lacking in diversity and small scale features. The loss of small farms through amalgamation is hypothesised to contribute to a reduction in landscape diversity.

The loss of land and the shedding of labour in an effort to reduce costs implies partial or total loss of livelihoods for affected individuals. In locations with high employment rates, alternative employment might be found. However in some localities individuals may remain unemployed, especially in areas of sparse population (few businesses) or high unemployment rates.

In areas with a strong dependency on agriculture for employment provision, the decline of employment in agriculture is associated with population decline as younger people out-migrate to find work. This results in a smaller population and an age structure biased towards the older age groups. This has important implications for community viability. The quality of life experienced by residents may gradually deteriorate as businesses (e.g. shops) and services (such as schools, health centres) cease operating due to insufficient demand.

The attractiveness of other options to farmers can be enhanced by the provision of financial incentives, and measures exist under P2 to encourage the development of new revenue streams. These include the extension of the farmer's activities along the supply chain to capture a greater share of the value added, for example by the processing and selling of food directly to end-customers. Farm resources can also be diverted into alternative uses, for example converting buildings for use as business premises or tourist accommodation. By means of branding, these activities can be intrinsically linked with the resources of the particular territory.

3.1.2. The intensity of the policy measure

The policy intensity (PI) in each EU region in the period 2007-13 is determined by expenditure changes.
More in detail, PI in EU15 is computed as 20% reduction in regional P1 expenditures, one-fourth of which is redistributed through P2. PI in EU12 is computed as a 10% reduction in P1 half of which is redistributed through P2. Although current (and future) regional expenditures on P1 and P2 are not available, for EU-15 P1 and P2 regional shares were computed by making use of ESPON 2006 database[13]. Assumptions were made of constant regional shares of P1 and P2 over time inside each country and

[13] ESPON 2006 database provides P1 and P2 expenditures for the year 1999 at NUTS3 level which have been next aggregated at NUTS2 level by researchers at DIG – Politecnico of Milan within ESPON 3.2 project. Future expenditure in regions is calculated utilizing expenditures institutionally agreed for the period 2007-13 and allocating them among regions as in the past.

regional P1 and P2 expenditures were computed as share of average annual P1 and P2 expenditures in each country agreed for the period 2007-2013.
As far as EU12 is concerned, a different strategy for computing PI was implemented. In fact, ESPON 2006 database does not provide information on P1 and P2 for EU12 countries. Therefore, data on P1 and P2 at NUTS2 level have been computed as regional share of national average annual P1 and P2 expenditures in the period 2007-2013 on the basis of the number of farms in each NUTS2 region.

3.1.3. Impact typologies and the logical chain from policy measure to regional impact

As said before, firstly single impacts (SDI) are computed at the level of single criteria or dimensions (impact on GDP, on emissions, etc.), and subsequently they are summarized into the three macro-components of territorial cohesion, namely territorial efficiency, territorial quality and territorial identity and into a generalized "summative" impact (SI). For each criterion, its relevance and its link to the policy measure being examined is explained below[14].

Territorial efficiency[15]

•*Impact on Economic growth (PIM_E1)*

Due to the assumptions made in the retained scenario, impacts on regional GDP will be mainly negative, as a decrease in income transfers to farmers will mainly take place, except for those regions which are highly performing in catching Pillar 2 resources. The assumption is made here that reduction in income support to farmers will generate a parallel reduction in GDP, partly as a consequence of lower agricultural activity and abandonment, partly as a consequence of reduced spending of farmers on intermediate goods and consumption goods.

• *Impact on Unemployment (PIM_E2)*

Impact on unemployment will depend, first of all on the general impact on farmers income, and secondly on the presence of different job opportunities in the single regions.

• *Impact on Local asset use for tourism (Tourism diversification) (PIM_E3)*

Economic activity utilising local assets is regarded as an effective way of boosting regional economic performance because of its local embeddedness. Tourism is one such activity and is regarded as an important and appropriate activity in rural areas. It is connected to agricultural policy which, through influencing land management practices, affects the infrastructure such as landscape, which supports tourism.
Some aspects of the competitiveness agenda such as growth and employment are relatively straightforward to implement. However other aspects such as efficiency of resource use (denoted by factor productivity) and quality level, though easy to conceptualise, are impractical to operationalise. In this context, the diversification by

[14] Impacts of CAP have been assessed across the following five dimensions:
- Economic growth and structure (i.e. indicators on Territorial efficiency, namely Economic Growth, Unemployment and Tourism diversification);
- Society (i.e. impact on employment and community viability)
- Environment (i.e. indicators on Territorial quality, namely Environmental quality and Risk of soil erosion);
- Climate change (i.e. impact on livestock emissions);
- Landscape and identity (i.e. indicators on Territorial identity, namely Landscape diversity, Community identity and Heritage products

[15] The sub-criterion Land abandonment from the criterion of Territorial Efficiency to Territorial Quality and merged to the sub-criterion Risk of soil erosion. In fact, risk of soil erosion increases with land abandonment and its measurement is actually based on data on land abandonment.

farmers of their activities (e.g. into tourism) can also be regarded as an indirect indicator of innovation or entrepreneurship[16].

Territorial quality

Territorial quality encompasses both environmental and socio-economic factors.

• *Impact on Environmental quality (PIM_Q1)*

Attributes of a high-quality physical environment include: absence of pollution, high levels of biodiversity, and careful land management that conserves natural resources. The incidence of these attributes is subject to change as agricultural management practices change, in response to policy.

• *Impact on Community viability (PIM_Q2)*

Census statistics have long shown declining population sizes in areas highly dependent on agricultural employment. This is commonly conceptualised as a vicious circle whereby farm labour is replaced by capital and, due to a lack of alternative employment opportunities, there is out-migration, especially by young people. This leads to a diminishing population size with an age structure biased towards older age groups. The implications for the quality of life experienced in such localities are that minimum population thresholds to support service provision may no longer be reached, and there may be an unbalanced age distribution.

• *Impact on Emissions and Climate Change (PIM_Q3)*

Global warming is recognised as one of the most serious challenges facing the world's population. Agriculture makes a significant contribution to the level of greenhouse gases (GHG), and the level of emissions is partly dependent on agricultural practice, which is in turn influenced by policy.

• *Impact on Risk of Soil Erosion (PIM_Q4)*

Risk of soil erosion depends on various hydro-geological and climate factors, and may greatly increase due to trends in agricultural exploitation of land, and namely on land abandonment. In fact, the asset base on which agriculture depends, namely land, can be maintained, improved or degraded as a result of agricultural practice. Thus agricultural policy which alters land management practices directly influences the future sustainability of farming.

Territorial identity

• *Impact on Landscape diversity (PIM_I1)*

Agriculture is a multifunctional activity which produces a range of environmental and recreational goods as well as food and fibre. Farmed landscapes are the product of the particular agricultural production methods employed. They may be quite distinctive to single localities and therefore contribute to their territorial identity. Specialisation and intensification in agriculture result in landscape changes by reducing its diversity.

• *Impact on Community identity (PIM_I2)*

Strong community identities may develop in localities, shaped by factors including the predominant occupational activities of residents. The decline in a predominant sector would slowly lead to a weakening of this identity which may be further diluted by out-migration. The character of distinct communities and cultures may be used as a driver in promoting tourism.

• *Impact on Heritage Products (PIM_I3)*

The territory in which food is produced may give rise to the production of locally distinct specialties and products. These result from the particular crops, farming methods and food processing techniques which have evolved locally. The drive for

[16] We acknowledge that the link between the increase in the number of tourist bed and an increase of income can be somehow indirect. However, we argue that this sub-criterion can capture the propensity to engage in differentiated agriculture activities thus indicating a more entrepreneurial and innovative attitude in managing and directing economic activities that use local assets.

technical efficiency in both agriculture and food distribution has led to greater homogeneity in the food outputs produced but also a contrary strategy is followed, enhancing local specificities, which may both increase income and strengthen regional identity.

3.1.4. Summary of Indicators: description and calculation

The TEQUILA methodology potentially provides a means of visualising and synthesizing impacts on a broad range of indicators, wider than other current tools in agricultural policy analysis, available for territorial assessments. Its use requires data for a wide range of variables with comprehensive coverage of EU-27 at a detailed territorial level. Although there are several models capturing the multifunctional nature of agriculture, as detailed in the Interim Report, it appears that currently none is capable of generating the necessary data at the relatively low spatial level of aggregation as required to run TEQUILA. In the absence of a satisfactory simulation approach, spreadsheet calculations have been employed to generate estimated values of impacts. Such calculations have heavily relied upon a number of simplifying assumptions. These relate to, inter alia, the income level at which farmers will exit and sell their land; re-employment rates of redundant farm labour; out-migration rates, and propensity of farmers to engage in new tourism or supply chain activities.

Indicators for each criterion described in section 3.1.3 are listed in Table 3.1.4.2 below[17]. In this section a brief description of each indicator is provided; precise formulas to compute them are indicated in Table 3.1.4.1.

[17] Impact indicators were firstly indicated by sectoral experts and next discussed by the TPG through extensive interactions and discussions. The Project specification required to analyse impacts on the following dimensions: economy, society, environment, competitiveness, climate change and territorial impact (conceived of as the summative impact of single impacts on the above mentioned dimensions). Thus, the indicators selected aims at capturing these dimensions but have been next combined in the three main criteria of Territorial Efficiency, Territorial Quality and Territorial Identity.

Table 3.1.4.2. Impact criteria in territorial impact assessment - CAP policy[18]

Macro-Criteria		Criteria	Definition	Measurement	Type
Territorial Efficiency (TE)	PIM_E1	**Economic growth**	Modulation/Total GDP; modulation = [(regional increase in P2) – (regional cut in P1)][19]	**% change in GDP**	Benefit
	PIM_E2	**Unemploy-ment**	(Present unemployment rate)*(Share of agricultural employment)*(PIM_E1 normalised)	**% change in unemployment rate**	Cost
	PIM_E3	**Tourism diversification**	(Number of beds in rural areas/Km2 in agricultural areas)*(PIM_E2 normalised)	**New tourism beds per Km2**	Benefit
Territorial Quality (TQ)	PIM_Q1	**Environmental quality**	((Total agricultural area entered into agri-environment schemes under Pillar2 of Cap)/Total agricultural area)*100	**% of agricult. areas into agricultural schemes**	Benefit
	PIM_Q2	**Community viability**	[((Share of areas occupied by farms<10ha)+(share of population aged >65)+(share of employment in agriculture))*(PIM_E1 normalised)]/3	**Indicator of social deprivation**	Cost
	PIM_Q3	**Emissions**	Variation in livestock emissions (Tons CH4 per year)	**Emissions**	Cost
	PIM_Q4	**Risk of soil erosion**	Areas at risk of soil erosion (ton/ha/year)*(5% of areas with farms <10ha / total agricultural areas)*100	**% of abandon. areas weighted by erosion probability**	Cost
Territorial Identity (TI)	PIM_I1	**Landscape diversity**	(5% of areas with farms <10ha / total agricultural areas)*100	**% of abandon. /incorporated agricultural areas**	Cost
	PIM_I2	**Community identity**	[(0,1*(Share of people aged >15 and <65) + (share of employment in agriculture)+(unemployment rate))*(PIM_E1 normalised)]*100/3	**Outmigration possibility (%)**	Cost
	PIM_I3	**Heritage products**	[(Employment in agriculture/ Gross Fixed Capital Formation in agriculture)*(PIM_E1 normalised)]/Max value	**Indicator of product diversification and innovation**	Benefit

PIM_E1, Economic growth

The indicator by which impact on economic growth is measured, namely agricultural income, would be subject to a number of changes as a result of the policy scenario. Negative changes would be expected from the reduction in SFP. These could be partially or wholly offset by decreasing production costs, accessing Pillar 2 payments, and indirectly through the establishment of new revenue streams (such as tourism or food processing). Here the direct net reduction in income transfers to farmers is equated to GDP reduction, expressed as percentage on total regional GDP.

PIM_E2, unemployment

Against a long term trend of reduced labour use in agriculture (proportional to present share of agricultural employment) it is assumed that there will be change in unemployment equal to jobs lost through reductions from agriculture (due to farm amalgamation, increased labour productivity and land abandonment), proportional to impact on GDP, minus jobs gained in other sectors. It is assumed that the probability of re-employment of redundant agricultural labour depends on the local level of unemployment.

PIM_E3, Tourism diversification.

[18] The main source exploited to build impact indicators are ESPON DATABASE, Eurostat and DG Agri.

[19] Regional cut in P1 = 0,2*0,4*Share of regional P1 expenditure*Average Annual (2007-2013) National P1 budget
Regional increase in P2= (0,25*National P1 CUT)*(Share of regional P2 expenditure on national total).
Data on P1 and P2 regional shares are derived from ESPON DATABASE 2007, ESPON Project 2.1.3.

Changes in the level of tourism diversification capacity, denoted by tourists beds, is assumed to be higher in those areas which already have a developing tourist industry, and reinforced the higher the push factor from other sections of the labour market (PIM_E2).

PIM_Q1, Environmental quality.

Agri-environment schemes, funded under Pillar 2, require farmers to manage land to secure a range of environmental benefits. The area of agricultural land entered into new agri-environment agreements is therefore a relevant indicator of change of environmental quality.

PIM_Q2, Community viability.

An indicator of social deprivation is used here, based on presence of weak farming, ageing of population and share of agricultural employment as an indicator of hidden unemployment.

PIM_Q3, Emissions and climate change.

The overall calculation of changes in emissions of GHG from agriculture is complicated, relying on a wide range of variables including land use, land management practice, and local environmental factors such as rainfall and winter temperature. Enteric methane is an important source of GHC resulting from digestion in ruminant animals. Changes in livestock numbers of a given type will produce directly proportional changes in methane (CH4) emissions, using appropriate coefficients derived from International Panel on Climate Change methodology (IPCC, 2006). This is a simplified calculation which ignores differences in manure management and between livestock breeds.

PIM_Q4, Risk of soil erosion

Certain conditions of slope and climate predispose some areas to irreversible soil erosion in the event that agricultural management is abandoned. Soil erosion statistics, showing annual per hectare soil losses, reveal 'hotspots'. Of particular relevance are those in parts of Greece, Spain, Portugal and France where abandonment, and a consequent failure to maintain terracing, would lead to soil erosion. Land abandonment represents a failure in the process of wise utilisation of local resources, namely land resources. Abandonment may take place in areas characterised by fragile and marginal practices. The synthetic indicator used is represented by % risk of abandonment (5% of weak farming areas) weighted by available risk of soil erosion.

PIM_I1, Landscape diversity

Small farms will be used as a proxy for landscape quality. An estimate is made of the number of small farms (below 10 hectares) which discontinue farming under their present owners. It is assumed that such land will either be abandoned or amalgamated into bigger holdings with loss of distinctive landscape features such as hedges, walls, small fields and vernacular buildings.

PIM_I2, Community identity

It can be argued that agricultural communities are distinctive from others. Furthermore, heritage aspects may be embedded in farming traditions, especially where labour intensive production methods are still used. The indicator selected is a probability of out-migration, given by the size of the agricultural workforce, present unemployment rate and share of population in working age.

PIM_I3, Heritage products

Presence of heritage products is linked to traditional techniques of growing crops and producing specialty products. Therefore, labour intensity in the agricultural sector is assumed as a proxy for this capability, enhanced by a push factor coming from expected reduction in GDP.

3.2. Impact of the new Transport Policy

3.2.1. Policy scenarios to be assessed

In this project, we focus on two types of measures inside the new transport policy: infrastructure and regulatory policies (i.e. "transport pricing").

Infrastructure networks to be assessed include road network, railways dedicated to freight traffic, railways dedicated to passenger traffic, airports and ports. Networks cover EU-27. Differently from the CAP policy considered in the previous section, the impact assessment is carried out at NUTS3 level, and a forecasting model has been used, namely the TRANS-TOOL model developed by DG TREN and its consultants. In order for the TRANS-TOOLS model to function properly, the new and improved links of both national and international importance need to be integrated in the networks utilised in previous analyses (2005).

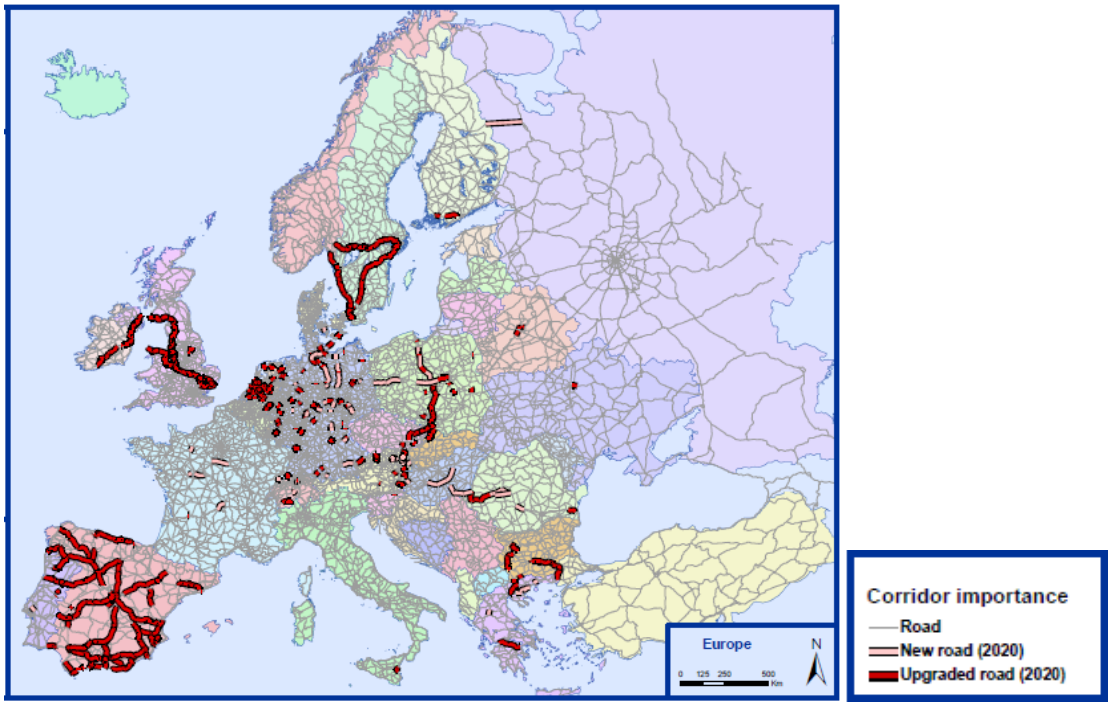
Traffic of the different transport modes is assigned to this new network. The networks are also used for calculating the travel/transport time and transport distances between all zones for the different transport modes. An improvement of a link in one of the networks will therefore lead to an improvement in time and/or distance for the transport mode under consideration.

The first scenario to be used is the *Baseline 2030* as defined in TRANSVisions study (DGTREN, March 2009; see Table 5 for a synthesis of the basic characteristics)[20]. The Baseline scenario assumes as policy framework the Revision of Transport White Book 2010-2030. This means that the Priority projects already defined are supposed to be completed in the horizon year 2030. Internalisation of external transport costs is applied according to PO2C scheme (congestion, noise and air pollution for trucks). Transport costs change differently according to each mode, with a significant reduction for rail freight as liberalisation continues and costs for selected corridors are taken down.

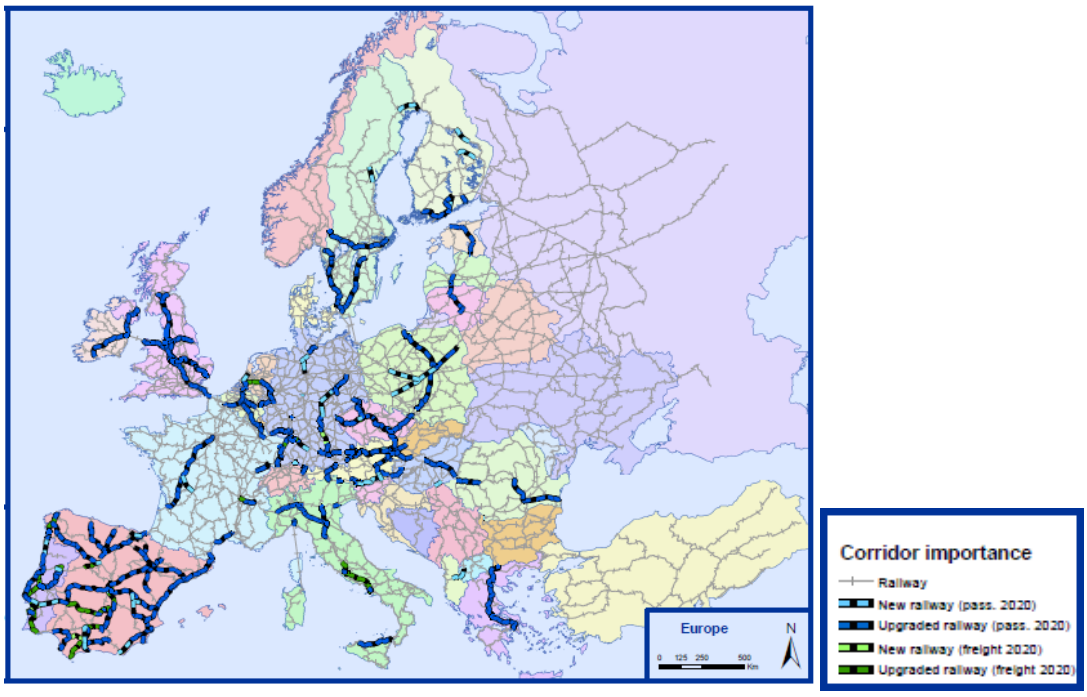
In the *Baseline Scenario* (scenario a in impact maps) links which have been constructed between 2005 and 2008 and links, which are currently under construction or already planned for construction are added. Therefore, the baseline is a conservative estimate of what could be accomplished. The roads indicated on the maps are road projects improving the main road network. Two different types of road works are foreseen, namely new construction and changes of existing infrastructure. Most of the changes are related to roads changing class or speed. A class change varies the attributes on a road link, e.g. moving from ordinary two-lane road to expressway or motorway standard, or moving from a 4 lane motorway to a motorway with 6 or more lanes. Although it is obvious that a motorway is not constructed in exactly the same alignment as an existing two lane road, it is assumed that the change in length is negligible. If roads are constructed in completely new alignments this is termed "New roads". The same terminology applies to the rail links. Either it is a change of attributes to existing links, e.g. speed improvement, or it is new construction. The road and rail networks in the baseline scenario are presented in Maps 3.2.1.1 and 3.2.1.2 below.

[20] The baseline scenario refers to year 2030; it is developed by exploiting the TRANSTOOLS model within the policy framework of the Revision of Transport White Book 2010-2020 and the Green Book on TENs revision.

Map 3.2.1.1 - Road infrastructure development in Baseline Scenario, 2030
Source: TRANSTOOL Model, 2008



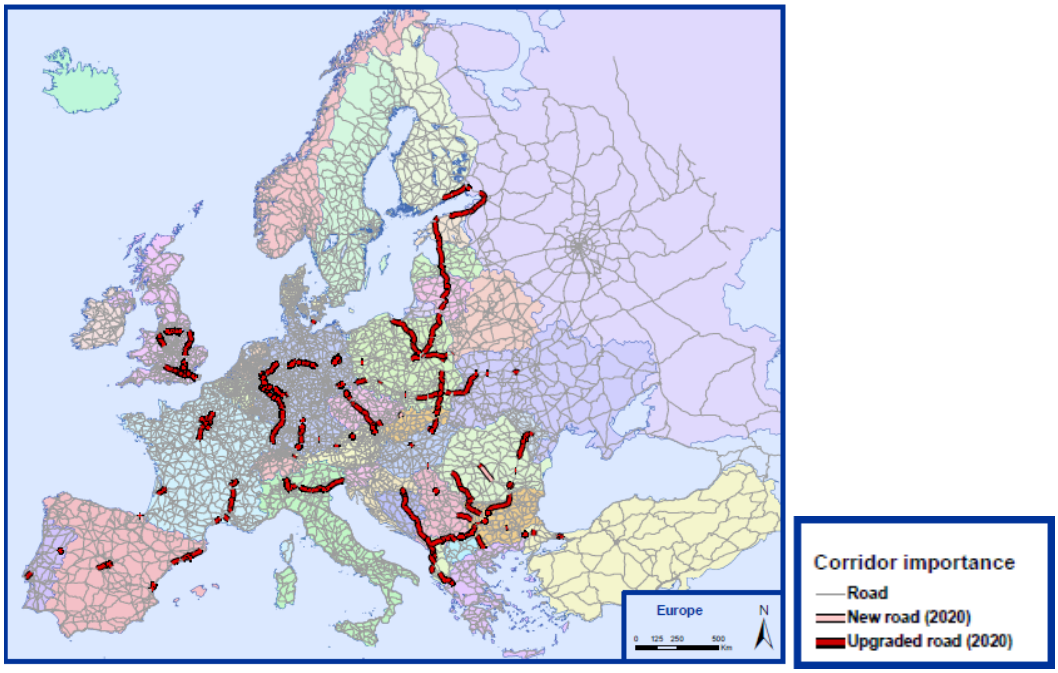
Map 3.2.1.2 - Rail infrastructure development in Baseline Scenario, 2030
Source: TRANSTOOL Model, 2008



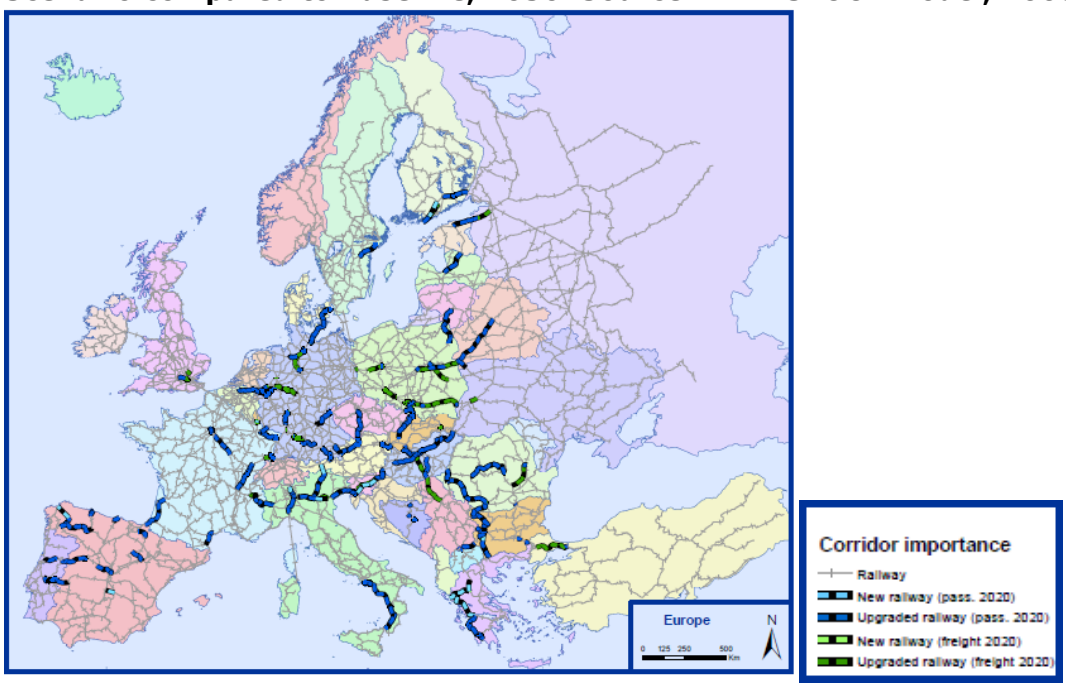
The second scenario is a *Infrastructure Enhancement* one (scenario b in impact maps), where policies are oriented towards new infrastructure provision. It is based on a High Growth 2030 scenario as defined in TRANSVisions study. In this case, a more comprehensive infrastructure development than foreseen in the baseline is assumed. The 30 priority projects defined in 2003 by the Van Miert Report are assumed to be completed as well as a number of other projects of relevance to European cohesion. These developments are mainly located in Eastern Countries, as Maps 3.2.1.3 and 3.2.1.4 show. The main objectives of this policy are improving

cohesion, accessibility and reducing congestion by completing all the TEN networks and pan-european corridors that are not included in the priority projects, many of them in Eastern Europe and including axes for Peace and Development. However, as this policy has the effect of increasing total traffic, it is assumed that a higher renewal of the car fleet will be enforced so that average emission ratios are lower. This target can be achieved by banning the presence in roads of old vehicles and by enforcing legal limits of emission ratios in newly manufactured vehicles. No other changes are introduced compared to the Baseline.

Map 3.2.1.3 - Road infrastructure development in the Infrastructure Enhancement Scenario compared to Baseline, 2030. Source: TRANSTOOL Model, 2008



Map 3.2.1.4 - Rail infrastructure development in the Infrastructure Enhancement Scenario compared to Baseline, 2030. Source: TRANSTOOL Model, 2008



The third scenario is a *Regulatory and Pricing Scenario* (scenario c in impact maps), based on Low Growth 2030 as defined in TRANSVisions study, characterised by a low economic development further emphasized by a negative population development. Low growth occurs because of increasing costs of energy, particularly oil. Europe's answer to the increasing energy costs is mobility reduction in terms of higher operating costs which reflects the high energy prices. Policies in this scenario are oriented towards taxation, internalisation of transport externalities, and putting incentives for a modal shift towards rail.

The Pricing scenario is focused on changes in the costs and prices of the different transport modes, taking the Baseline as a starting point. The main policy applied is a generalisation of internalisation costs to road passenger transport, while at the same time the PO2C scheme is expanded to incorporate an extra charge in motorways. Moreover the transport costs are increased in relation to baseline to encourage modal shift and a global reduction of mobility. As road modes are the most heavily charged by both costs and internalisation, a change towards rail and maritime modes is expected on this scenario.

Of what concerns transport pricing, in the Pricing Scenario research and development initiatives are in line with the baseline, but fuel cost for passenger cars is expected to be 20 % higher than in 2005, in constant 2005 prices. Also, distance based transport costs for heavy goods vehicles is assumed to increase 10% in constant 2005 prices.

Additionally, the network is assumed to be the same as in the baseline scenario (Maps 3.2.1.1 and 3.2.1.2). However, cost recovery for heavy goods vehicles is being anticipated in the Vignette countries. In the Pricing scenario the introduction of the cost recovery is assumed as a necessity in order to carry out necessary maintenance and reconstruction of the network under low growth conditions. Internalisation is anticipated at the slightly higher level than in the Baseline scenario (i.e. internalisation of noise, air pollution and congestion has the same values per km as indicated in the Baseline scenario plus an increase of 0,04euro/km).
Passenger rail fares are expected to be the same as in the Baseline scenario. For rail freight the rail transport costs are assumed to increase mainly because the improvements in rail technology and cross border operations are not advancing as fast as in the Baseline scenario. An increase of rail transport costs of 6% has been assumed.

The air transport industry is supposed to be under strain because of high oil prices and a slow economic development. In order to ensure profitability of the business the 2005 air fares are assumed to increase 20% in real terms. The transport costs of freight transport by inland waterways are unchanged compared to the Baseline scenario. Also, maritime transport are supposed to develop along the same path as truck transport, i.e. maritime transport costs is assumed to increase 10% in real terms.

Table 3.2.1.1. Transport policy scenarios: main features

Scenario	**Baseline**	**Infrastructure Enhancement**	**Pricing policies**
Year	**2030**	**2030**	**2030**
Transport cost relative to 2005:			
- Rail and bus fare	50% GDP (max. 30%)	50% GDP (max. 30%)	50% GDP (max. 30%)
- Passenger car fuel cost	7%	7%	17%
- Air fare	0%	0%	15%
- Truck driving cost	4%	4%	10%
- Rail freight cost	-10%	-10%	5%
- IWW freight cost	0%	0%	0%
- Maritime transport cost	4%	4%	10%
Networks:			
- Road	Baseline 2030	High growth 2030	Baseline 2030
Passenger km cost	as in 2005	as in 2005	as in 2005
Passenger km internalisation	0	0	25 % of truck intern
Passenger km cost recovery vignette countries	0	0	0,02 EU on motorways
Truck km cost	as in 2005	as in 2005	as in 2005
Truck km internalisation	IMPACT table	IMPACT table	IMPACT table + 0,04 EU
Truck km cost recovery vignette countries	0	0	0,06 EU on Motorways
- Rail passenger	Baseline 2030	High growth 2030	Baseline 2030
- Rail freight	Baseline 2030	High growth 2030	Baseline 2030
- Air	2005	Extra low cost lines	2005
- IWW	2005	2005	2005

3.2.2. Policy intensity in regions.

Policy intensity in each region (NUTS 3) is defined considering the new infrastructure links passing through each region's territory, determining an increase in generalised accessibility.

Intensity of policy pricing and regulations is attributed to regions with the intensity indicated in Tab. 5, determining transport costs and emissions proportional to the traffic which is forecasted.

3.2.3. Impact typologies.

On the basis of the experience of the first version of the TEQUILA model (ESPON 3.2 project), the specific impacts and the consequent indicators to be considered in the present project are as follows (see Table 3.2.3.1 below).

Table 3.2.3.1. Impact criteria in territorial impact assessment - Transport policies

Macro - criteria	Variable	Criteria	Definition	Type	Measurement	Unit of measure
TE Territorial Efficiency	PIM_E1	**Productivity of inland transport infrastructure**	Productivity of inland infrastructure	Benefit	total traffic/km road and rail	passenger and tons / km
	PIM_E2	**Productivity of airports**	Productivity of airports	Benefit	pax noEU/ total pax	dimensionless
	PIM_E3	**Economic growth**	GDP per Capita	Benefit	GDP variation including the marginal increase due to new infrastructure	€/capita
	PIM_E4	**Congestion costs**	Congestion cost	Cost	time on congestion/total time	dimensionless
TQ Territorial Quality	PIM_Q1	**Traffic passing through**	Road freight crossing the region borders	Cost	non-intraNUTS2 road freight traffic/total freight traffic (no internal)	dimensionless
	PIM_Q2	**Emissions**	CO2 emissions per usable land	Cost	Road emissions for cars and trucks in MTonnesCO2 / usable land	million Tonnes CO2 / km2
	PIM_Q3	**Safety**	Traffic separation in different infrastructure levels	Benefit	traffic on motorways / (traffic 2-lane road + traffic on motorways)	dimensionless
	PIM_Q4	**Market opportunities**	Market potentially accessible	Benefit	GDP at less than 3 hours (multimodal)	million €
TI Territorial Identity	PIM_I1	**Landscape fragmentation**	Density of high capacity road and rail infrastructure	Cost	km of motorway + km of 2track rail / surface (km/km2)	km/km2
	PIM_I2	**Exposure to external visitors**	External passengers (outside the region) at more than 3h	Cost	All passengers reaching the NUTS3 at more than 3h	passengers
	PIM_I3	**Regional integration**	Regional road connectivity	Benefit	average time by road to other NUTS3 capitals in the same NUTS2 (inverted)	time in hours

The main difference in relation to TEQUILA1 as implemented in ESPON 3.2 Project refers to:

- The inclusion of productivity of infrastructure and airports in Territorial Efficiency;
- The inclusion of congestion costs in the Territorial Efficiency macro-criterion, as they refer to a reduction in infrastructure resource efficiency (previously they were included in Territorial Quality);
- The inclusion of freight traffic passing through regions, and of accidents in Territorial Quality;
- The exclusion of an indicator of "Creativity" in the Territorial Identity criterion, judged too weak;
- The inclusion of an indicator of globalisation in Territorial Identity[21].

[21] Impact indicators were firstly indicated by sectoral experts and next discussed by the TPG through extensive interactions and discussions. This differs and improves upon the previous Tequila 1 model.A lively discussion took place among partners concerning Territorial Identity indicators. Transport experts judged regional and national connectivity as leading to reinforce regional and national identity. On the other hand, territorial experts judged connectivity as an element of Territorial Quality and intended Territorial Identity as "local" identity. The Project specification required to analyse impacts on the following dimensions: economy, society, environment, competitiveness, climate change and territorial impact (conceived of as the summative impact of single impacts on the

2.3.4. Logical chain from policy measures to impacts, indicators and methodology to compute policy impacts

TRANS-TOOLS, official DGTREN forecast model has been used to move from policies to the assessment indicators above defined. The three components of territorial cohesion, namely territorial efficiency, territorial quality and territorial identity represent the main macro-criteria for SI, although each single sub-component has been inspected per se as SDI. Within each macro-criterion a number of criteria have been identified, and their relevance and their link to the policy measure being examined is explained below.

Territorial Efficiency
Impact on Productivity of inland transport infrastructure (PIM_E1)

1. The road and rail infrastructure length (km) is calculated summing up all road and rail links in a region assumed in each scenario. TRANSTOOLS graphs cover major national and regional links.
2. The increase in road and rail infrastructure induces a reduction in transport costs, due to lower length and travel times between NUTS3 capitals.
3. As a result of relative lower transport costs, trip distribution between NUTS3 capitals and modal split change, leading to new traffics on the networks.
4. Productivity of inland transport infrastructure in each NUTS3 region is defined as a ratio between total road and rail traffic (vehicle-km) and total length of road and rail infrastructure.
5. A higher productivity ratio indicates a better use of available infrastructure and thus is regarded as a benefit for the region.

Impact on Productivity of airports (in relation to external trips) (PIM_E2)

1. The total air passengers in each airport are calculated using TRANSTOOLS forecast model.
2. Variations on GDP and population in each region are obtained using the econometric submodel CGEurope.
3. The attractiveness of each region to external EU business and tourist trips changes according to GDP and population.
4. Productivity of airports is calculated in each NUTS3 region as a ratio between extraEU air passengers over total air passengers, by adding figures of all airports in the region.
5. A higher productivity ratio indicates more attractiveness of the region to external trips, encouraging more economic development and thus is regarded as a benefit for the region.

Impact on Economic growth (PIM_E3)

1. Impact on economic growth in each region is defined for each scenario. Economic growth is measured as GDP per capita.
2. CGEurope submodel calculates the marginal increases in GDP due to the presence of new transport infrastructure, including spill over effects from neighbouring regions.
3. Economic growth is regarded as a benefit for the region.

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above mentioned dimensions). Thus, the indicators selected aims at capturing these dimensions but have been next combined in the three main criteria of Territorial Efficiency, Territorial Quality and Territorial Identity.

Impact on Congestion cost (PIM_E4)

1. New infrastructures change transport costs.
2. Variations in transport costs change locational choices, trip distribution, modal split and total traffic volumes.
3. Traffics on road network are used to compute congestion using flow-speed curves on each link.
4. Congestion cost is defined as the number of daily hours driving on congestion on one day in each link.
5. A higher congestion level is regarded as a cost and has a negative impact on the region.

Territorial Quality

Impact on Freight traffic passing through (PIM_Q1)

1. TRANSTOOLS model calculates freight matrices for a given scenario. The model works at NUTS2 level for freight.
2. Matrices are assigned on the networks.
3. Vehicle-km is computed for each NUTS2.
4. Traffic passing through is defined as the ratio between freight vehicle-km with origin or destination outside the NUTS2 over total freight traffic in the region.
5. Traffic passing through is regarded as a cost.

Impact on Emissions (by road traffic) (PIM_Q2)

1. Road passenger and freight matrices are assigned to the road network for each scenario.
2. According to the average speed in each link and the number of vehicle-km, the CO2 emissions are calculated using standard speed-emission curves, representative of the average EU27 fleet.
3. Total emissions inside each NUTS3 are summed up and divided by the surface of the region (usable land).
4. An increase in the density of CO2 emissions is regarded as a cost.

Impact on Safety (PIM_Q3)

1. New road infrastructures are introduced in the TRANSTOOLS graphs.
2. Road matrices are computed and assigned on the network.
3. All vehicle-km in the roads of each NUTS3 is summed-up.
4. Safety is defined as the ratio between traffic on roads with separate lanes over total traffic, given that roads with separate lanes have a much lower accident incidence.
5. An increase in Safety is regarded as a regional benefit.

Impact on Market opportunities (PIM_Q4)

1. TRANSTOOLS model computes the GDP in each NUTS3 region.
2. TRANSTOOLS graphs are used to compute travel times between NUTS3 capitals using different transport modes, taking into account congestion on road.
3. For each NUTS3 region, the GDP of other regions at less than 3 hours travel time is summed up (including the own GDP). 3 hours is the average maximum time limit to make a daily round trip.
4. More GDP at 3 hours implies more chances to boost the regional economy and thus it is regarded as a benefit.

Territorial Identity

Impact on Landscape fragmentation (PIM_I1)

1. Landscape fragmentation in each region is computed by dividing the total length of motorways and 2-track rails over total regional surface.
2. Only high capacity infrastructures are considered because they are the ones having the highest barrier effect on the environment.
3. Higher fragmentation is regarded as a cost.

Impact on Exposure to external visitors (PIM_I2)

1. TRANSTOOLS graphs are used to compute travel times between NUTS3 capitals using different transport modes, taking into account congestion on road.
2. All passengers arriving to a NUTS3 capital at more than 3 hours distance are summed up.
3. Visitors at more than 3 hours of travel time are regarded as a threat for regional identity

Impact on Regional integration (PIM_I3)

1. TRANSTOOLS road graph is used to compute travel times between NUTS3 capitals, taking into account congestion.
2. Average travel time between NUTS3 capitals inside the same NUTS2 is calculated.
3. A reduction on average time is regarded as a better regional integration and thus is a benefit.

The process to compute the territorial impact on the different criteria consist in two simultaneous steps:

1. TRANS-TOOLS results are regionalised at the NUTS3 (e.g. freight forecasts are obtained at NUTS2 level and need to be attached to NUTS3);
2. The specific TEQUILA2 indicators are computed.

A routine is being programmed in order to transform TRANS-TOOLS results into the indicators required by TEQUILA, linked to a GIS. Additionally, some refinement and additional work are required for the regionalization process, basically splitting networks segments or links at NUTS3 level.

TRANS-TOOLS follows a state-of-the-practice 4-step modelling framework, consisting of a successive modelling of transport generation (at NUTS3), distribution (among NUTS3 and NUTS2), modal split (between transport modes) and network assignment.
Policies are expressed in terms of networks (e.g. TENs), as well as in costs and times by passengers and/or freight travelling across the networks.
TRANS-TOOLS is the best state-of-the-practice transport-oriented 4-steps forecast model available at EU level[22], that includes specific socioeconomic modules based on complementary modelling paradigms.
The modelling capabilities of TRANS-TOOLS are related directly to input variables describing the infrastructure networks and aspects related to the networks e.g. transport costs or transport times, as well as flows between NUTS3 and NUTS2 regions. Therefore, the TRANS-TOOLS model is also able to offer answers on policy questions indirectly affecting transport costs and transport times, as well as demand evolution.

Pros and cons of TRANS-TOOLS can be summarised as follows:

- It provides results only for 2020 and 2030 (or a fixed year, but it does not give evolutions over time).

[22] It is a 4-steps transport equilibrium model (version November 2008, developed by DTU and others in TEN_CONNECT), calibrated on 2005 data.

- Policies are translated into generalised user costs in 2030, either in values of time or in costs vehicle operation.
- It covers EU27 and neighbouring countries (refined for Eastern European countries) but not Northern Africa.
- The new road assignment procedure implemented (Stochastic User Equilibrium (SUE) local traffic generated and preloaded, assignment by periods of the day) allows a detailed analysis of congestion on roads (and therefore the impact of transport policies such as speed-limits).
- The new trade model facilitates the analysis of import/export freight.
- Passenger trips with origin or destination outside EU27 are included but not explicitly modelled (except neighbouring countries, but not Northern Africa).
- In the case of aviation, trips with origin or destination outside EU27 are not modelled (EU-27 trip segments are included, in non-direct flights).
- Freight trips with origin or destination outside EU27 are included as if they had their origin or destination in a European port (except for neighbouring countries).
- Air freight is not included.
- There is no explicit modelling of ferries (included as road and rail links) There is no policy-interface, producing a synthesis of the 2 Gb results produced in each scenario run (leading to a very time-consuming process of analysis).

4. The expert meetings and the methodological improvements

4.1. Programme and results of the first expert meeting

The main objective of the first expert meeting, organised and held at Free University on 4 March 2009, was to assess the parameters of the TEQUILA 1 model by means of gathering expert knowledge. This meeting was aimed at testing the methodology to be implemented to analyse the two sectoral policies (i.e. transport and CAP). Therefore, the results drawn from the meeting have not been taken into consideration for later analysis.

Thirteen experts in the domain of regional and urban economics, transport and infrastructure research[23], and MCA analysis participated to the first meeting (see Annex 7 for the full list). These experts have familiarity with transport economics and policies as well as MCA methodological issues; both factors were relevant selection criteria of participants to this meeting because of its own aim, i.e. to test the methodology to be applied in the next meeting aimed at assessing the two sectoral policies studied in TIPTAP. Experts were introduced to the ESPON TIPTAP project and to the TEQUILA 1 model, its functioning and its current specification by Prof. dr. Camagni. The respondents were given the opportunity to familiarize themselves with the model.

Next, the participants were introduced to the main objectives and activities of the meeting. The criteria included in the model and their score range were discussed in more detail. The indicators included in TEQUILA 1 and their definition and measurement is detailed in Table 4.1.1 below. Also, what kind of input was expected from the experts during the meeting was explained. In the remainder of this section we will discuss the three exercises conducted and the results produced.

Table 4.1.1. Criteria Impact criteria in territorial impact assessment - Transport policies, TEQUILA1 model

Macro-Criteria	Variable	Criteria	Type	Definition	Measurement
Territorial efficiency	PIM_E1	**Internal connectivity**	Benefit	Dif transport endowment (new road + rail) / GDP	Km/GDP
	PIM_E2	**External accessibility**	Benefit	Dif accessibility is new passengers accessible by road/rail (potential)	Number of persons
	PIM_E3	**Economic growth**	Benefit	Dif GDP per capita, scenario B1 – Difference to baseline scenario 2000-2021	Dif % GDP/Inhabitant
Territorial quality	PIM_Q1	**Congestion**	Cost	Differential flows estimated	Million Vehicles/Km
	PIM_Q2	**Emissions**	Cost	Differential CO2 emissions estimated	Million Tons CO2/Year
	PIM_Q3	**Transport sustainability**	Benefit	New rail minus new roads with respect to scenario 2021	Km minus Km
Territorial identity	PIM_I1	**Creativity**	Benefit	Dif accessibility times [knowledge and creative services]	(# people)*(# libraries + theathres)
	PIM_I2	**Cultural heritage**	Benefit	Dif accessibility times [# monuments + museums]	(# people)*(# monuments – museums)
	PIM_I3	**Landscape resources**	Cost	Dif transport endowment (new km of road+rail)/GDP	Km/GDP

[23] Given the experimental nature of the meeting, the panel of experts did not necessarily gathered specifically experts on transports.

Exercise 1: AHP. Establishing the weight values for Territorial efficiency, Territorial quality and Territorial identity.
The first assessment exercise was relatively easy and short. The exercise was setup to allow the participant to familiarize themselves with the assessment exercises and the questionnaires used.
During the exercise the participants were asked to compare Territorial efficiency, Territorial quality and Territorial identity in a pair-wise manner. The experts had to indicate which of the criteria is more important, according to the scale reported in Table 4.1.2.

Table 4.1.2. Pair-wise comparison format - AHP Saaty's method semantic scale

1	X is extremely more important than Y
1a	X is less then extremely more important than Y
2	X is very strongly more important than Y
2a	X is less then very strongly more important than Y
3	X is strongly more important than Y
3a	X is less then strongly more important than Y
4	X is moderately more important than Y
4a	X is less then moderately more important than Y
5	X is practically equally important as Y

The results of the first exercise are the weight values for Territorial efficiency, Territorial quality and Territorial identity, calculated on the basis of the results of the pair-wise comparisons and by means of AHP (Table 4.1.3).

Table 4.1.3 Experts' weight values for Territorial efficiency, Territorial quality, Territorial identity (TEQUILA1)

	Territorial efficiency	**Territorial quality**	**Territorial identity**
Expert 1	10	69	21
Expert 2	66	25	9
Expert 3	29	57	14
Expert 4	66	25	9
Expert 5	70	23	7
Expert 6	29	57	14
Expert 7	72	22	6
Expert 8	70	23	7
Expert 9	70	23	7
Expert 10	69	21	10
Expert 11	68	26	6
Expert 12	68	26	6
Expert 13	Did not participate in this exercise		
Min value	**10**	**21**	**5**
Max value	**72**	**69**	**21**
Average	**57**	**33**	**10**
STDEV	**21**	**17**	**5**

Weights can be interpreted as relative preference of one (macro)-criterion as compared to the others. The results suggest that the majority of respondents deems Territorial efficiency the most important category of criteria or effects which policies should be aimed at in order to improve territorial cohesion (Table 4.1.3). In fact, Territorial efficiency receive a higher weight than Territorial quality, meaning that experts consider measures and policies affecting the former more relevant to territorial cohesion than the measures or policies affecting the latter.

Exercise 2: Holistic scaling. Establishing value functions and weights for criteria.
For each of the main categories Territorial efficiency, Territorial quality and Territorial identity a so-called multi-attribute value function model was developed on the basis of the associated three sub-criteria and weights values.
As explained in the previous section, the strategy used is holistic scaling. The participants were asked to state their preferences over 16 fictitious policy alternatives

and to assign a value between 0 and 10 to the alternatives while taking into account the scores on the complete set of criteria. In each of these 16 fictitious alternatives, each criterion can take on the minimum or the maximum or an intermediate score (e.g. the first sub-criterion takes on the maximum value, the second the minimum and the third the minimum too).
The exercise was structured as follows. First an introduction was given to the main objectives of the exercise as well as the questionnaire used. Furthermore, the various criteria were described as well as the associated score ranges. During the choice experiment, the experts are given descriptions of the fictitious alternatives and were asked to rate these, while taking all criteria scores into consideration[24].
The exercise produced three multi-attribute value function models containing value functions and weights, one for Territorial efficiency, one for Territorial quality and one for Territorial identity. These three models were next integrated into one model by means of the weight values obtained during the first exercise (Table 4.1.4).

Table 4.1.4. Weight values of macro-criteria and criteria (revised TEQUILA1) – Experts judgements

Criterion:	Weight main category	Weight of criterion to main category	Standardized weight[25]
Internal accessibility	57	13	7
External accessibility	57	17	9
Economic growth	57	71	40
Congestion	33	29	10
Emissions	33	45	15
Transport sustainability	33	26	9
Creativity	10	33	3
Cultural heritage	10	23	2
Landscape fragmentation	10	44	4

The model contains three sub-criteria for Territorial Efficiency namely, Internal connectivity, External accessibility and Economic growth. Especially the criterion Economic growth received a relatively large weight value (70): the majority of experts signalled that measures stimulating economic growth should form the main ingredient of policies focusing on territorial efficiency and cohesion (Table 4.1.5).

Table 4.1.5. Weight values for criteria belonging to Territorial efficiency (TEQUILA1)

	Internal connectivity	External accessibility	Economic growth
Min value	0	0	33
Max value	33	42	100
Average	13	17	70
STDEV	13	16	28

The value functions for the three attributes transform a score on the respective criteria into a value between 0 and 1 (see Figures 4.1.1 - 4.1.3). For instance, let's assume a policy that increases economic growth as measured in GDP per capita by 4%. The associated value is equal to 82. This implies that the policy will yield 82% of the weight value assigned to the criterion economic growth (70) which is 54 weight points (i.e. the score is multiplied times the weight value assigned to the criteria).
Figures 4.1.1 to 4.1.3 also show that the value functions are almost linear, supporting the assumptions of the TEQUILA1 model.

[24] In other words, each fictitious policy alternative is associated to a combination of the possible scores of each sub-criterion (within each main criterion). Experts were asked to assess these fictitious alternatives, while taking all criteria scores into consideration.
[25] Standardised weights are equal to "weight main category" (column 1) times "weight criterion to main category" (column 2) divided by 100, so that their sum adds up to 100.

Figure 4.1.1. Value function for criterion Economic growth (TEQUILA1)

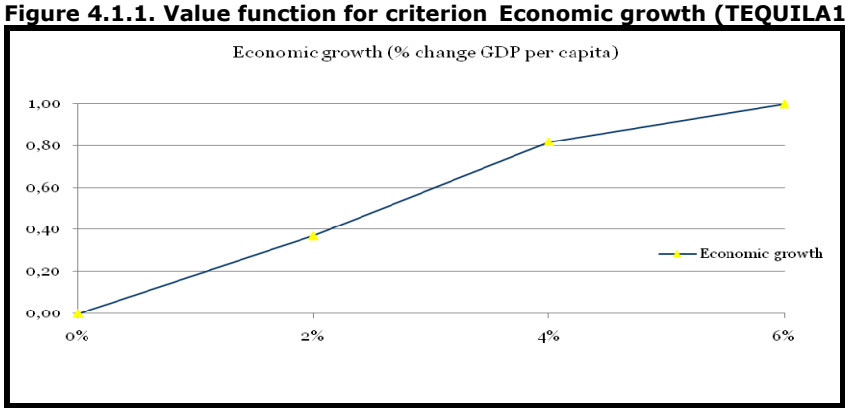


Figure 4.1.2. Value function for criterion External accessibility (TEQUILA1)

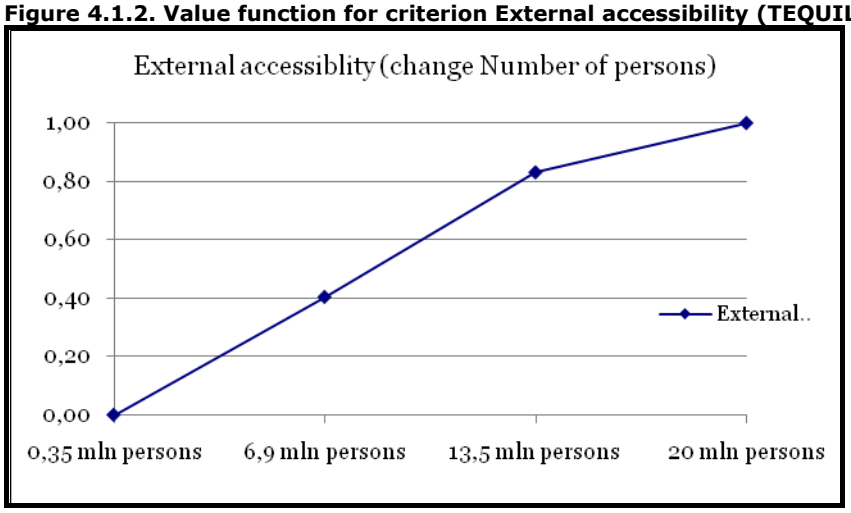
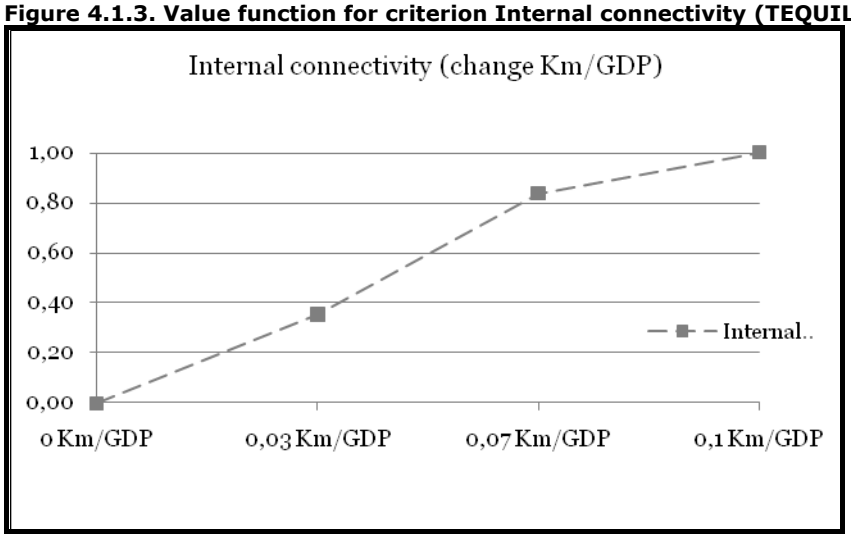


Figure 4.1.3. Value function for criterion Internal connectivity (TEQUILA1)



The experts gave almost equal weight values to the criteria Congestion (0,29) and Transport sustainability (26). However, the criterion Emissions was given the largest weight value (45) (Table 4.1.6).

Table 4.1.6. Weight values for criteria belonging to Territorial quality (TEQUILA1)

	Congestion	Emissions	Transport sustainability
Min value	0	25	0
Max value	67	100	50
Average	29	45	26
STDEV	18	22	17

The value functions for Congestion and Emissions depicted in the graphs below are monotonically decreasing and have a linear form (Figure 4.1.4 and 4.1.5), differently from the value function for Transport sustainability (Figure 4.1.6).

Figure 4.1.4. Value function for criterion Congestion (TEQUILA1)

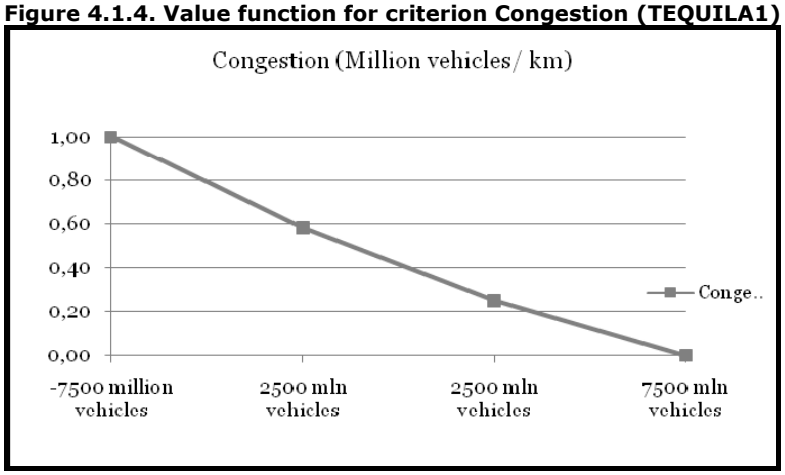


Figure 4.1.5. Value function for criterion Emissions (TEQUILA1)

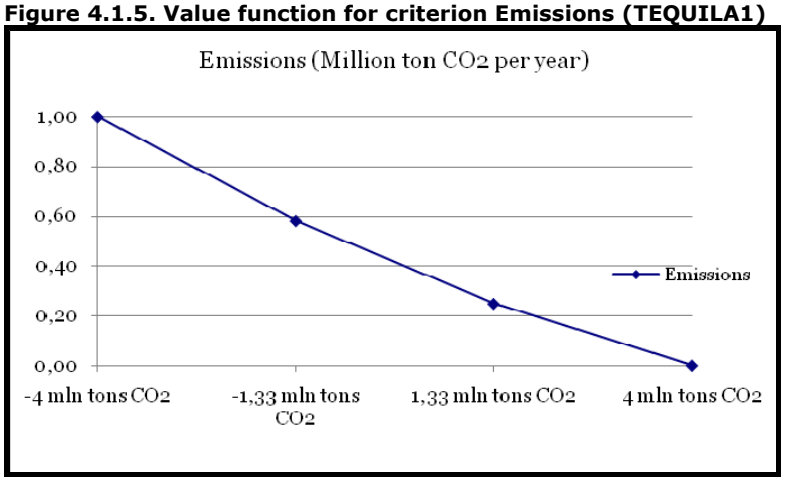
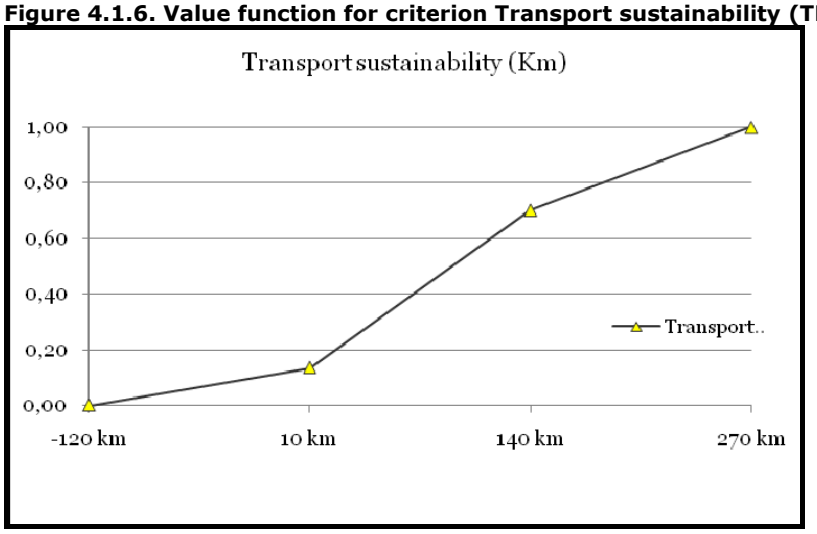


Figure 4.1.6. Value function for criterion Transport sustainability (TEQUILA1)



The value functions for Congestion and Emissions also signal the relative importance of these criteria. In fact, approximately 60% of the weight values for these criteria is realized when the third level is attained. Congestion should be reduced at least to

2500 mln vehicles/Km to be considered as reasonably effective by the experts and thus improving on the welfare of a region.
Policies aiming at the reduction of Emissions produce approximately 60% of the weight value (45) once the realized reduction is at least 1,33 mln tons CO2 per year.

The weight values for criteria of Territorial identity indicate that Landscape fragmentation is the most important criterion of this group. Also, the criterion Creativity is placed above Cultural heritage (Table 4.1.7).

Table 4.1.7. Weight values for criteria belonging to Territorial identity (TEQUILA1)

	Creativity	Cultural heritage	Landscape fragmentation
Min value	0	0	0
Max value	100	50	100
Average	33	23	44
STDEV	29	19	35

The value functions of the three criteria are almost linear (Figures 4.1.7 - 4.1.9).

Figure 4.1.7. Value function for criterion Creativity (TEQUILA1)

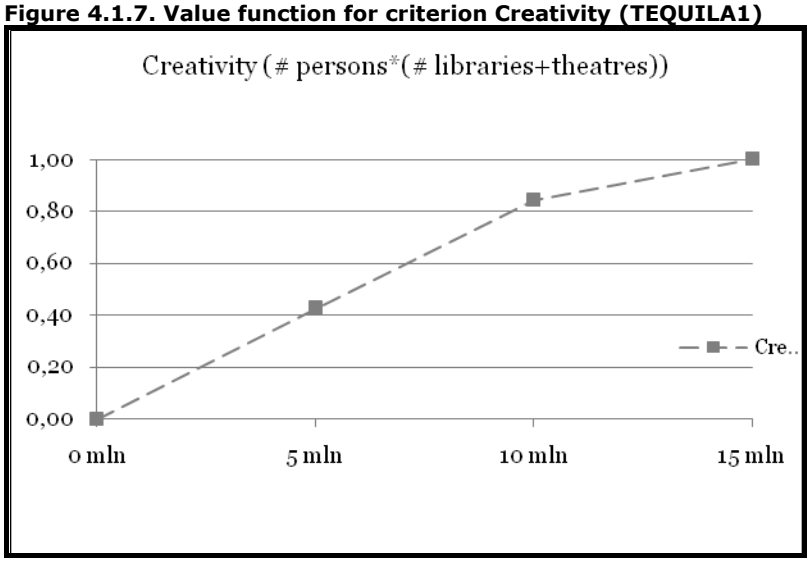


Figure 4.1.8. Value function for criterion Cultural heritage (TEQUILA1)

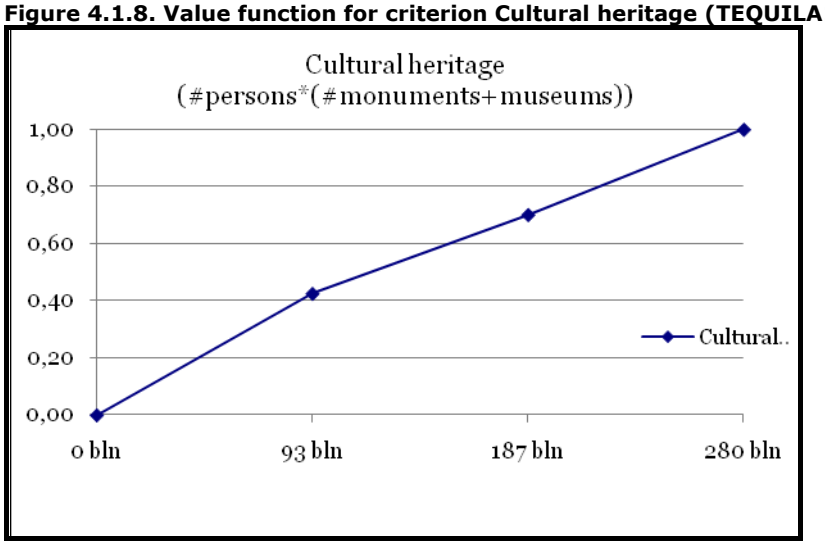
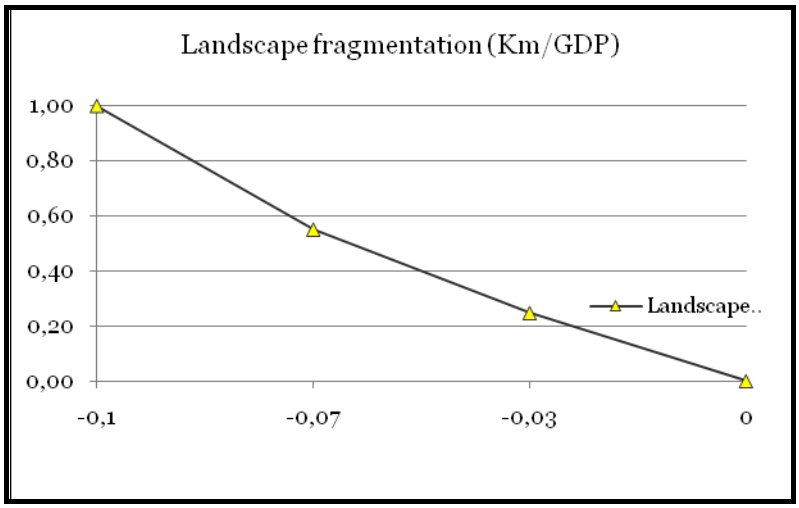


Figure 4.1.9. Value function for criterion Landscape fragmentation (TEQUILA1)



Only the value function for Creativity slightly deviates from the linear form. This value function also shows that 84% of the weight value assigned to creativity is realized once the score on the criterion is equal to or higher than 10 mln persons. This is 70% and 55% for Cultural heritage and Landscape fragmentation.
This implies that for the latter two criteria higher scores are required. So, policies aimed at stimulating Cultural heritage and limiting Landscape fragmentation need to result in relatively large changes in the criteria scores before they become effective. For example, a policy reducing landscape fragmentation with 0,03 Km/GDP will produce only 11 utility points ((25*44)/100). Larger reductions are therefore necessary before a significant share of the weight value is contributed.

These two assessment exercises produced two types of results.
The results of the first exercise allowed us to calculate the weights for the main categories of criteria included in the TEQUILA model (Table 4.1.3). The second assessment exercise produced a multi-attribute value function model for each of these main categories. These models consist of a value function and a weight value for each criterion belonging to a main category. These weight values indicate the contribution of a single criterion to the score on one of the main categories. For example, the maximum contribution of the criterion Economic growth to Territorial efficiency is equal to 70 (Table 4.1.4, third column). In order to get an impression of the maximum contribution of a single criterion to the Territorial cohesion we need to multiply the weight assigned to each main category with the weight of individual criteria (Table 4.1.4, last column). One can read that the criterion Economic growth is the largest contributor to the concept of Territorial cohesion. This criterion is followed by Emissions and Congestion. Criteria belonging to Territorial identity are relatively small contributors to Territorial cohesion. The analysis shows that the experts believe that policies focussing on economic growth are considered to be the most important ones to reduce regional differences.

Exercise 3: AHP. Establishing value for Dr,c and Vr,c
The TEQUILA model takes differences between European NUTS3 regions into account when assessing the effectiveness or welfare consequences of policies by means of the desirability (Dr,c) and vulnerability (Vr,c) parameters. The experts were asked to discuss the desiderability for and vulnerability of a region for an impact on the different criteria. The exercise made use of the following regional distinctions, as detailed in the Inception Report, aimed at capturing regional fragilities and potentials:

- Urbanized European NUTS3 regions VS rural European NUTS3 regions;
- Advanced European NUTS3 regions VS Developing European NUTS3 regions;

- Northern, Southern, Western and Eastern European NUTS3 regions.

We considered rural regions those NUTS3 regions classified as prevalently rural according to the OECD classification as suggested by the comments from the Sounding Board to the Interim report. All the other regions are considered as urban[26].
We considered as advanced those regions with a GDP level greater than the EU average (as of 2005[27]) and developing the others.
We finally considered Northern regions those in Sweden, Finland and Denmark, Southern those in Portugal, Spain, Italy, Greece, Malta and Cyprus, Western those in United Kingdom, Ireland, France, Germany, The Netherlands, Belgium, Luxemburg and Austria, Eastern those in Slovenia, Czech Republic, Hungry, Slovakia, Estonia, Bulgaria, Romania, Lithuania and Latonia.
This classification has been maintained also in the next expert meetings.

The assessment exercises took the form of AHP and the experts were asked to compare regions in a pair-wise manner with regard to the desiderability of a criterion and the vulnerability of a specified region for an impact on a criterion (according to the scale in Table 4.1.2). Based on the assigned importance degree, weight values for each region indicating the desiderability of good score on a criterion or its vulnerability of that region for an impact were calculated (Table 4.1.8 and 4.1.9). Higher weight values imply a higher desirability and vulnerability of an impact. For instance, in the case of congestion, policy impacting on this criterion are more desirable for urban than for rural regions.

Table 4.1.8. Desirability of impacts for specific European regions (TEQUILA1)[28]

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Internal connectivity	1,64	0,36	1,16	0,84	0,46	0,5	0,34	0,72
External accessibility	1,16	1,16	0,66	0,66	0,68	0,48	0,34	0,74
Economic growth	1,32	0,72	0,36	1,64	0,64	0,56	0,22	0,82
Congestion	1,72	0,28	1,24	0,76	0,66	0,52	0,56	0,28
Emissions	1,72	0,3	1,5	0,5	0,6	0,48	0,5	0,42
Transport sustainability	1,72	0,28	1,3	0,7	0,56	0,52	0,46	0,46
Creativity	1,66	0,34	0,9	1,1	0,52	0,66	0,64	0,18
Cultural heritage	1,12	0,88	0,78	1,22	0,2	0,62	0,64	0,56
Landscape fragmentation	0,32	1,68	0,52	1,48	0,42	0,54	0,48	0,58

[26] It is worth, however, clarifying that in the case of CAP we used data at NUTS2 level. In this case, due to the different aggregation scale, we considered as rural those regions classified, according to OECD classification, either as prevalently rural or significantly rural, and as urban the others.
[27] For the purpose of this classification, we used data on GDP from the ESPON INTERANL database on the last year available (i.e. 2005)
[28] AHP method has been used to derive desiderability and vulnerability weights first for the comparison between urban and rural regions, next to the comparison between advanced and developing regions and finally to the comparison between Northern, Southern, Western and Eastern regions. This is why the sum of weights for urban and rural regions adds up to 1, as well as the sum of weights for advanced and developing regions and, finally, as well as the sum of weights for Northern, Southern, Western and Eastern regions.

Table 4.1.9. Vulnerability of impacts for specific European regions (TEQUILA1)

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Internal connectivity	1,22	0,78	0,78	1,22	0,22	0,4	0,58	0,8
External accessibility	0,88	1,5	0,78	1,22	0,2	0,4	0,44	0,88
Economic growth	1	0,78	0,36	1,64	0,22	0,48	0,16	1,14
Congestion	1,34	0,66	1,16	0,84	0,18	0,66	0,6	0,56
Emissions	1,04	0,96	1,18	0,82	0,18	0,64	0,68	0,48
Transport sustainability	1,2	0,8	0,9	1,1	0,2	0,56	0,7	0,52
Creativity	1,02	0,98	0,5	1,5	0,38	0,46	0,66	0,5
Cultural heritage	1,16	0,84	0,72	1,28	0,14	0,76	0,46	0,64
Landscape fragmentation	0,28	1,72	0,7	1,3	0,12	0,8	0,46	0,62

Except for Landscape fragmentation, policies impacting on the selected criteria are more desirable for urbanized European NUTS3 regions than for regions which can be marked as rural (Table 4.1.8). Internal connectivity is relatively more desirable for advanced than for developing regions. This also applies to the criteria Congestion, Emissions and Transport sustainability. Policy impacts on Economic growth, Creativity, Cultural heritage and Landscape fragmentation are deemed more desirable for developing European regions. In general, impacts on Territorial quality are more desirable for advanced European NUTS3 regions while impacts on Territorial identity for developing NUTS3 regions.

Measures influencing Territorial efficiency will affect Eastern European NUTS3 regions more than others (Table 4.1.8). Also, measures aimed at improving Territorial quality seem to be more appropriate for Northern European regions. Overall, however, the differences between regions are small on most criteria but Creativity, since Eastern European NUTS3 regions are barely affected by an impact on this criterion.

Finally, especially urbanized regions are vulnerable to impacts on most criteria but External accessibility and Landscape fragmentation (Table 4.1.9). Also, the experts indicated that, except for congestion, developing regions are more vulnerable to impacts on the various criteria.

In conclusion, the expert knowledge gathered allowed us to specify the components of the TEQUILA 1 model in more detail. The results obtained allow us to adjust the weight values for the main categories of TEQUILA criteria. In fact, more emphasis should be put on Territorial efficiency and Territorial Quality and less be given to Territorial identity (the weight value should be lowered from 33 to 10). Also, economic growth should be considered the most important criterion when designing policies which focus on territorial cohesion (Table 4.1.4, last column).

Furthermore, the application of holistic scaling resulted in a more detailed specification of the value functions for the various criteria. Most assumptions with regard to the functional form of the value functions do hold. The value functions for the various criteria are confirmed to take the linear form.

AHP has been successfully applied to obtain weight values reflecting the desiderability for and the vulnerability of a region for a specific impact. The weight values obtained can be used in the TEQUILA model to adjust impacts on criteria for different types of regions, as described in section 2.1 (point 6).

4.2. Programme and results of the second expert meeting

The second expert meeting was aimed at assessing the parameters of TEQUILA 2 for the transport policies. The meeting was organised and held at MCRIT, Barcelona on 28 April 2009.
Twelve experts in the domain of transport and infrastructure research, from the private sector, the public sector, universities and representatives of local government, participated to the second meeting (see Annex 2 for the full list). This panel of experts have been invited as representatives of different stakeholders involved in and affected by the design and implementation of transport policies. Experts were introduced to the ESPON TIPTAP project and to the TEQUILA-model, its functioning and its current specification by Prof. dr. Camagni. The respondents were given the opportunity to familiarize themselves with the model.
Next, the participants were introduced to the main objectives and activities of the meeting. The criteria included in the model and their score range were discussed in more detail. Also, what kind of input was expected from the experts during the meeting was explained. In the remainder of this section we will discuss the three exercises conducted and the results produced.
The indicators included in TEQUILA 2 for transport policies are detailed in Table 4.2.1 below[29].

Table 4.2.1. Impact criteria in territorial impact assessment - Transport policies

Macro-Criteria	Variable	
TE Efficiency	PIM_E1	**Productivity of inland transport infrastructure**
	PIM_E2	**Productivity of airports**
	PIM_E3	**Economic growth**
	PIM_E4	**Congestion costs**
TQ Quality	PIM_Q1	**Traffic passing through**
	PIM_Q2	**Emissions**
	PIM_Q3	**Safety**
	PIM_Q4	**Market opportunities**
TI Identity	PIM_I1	**Landscape fragmentation**
	PIM_I2	**Exposure to external visitors**
	PIM_I3	**Regional integration**

Exercise 1: AHP. Establishing the weight values for Territorial efficiency, Territorial quality and Territorial identity.
The first assessment exercise was relatively easy and short. The exercise was setup to allow the participant to familiarize themselves with the assessment exercises and the questionnaires used.
During the exercise the participants were asked to compare Territorial efficiency, Territorial quality and Territorial identity in a pair-wise manner. The experts had to indicate which of the criteria is more important, according to the scale reported in Table 4.1.2.

[29] Indicators have been chosen on the basis of the experience of the first version of the TEQUILA model (ESPON 3.2 project), although with some differences; in particular, three new indicators have been included, namely productivity of infrastructure and airports in Territorial Efficiency and freight traffic passing through regions, and of accidents in Territorial Quality, and one excluded, Creativity in Territorial Identity criterion. Differently from TEQUILA 1, indicators have been chosen by sectoral experts in transports, thus representing an improvement on the previous version of the model.

The results of the first exercise are the weight values for Territorial efficiency, Territorial quality and Territorial identity, calculated on the basis of the results of the pair-wise comparisons and by means of AHP (Table 4.2.2).

Table 4.2.2. Experts' weight values for Territorial efficiency, Territorial quality, Territorial identity (TEQUILA2 – Transport policies)

	Territorial efficiency	Territorial quality	Territorial identity
Expert 1	9	25	66
Expert 2	61	9	30
Expert 3	25	10	65
Expert 4	32	39	29
Expert 5	57	29	14
Expert 6	60	28	12
Expert 7	48	41	11
Expert 8	30	61	09
Expert 9	65	08	27
Expert 10	28	64	7
Expert 11	62	14	24
Min value	9	8	7
Max value	65	64	66
Average	**43**	**30**	**27**
STDEV	19	20	21

The results suggest that the majority of respondents deems Territorial efficiency the most important category of criteria or effects which policies should be aimed at in order to improve territorial cohesion (Table 4.2.2).

Exercise 2: Holistic scaling. Establishing value functions and weights for sub-criteria.
For each of the main categories Territorial efficiency, Territorial quality and Territorial identity a so-called multi-attribute value function model was developed on the basis of the associated three sub-criteria and weights values.
As explained in the previous section, the strategy used is holistic scaling. The participants were asked to state their preferences over 9 fictitious policy alternatives and to assign a value between 0 and 10 to the alternatives while taking into account the scores on the complete set of criteria. In each of these 9 fictitious alternatives, each criterion can take on the minimum or the maximum or an intermediate score (e.g. the first sub-criterion takes on the maximum value, the second the minimum and the third the minimum too).
The exercise was structured as follows. First an introduction was given to the main objectives of the exercise as well as the questionnaire used. Furthermore, the various criteria were described as well as the associated score ranges. During the choice experiment, the experts are given descriptions of the fictitious alternatives and were asked to rate these, while taking all criteria scores into consideration[30].
The exercise produced three multi-attribute value function models containing value functions and weights, one for Territorial efficiency, one for Territorial quality and one for Territorial identity. These three models were next integrated into one model by means of the weight values obtained during the first exercise (Table 4.2.3).

[30] In other words, each fictitious policy alternative is associated to a combination of the possible scores of each sub-criterion (within each main criterion). Experts were asked to assess these fictitious alternatives, while taking all criteria scores into consideration.

Table 4.2.3. Weight values of macro-criteria and criteria (TEQUILA2 – Transport policies) – Experts judgements

Macro-criteria	Weight main category	Criteria	Contribution of criterion to main category	Standardised weight
Territorial Efficiency	43	Productivity of inland infrastructure	18	8
		Productivity of airports	10	4
		Economic growth	54	23
		Congestion costs	18	8
Territorial Quality	30	Traffic passing through	16	5
		Emissions	25	8
		Safety	24	7
		Market opportunities	35	10
Territorial Identity	27	Landscape fragmentation	45	12
		Exposure to external visitors	38	10
		Regional integration	17	5

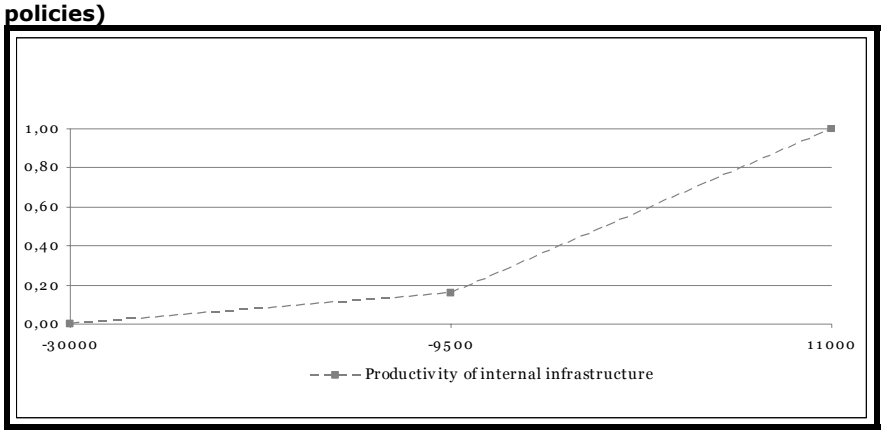
The model contains four sub-criteria for Productivity of internal infrastructure, Productivity of airports, Economic growth and Congestions costs. Especially the criterion Economic growth received a relatively large weight value (54): the majority of experts signalled that measures stimulating economic growth should form the main ingredient of policies focusing on territorial efficiency and cohesion (Table 4.2.4).

Table 4.2.4. Weight values for criteria belonging to Territorial efficiency (TEQUILA2 – Transport policies)

	Productivity of inland infrastructure	Productivity of airports	Economic growth	Congestion costs
Min value	0	0	33	0
Max value	50	33	100	44
Average	18	10	54	18
STDEV	17	11	19	13

The value functions[31] for the four attributes transform a score on the respective criteria into a value between 0 and 1 (see Figures 4.2.1 - 4.2.4).

Figure 4.2.1. Value function for criterion Productivity of internal infrastructure (TEQUILA 2 – Transport policies)



[31] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.2.2. Value function for criterion Productivity of airports (TEQUILA2 – Transport policies)

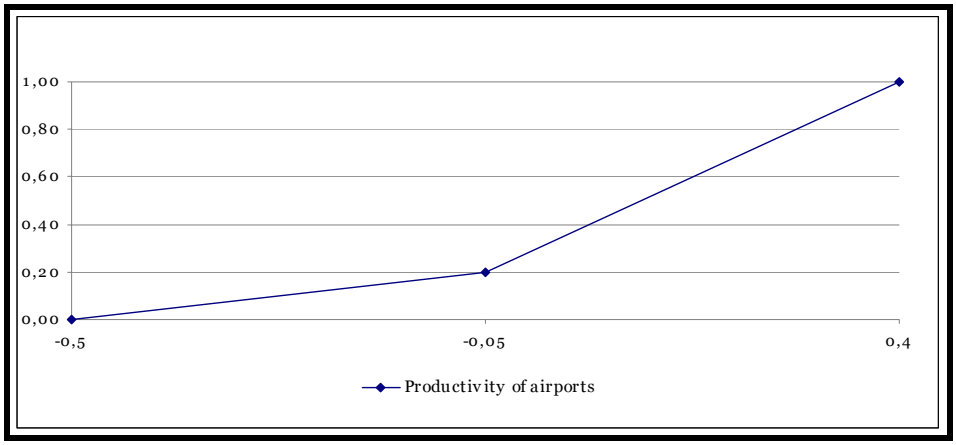


Figure 4.2.3. Value function for criterion GDP growth (TEQUILA2 – Transport policies)

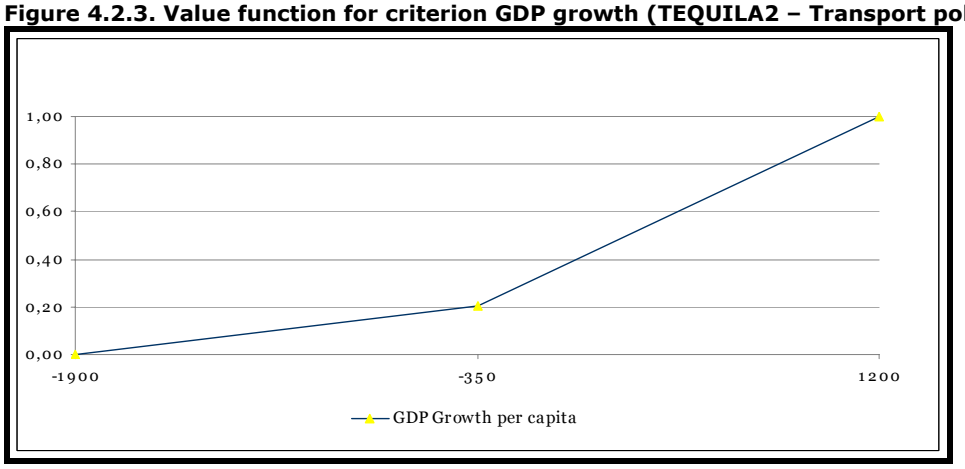
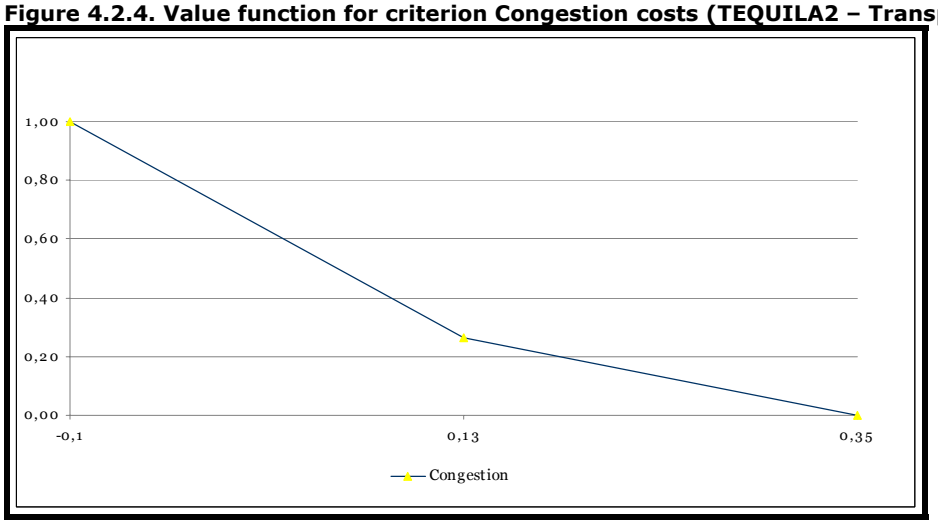


Figure 4.2.4. Value function for criterion Congestion costs (TEQUILA2 – Transport policies)



The experts gave almost equal weight values to the criteria CO2 emissions (25) and Market opportunities (24). However, the criterion Safety was given the largest weight value (35) (Table 4.2.5).

Table 4.2.5. Weight values for criteria belonging to Territorial quality (TEQUILA2 – Transport policies)

	Road freight crossing region border	CO2 emissions	Safety	Market opportunities
Min value	0	0	0	0
Max value	33	67	99	99
Average	16	25	35	24
STDEV	11	20	26	29

The value functions[32] for Road freight crossing regional borders and Safety depicted in the graphs below are linear (Figure 4.2.5 and 4.2.7), differently from the value function for CO2 emissions and Market opportunities (Figure 4.2.6 and 4.2.8).

Figure 4.2.5. Value function for criterion Road freight crossing region border (TEQUILA2 – Transport policies)

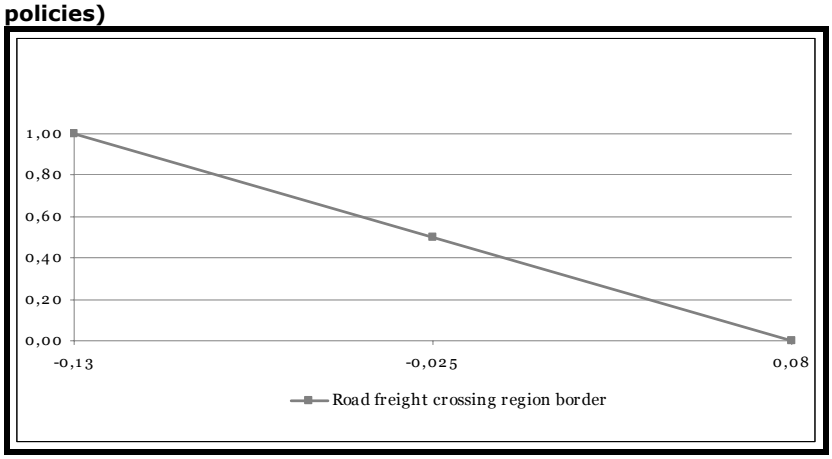


Figure 4.2.6. Value function for criterion CO2 emissions (TEQUILA2 – Transport policies)

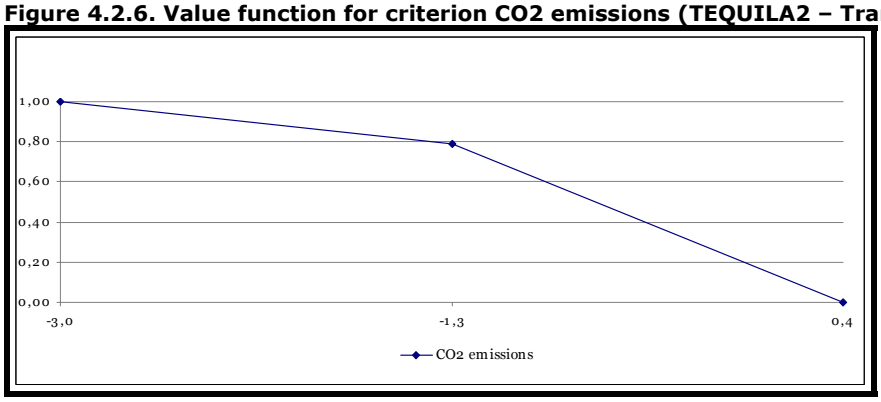
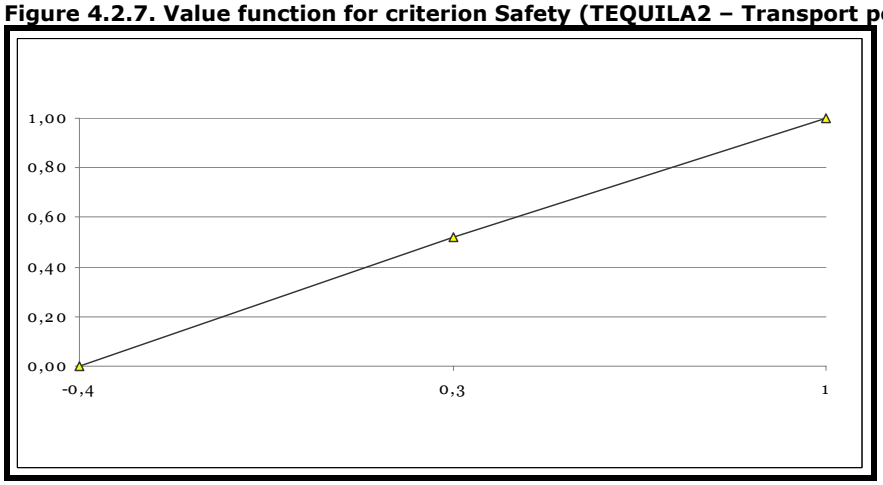
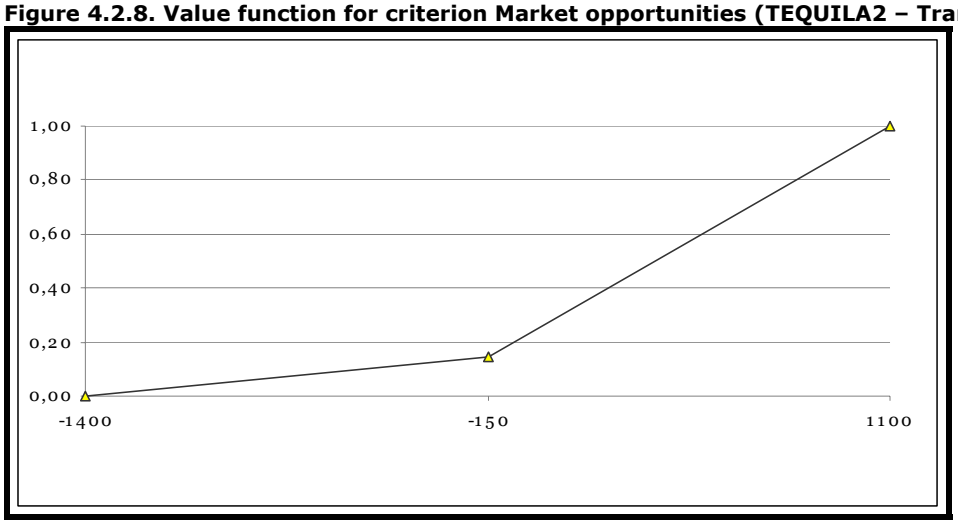


Figure 4.2.7. Value function for criterion Safety (TEQUILA2 – Transport policies)



[32] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.2.8. Value function for criterion Market opportunities (TEQUILA2 – Transport policies)



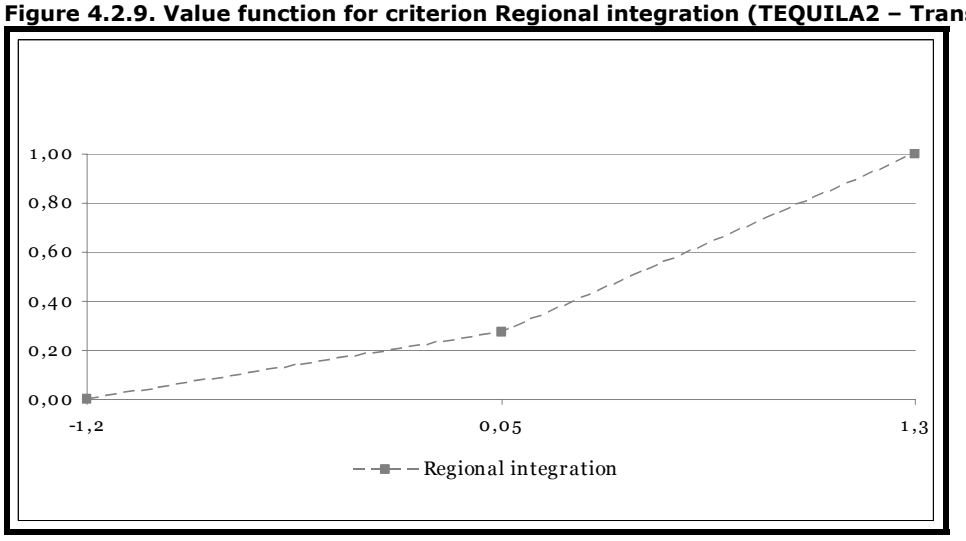
The weight values for criteria of Territorial identity indicate that Landscape fragmentation is the most important criterion of this group. Also, the criterion Creativity is placed above Cultural heritage (Table 4.2.6).

Table 4.2.6. Weight values for criteria belonging to Territorial identity (TEQUILA2 – Transport policies)

	Regional integration	Landscape fragmentation	Openness to daily visitors
Min value	0	33	33
Max value	33	67	50
Average	17	45	38
STDEV	17	13	7

The value functions[33] of the three criteria are almost linear (Figures 4.2.9 - 4.2.11).

Figure 4.2.9. Value function for criterion Regional integration (TEQUILA2 – Transport policies)



[33] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.2.10. Value function for criterion Landscape fragmentation (TEQUILA2 – Transport policies)

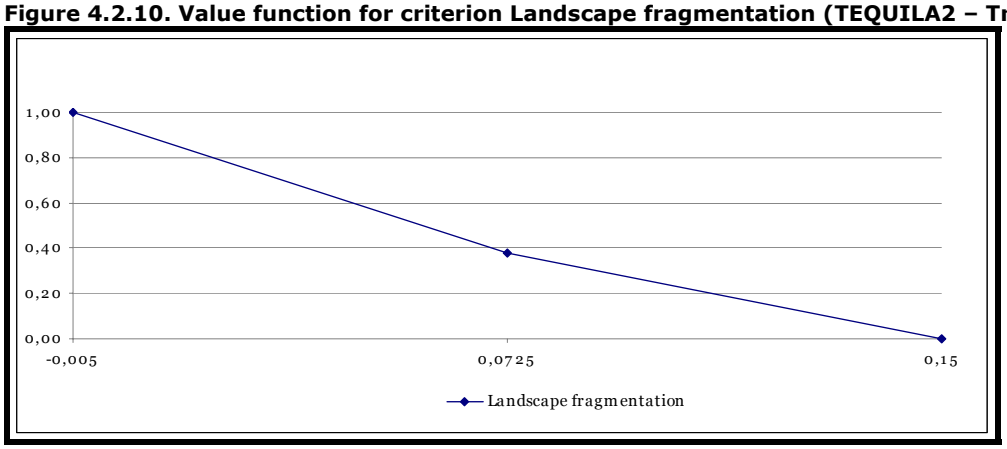
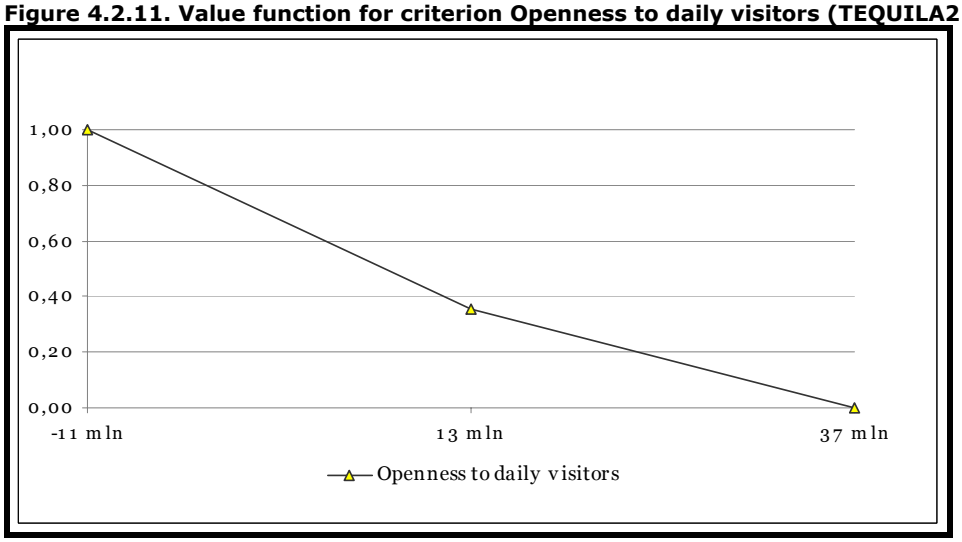


Figure 4.2.11. Value function for criterion Openness to daily visitors (TEQUILA2 – Transport policies)



These two assessment exercises produced two types of results.
The results of the first exercise allowed us to calculate the weights for the main categories of criteria included in the TEQUILA model (Table 4.2.2). The second assessment exercise produced a multi-attribute value function model for each of these main categories. These models consist of a value function and a weight value for each criterion belonging to a main category. The value functions indicate that, for most of the criteria identified, policies targeting either Territorial efficiency or Territorial quality or Territorial identity need to produce relatively large changes in criteria scores to become really effective. In fact, in most of the cases but CO2 emissions, the value functions show that only 20% (up to 50% in a few cases) of the weight assigned to an impact indicator is realised when the impact indicator is at its mean value. These weight values indicate the contribution of a single criterion to the score on one of the main categories. For example, the maximum contribution of the criterion Economic growth to Territorial efficiency is equal to 54 (Table 4.2.3, fourth column). In order to get an impression of the maximum contribution of a single criterion to the Territorial cohesion we need to multiply the weight assigned to each main category with the weight of individual criteria (Table 4.2.3, last column). One can read that the criterion Economic growth is the largest contributor to the concept of Territorial cohesion. This criterion is followed by Emissions and Congestion. Criteria belonging to Territorial identity are relatively small contributors to Territorial cohesion. The analysis shows that the experts believe that policies focussing on economic growth are considered to be the most important ones to reduce regional differences.

Exercise 3: AHP. Establishing value for Dr,c and Vr,c

The TEQUILA model takes differences between European NUTS3 regions into account when assessing the effectiveness or welfare consequences of policies by means of the desirability (Dr,c) and vulnerability (Vr,c) parameters. The experts were asked to discuss the desiderability for and vulnerability of a region for an impact on the different criteria. The exercise made use of the following regional distinctions aimed at capturing regional fragilities and potentials:

- Urbanized European NUTS3 regions VS rural European NUTS3 regions;
- Advanced European NUTS3 regions VS Developing European NUTS3 regions;
- Northern, Southern, Western and Eastern European NUTS3 regions.

The assessment exercises took the form of AHP and the experts were asked to compare regions in a pair-wise manner with regard to the desiderability of a criterion and the vulnerability of a specified region for an impact on a criterion (according to the scale in Table 4.1.2). Based on the assigned importance degree, weight values for each region indicating the desiderability of good score on a criterion or its vulnerability of that region for an impact were calculated (Table 4.2.7 and 4.2.8). Higher weight values imply a higher desirability and vulnerability of an impact.

Table 4.2.7. Desirability of impacts for specific European regions (TEQUILA2 – transport policies)

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Productivity of inland infrastructure	1,65	0,35	0,27	1,73	0,27	1,69	0,81	1,22
Productivity of airports	1,78	0,23	1,71	0,29	1,27	0,70	1,16	0,87
Economic growth	1,71	0,29	0,23	1,78	0,50	1,07	0,86	1,58
Congestion costs	1,75	0,25	1,73	0,27	1,26	0,92	1,07	0,75
Traffic passing through	0,92	1,08	0,50	1,50	1,44	1,52	0,36	0,68
Emissions	1,67	0,33	0,83	1,17	1,38	1,11	0,58	0,94
Safety	1,75	0,25	0,43	1,57	1,31	1,27	0,56	0,86
Market opportunities	0,93	1,07	0,83	1,17	1,42	1,00	0,36	1,22
Landscape fragmentation	1,08	0,92	1,00	1,00	0,73	1,14	1,70	0,43
Exposure to external visitors	0,69	1,31	0,53	1,47	1,16	1,02	1,03	0,79
Regional integration	1,08	0,92	0,72	1,28	0,98	0,58	1,14	1,31

Table 4.2.8. Vulnerability of impacts for specific European regions (TEQUILA2 – transport policies)

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Productivity of inland infrastructure	0,50	1,50	0,50	1,50	1,25	0,38	1,24	1,12
Productivity of airports	1,17	0,83	1,17	0,83	1,75	0,38	0,75	1,12
Economic growth	0,50	1,50	0,50	1,50	0,89	0,64	0,36	2,11
Congestion costs	1,17	0,83	1,17	0,83	1,67	0,38	0,82	1,12
Traffic passing through	0,50	1,50	0,50	1,50	1,25	0,38	1,24	1,12
Emissions	0,46	1,54	0,43	1,57	0,78	1,03	0,55	1,63
Safety	1,21	0,79	0,58	1,42	0,76	0,55	0,51	2,18
Market opportunities	0,43	1,57	0,50	1,50	0,80	0,57	0,36	2,27
Landscape fragmentation	0,81	1,19	0,72	1,28	0,94	1,05	0,58	1,43
Exposure to external visitors	0,36	1,64	0,28	1,72	0,98	0,98	0,55	1,50
Regional integration	0,75	1,25	0,97	1,03	0,76	0,82	0,90	1,52

Except for Traffic passing through, Market opportunities and Exposure to external visitors, impacts on the selected criteria are more desirable for urbanized European NUTS3 regions than for regions which can be marked as rural (Table 4.2.7). Increase in Productivity of airports and reductions of congestion costs are relatively more desirable for advanced than for developing regions. Policies impacting on the other

indicators are, conversely, more desirable for developing European regions. In general, impacts on Territorial Quality and Territorial Identity are more desirable for developing NUTS3 regions.
Measures influencing Territorial efficiency are more desirable for Eastern European NUTS3 regions more than others (Table 4.2.7). Also, measures aimed at improving Territorial quality seem to be more appropriate for Northern European regions. Finally, measures impacting on Territorial Identity seem more desirable for Western regions.
Especially urbanized regions are vulnerable to impacts on Congestions costs, Productivity of airports and Safety. Also, the experts indicated that, except for congestion and productivity of airports, developing regions are more vulnerable to impacts on the various criteria. Easter regions are the most vulnerable on several indicators but Productivity of inland infrastructure and airports, and Traffic passing through.
In conclusion, the expert knowledge gathered allowed us to specify the components of the current version of the TEQUILA model in more detail. The results obtained allow us to adjust the weight values for the main categories of TEQUILA criteria. In fact, more emphasis should be put on Territorial efficiency and some less on Territorial Quality and to Territorial identity. Also, economic growth should be considered the most important criterion when designing policies which focus on territorial cohesion (Table 4.2.3).
Furthermore, the application of holistic scaling resulted in a more detailed specification of the value functions for the various criteria. Most assumptions with regard to the functional form of the value functions do hold. Most of the value functions for the various criteria are confirmed to take the linear form.
AHP has been successfully applied to obtain weight values reflecting the desiderability for and the vulnerability of a region for a specific impact. The weight values obtained have been used in TEQUILA 2 model to adjust impacts on criteria for different types of regions, as described in section 2.1 (point 6).

4.3. Programme and results of the third expert meeting

The third expert meeting was aimed at assessing the parameters of TEQUILA 2 for CAP. The meeting was organised and held at University of Newcastle upon Tyne, Newcastle, on 12 May 2009.
Twelve experts in the domain of CAP and rural development from University of Newcastle participated to the third meeting (see Annex 1 for the full list). These experts have been invited because of their different areas of scientific specialisation, both thematic and geographical, in the field of agricultural economics (for instance, newly accessed countries or developing countries). They were introduced to the ESPON TIPTAP project and to the TEQUILA-model, its functioning and its current specification by Prof. dr. Camagni. The respondents were given the opportunity to familiarize themselves with the model.
Next, the participants were introduced to the main objectives and activities of the meeting. The criteria included in the model and their score range were discussed in more detail. Also, what kind of input was expected from the experts during the meeting was explained. In the remainder of this section we will discuss the three exercises conducted and the results produced.
The indicators included in TEQUILA 2 for CAP are detailed in Table 4.3.1 below[34].

[34] Impacts of CAP have been assessed across the following four dimensions (as stated in the Inception Report):

Table 4.3.1. Impact criteria in territorial impact assessment – CAP policy

Macro-criteria		Criteria
Territorial Efficiency (TE)	PIM_E1	**Economic growth**
	PIM_E2	**Unemployment**
	PIM_E3	**Tourism diversification**
Territorial Quality (TQ)	PIM_Q1	**Environmental quality**
	PIM_Q2	**Community viability**
	PIM_Q3	**Emissions**
	PIM_Q4	**Risk of soil erosion**
Territorial Identity (TI)	PIM_I1	**Landscape diversity**
	PIM_I2	**Community identity**
	PIM_I3	**Heritage products**

Exercise 1: AHP. Establishing the weight values for Territorial efficiency, Territorial quality and Territorial identity.
The first assessment exercise was relatively easy and short. The exercise was setup to allow the participant to familiarize themselves with the assessment exercises and the questionnaires used. Also, what kind of input was expected from the experts during the meeting was explained.

During the exercise the participants were asked to compare Territorial efficiency, Territorial quality and Territorial identity in a pair-wise manner. The indicators included in TEQUILA 2 for CAP and their definition and measurement is detailed in Table 1 below.
The experts had to indicate which of the criteria is more important, according to the scale reported in Table 4.1.2.

The results of the first exercise are the weight values for Territorial efficiency, Territorial quality and Territorial identity, calculated on the basis of the results of the pair-wise comparisons and by means of AHP (Table 4.3.2).

- farm impacts (i.e. indicators on Territorial efficiency, namely Economic Growth, Unemployment and Tourism diversification);
- environmental impacts (i.e. indicators on Territorial quality, namely Environmental quality and Emissions);
- landscape impacts (i.e. indicators Risk of soil erosion in Territorial quality and Landscape diversity in Territorial identity); and
- society/culture (i.e. indicators Community viability in Territorial quality and Community identity and Heritage products in Territorial identity).

Table 4.3.2. Experts' weight values for Territorial efficiency, Territorial quality, Territorial identity (TEQUILA2 – CAP policy)

	Territorial efficiency	Territorial quality	Territorial identity
Expert 1	74	20	5
Expert 2	73	22	5
Expert 3	78	9	13
Expert 4	60	28	12
Expert 5	68	25	6
Expert 6	57	29	14
Expert 7	60	20	20
Expert 8	23	70	7
Expert 9	60	20	20
Expert 10	63	11	26
Expert 11	17	77	6
Expert 12	61	30	9
Min	17	9	5
Max	78	77	26
average	**58**	**30**	**12**

The results suggest that the majority of respondents deems Territorial efficiency the most important category of criteria or effects which policies should be aimed at in order to improve territorial cohesion (Table 4.3.2).

Exercise 2: Holistic scaling. Establishing value functions and weights for sub-criteria.
For each of the main categories Territorial efficiency, Territorial quality and Territorial identity a so-called multi-attribute value function model was developed on the basis of the associated three sub-criteria and weights values.
As explained in the previous section, the strategy used is holistic scaling. The participants were asked to state their preferences over 16 fictitious policy alternatives and to assign a value between 0 and 10 to the alternatives while taking into account the scores on the complete set of criteria. In each of these 16 fictitious alternatives, each criterion can take on the minimum or the maximum or an intermediate score (e.g. the first sub-criterion takes on the maximum value, the second the minimum and the third the minimum too).
The exercise was structured as follows. First an introduction was given to the main objectives of the exercise as well as the questionnaire used. Furthermore, the various criteria were described as well as the associated score ranges. During the choice experiment, the experts are given descriptions of the fictitious alternatives and were asked to rate these, while taking all criteria scores into consideration[35].
The exercise produced three multi-attribute value function models containing value functions and weights, one for Territorial efficiency, one for Territorial quality and one for Territorial identity. These three models were next integrated into one model by means of the weight values obtained during the first exercise (Table 4.3.3).

[35] In other words, each fictitious policy alternative is associated to a combination of the possible scores of each sub-criterion (within each main criterion). Experts were asked to assess these fictitious alternatives, while taking all criteria scores into consideration.

Table 4.3.3. Weight values of macro-criteria and criteria (TEQUILA2 – CAP policy) – Experts judgements

Macro-criteria	Weight main category	Criteria	Contribution of criterion to main category	Standardised weight
Terrirorial efficiency	58	**Economic growth**	21	12
		Unemployment	34	20
		Tourism diversification	45	26
Terrirorial quality	30	**Environmental quality**	38	12
		Community viability	8	2
		Emissions	1	0
		Risk of soil erosion	52	16
		Landscape diversity	19	2
Terrirorial identity	12	**Community identity**	49	6
		Heritage products	32	4

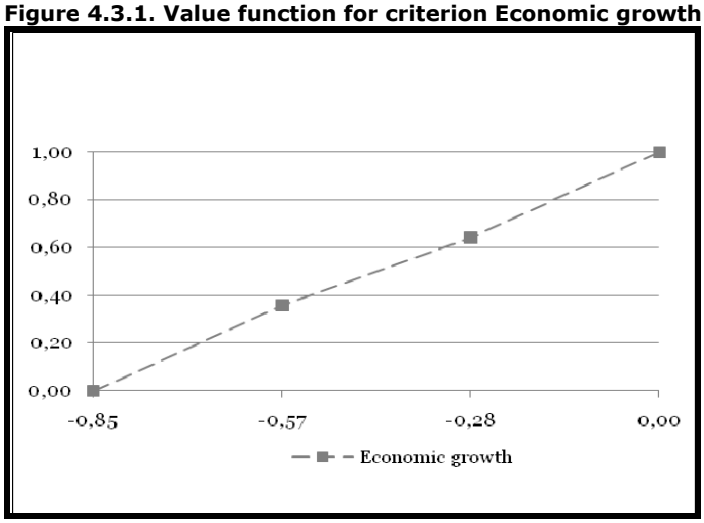
The model contains three sub-criteria for Territorial Efficiency namely, Internal connectivity, External accessibility and Economic growth. Especially the criterion Tourism diversificaton received a relatively large weight value (0,45): the majority of experts signalled that measures supporting efforts of tourism diversification should form the main ingredient of policies focusing on territorial efficiency and cohesion (Table 4.3.4).

Table 4.3.4. Weight values for criteria belonging to Territorial efficiency (TEQUILA2 – CAP policy)

	Economic growth	Unemployment	Tourism diversification
Min value	0	0	0
Max value	100	98	99
Average	21	34	45
STDEV	29	29	29

The value functions[36] for the three attributes transform a score on the respective criteria into a value between 0 and 1 (see Figures 4.3.1-4.3.3).
Figures 4.3.1 to 4.3.3 also show that the value functions are linear (economic growth) but also take more complex functional forms (Unemployment and Tourism diversification).

Figure 4.3.1. Value function for criterion Economic growth (TEQUILA2 – CAP policy)



[36] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.3.2. Value function for criterion Unemployment (TEQUILA2 – CAP policy)

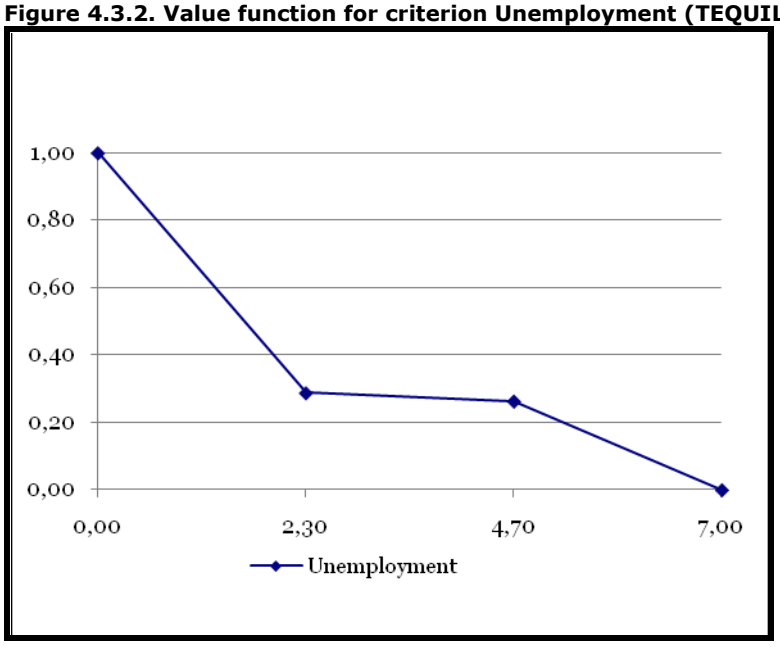
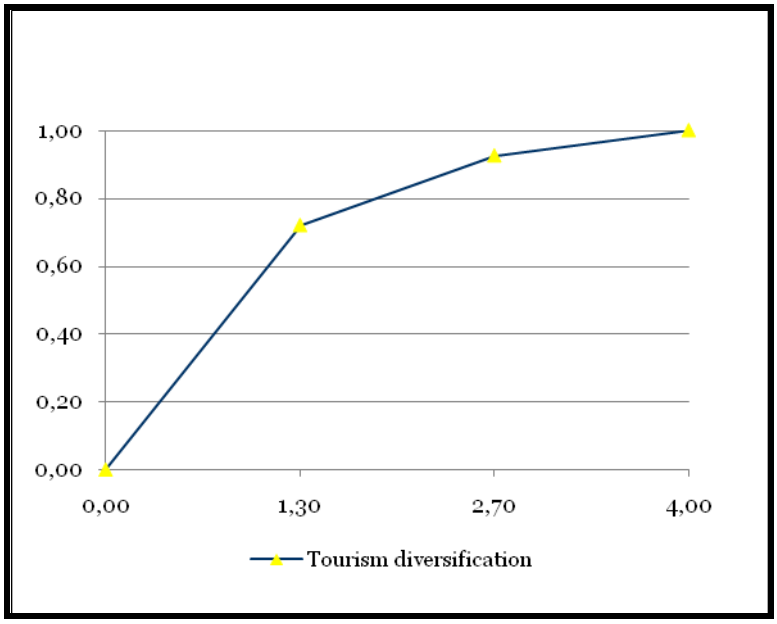


Figure 4.3.3. Value function for criterion Tourism diversification (TEQUILA2 – CAP policy)



The experts gave little weight value to the criterion Community viability (8) and even less to Emissions (1). Differently, the criterion Risk of soil erosion was given the largest weight value (52) (Table 4.3.5).

Table 4.3.5. Weight values for sub-criteria belonging to criterion Territorial quality (TEQUILA2 – CAP policy)

	Environmental quality	Community viability	Emissions	Risk of soil erosion
Min value	00	00	00	00
Max value	99	37	04	100
Average	38	08	01	52
STDEV	39	14	01	42

None of the value functions[37] for Territorial Quality indicator has a linear form (Figure 4.3.4 to 4.3.7.

Figure 4.3.4. Value function for criterion Environmental quality (TEQUILA2 – CAP policy)

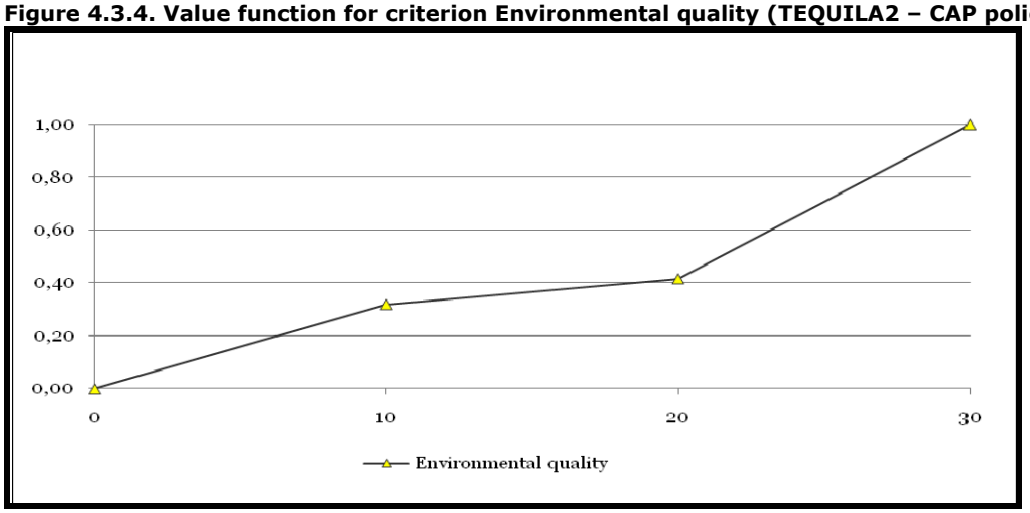


Figure 4.3.5. Value function for criterion Community viability (TEQUILA 2 – CAP)

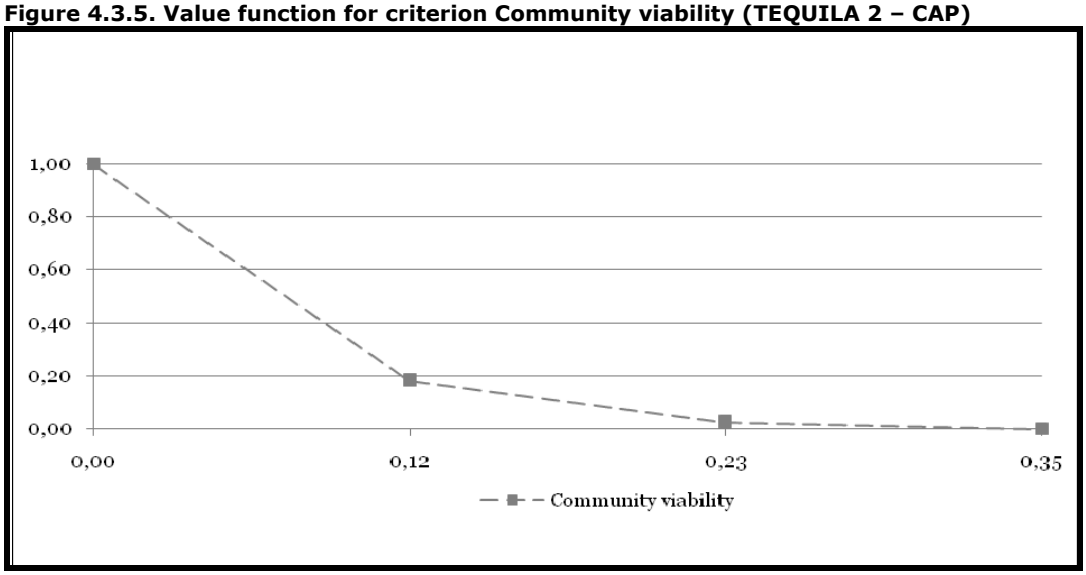
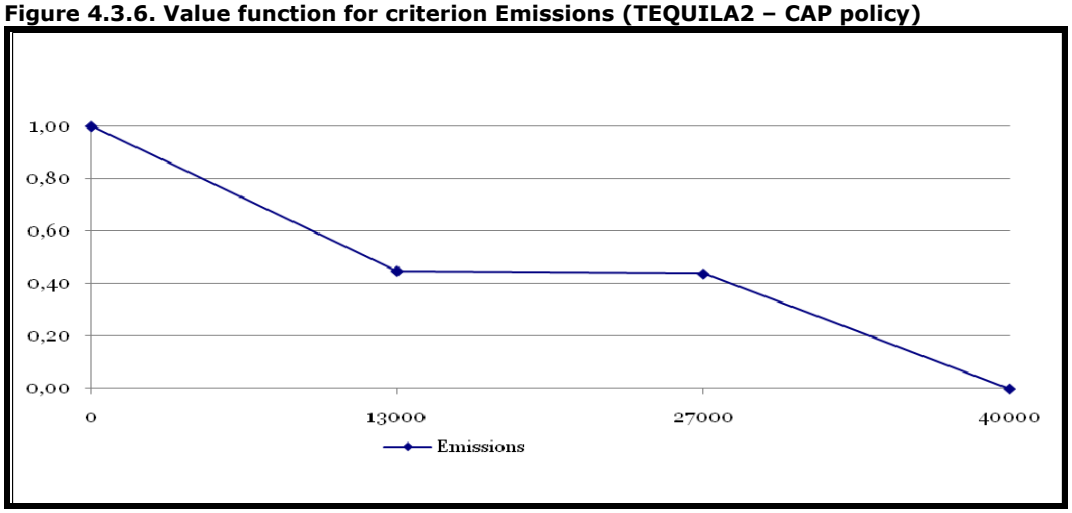
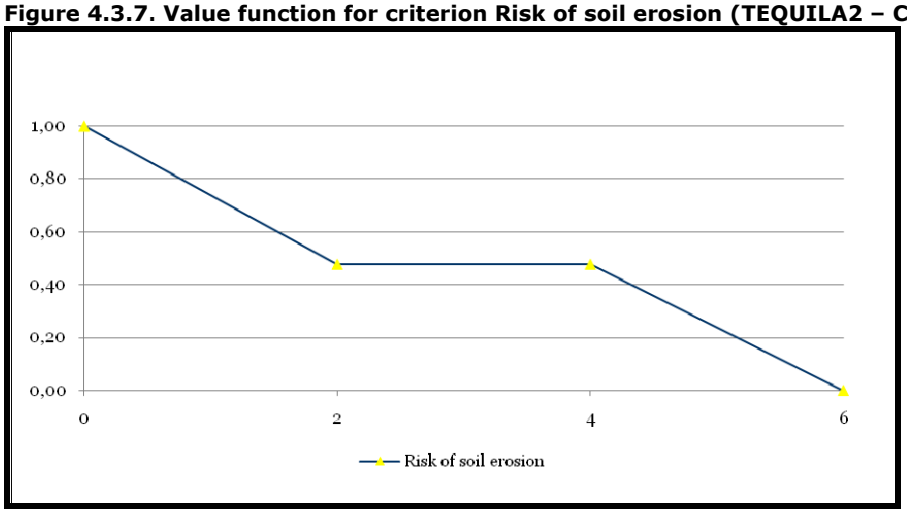


Figure 4.3.6. Value function for criterion Emissions (TEQUILA2 – CAP policy)



[37] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.3.7. Value function for criterion Risk of soil erosion (TEQUILA2 – CAP policy)



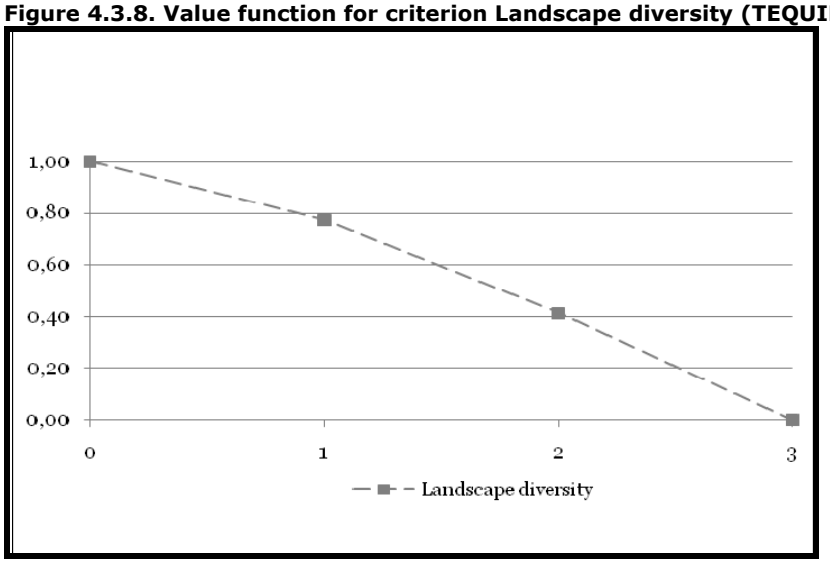
The weight values for criteria of Territorial identity indicate that Community identity is the most important criterion of this group. Also, the criterion Heritage products is placed above Landscape diversity (Table 4.3.6).

Table 4.3.6. Weight values for criteria belonging to Territorial identity (TEQUILA2 – CAP policy)

	Landscape diversity	Community identity	Heritage products
Min value	0	0	0
Max value	100	100	100
Average	19	49	32
STDEV	28	38	36

The value functions[38] of the three criteria are almost linear (Figures 4.3.8 - 4.3.10).

Figure 4.3.8. Value function for criterion Landscape diversity (TEQUILA2 – CAP policy)



[38] For interpretation of value function, please see the examples provided in section 4.1.

Figure 4.3.9. Value function for criterion Community identity (TEQUILA2 – CAP policy)

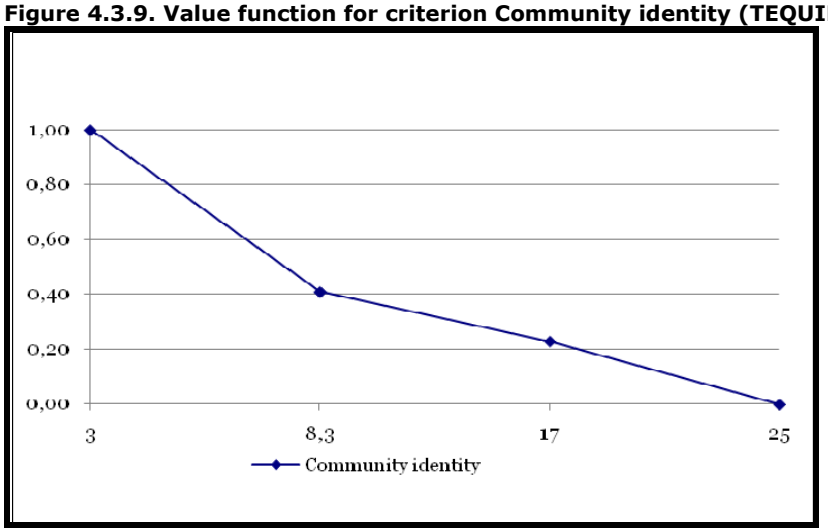
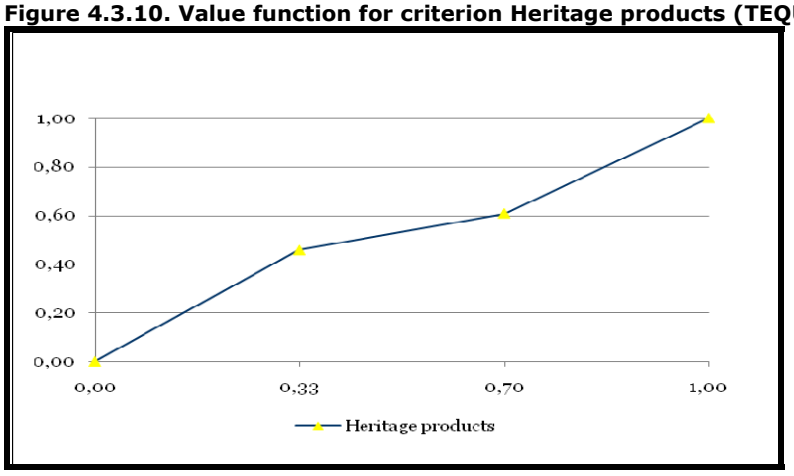


Figure 4.3.10. Value function for criterion Heritage products (TEQUILA2 – CAP policy)



These two assessment exercises produced two types of results.
The results of the first exercise allowed us to calculate the weights for the main categories of criteria included in the TEQUILA model (Table 4.3.2). The second assessment exercise produced a multi-attribute value function model for each of these main categories. These models consist of a value function and a weight value for each criterion belonging to a main category. These weight values indicate the contribution of a single criterion to the score on one of the main categories. For example, the maximum contribution of the criterion Tourism diversification to Territorial efficiency is equal to 45 (Table 4.3.3, fourth column). In order to get an impression of the maximum contribution of a single criterion to the Territorial cohesion we need to multiply the weight assigned to each main category with the weight of individual criteria (Table 4.3.3, last column). One can read that the criterion Tourism diversification is the largest contributor to the concept of Territorial cohesion. This criterion is followed by Unemployment, Risk of soil erosion and Economic growth. Criteria belonging to Territorial identity are relatively small contributors to Territorial cohesion. The analysis shows that the experts believe that policies supporting tourism diversification are considered to be the most important ones to reduce regional differences.

Exercise 3: AHP. Establishing value for Dr,c and Vr,c
The TEQUILA model takes differences between European NUTS3 regions into account when assessing the effectiveness or welfare consequences of policies by means of the

desirability (Dr,c) and vulnerability (Vr,c) parameters. The experts were asked to discuss the desiderability for and vulnerability of a region for an impact on the different criteria. The exercise made use of the following regional distinctions aimed at capturing regional fragilities and potentials:

- Urbanized European NUTS3 regions VS rural European NUTS3 regions;
- Advanced European NUTS3 regions VS Developing European NUTS3 regions;
- Northern, Southern, Western and Eastern European NUTS3 regions.

The assessment exercises took the form of AHP and the experts were asked to compare regions in a pair-wise manner with regard to the desiderability of a criterion and the vulnerability of a specified region for an impact on a criterion (according to the scale in Table 4.1.2). Based on the assigned importance degree, weight values for each region indicating the desiderability of good score on a criterion or its vulnerability of that region for an impact were calculated (Table 4.3.7 and 4.3.8). Higher weight values imply a higher desirability and vulnerability of an impact.

Table 4.3.7. Desirability of impacts for specific European regions (TEQUILA2 – CAP policy)

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Economic growth	0,97	1,03	0,46	1,54	0,82	1,05	0,55	1,58
Unemployment	1,10	0,90	0,35	1,65	1,53	0,98	0,44	1,05
Tourism diversification	0,95	1,05	0,45	1,55	1,28	0,98	0,88	0,86
Environmental quality	1,00	1,00	1,31	0,69	0,75	0,98	0,93	1,34
Community viability	0,50	1,50	0,75	1,25	0,60	1,15	1,06	1,18
Emissions	1,13	0,88	1,04	0,96	0,74	0,66	1,34	1,26
Risk of soil erosion	0,41	1,59	0,48	1,52	0,72	2,03	0,64	0,61
Landscape diversity	0,78	1,22	0,88	1,13	1,34	0,83	1,27	0,56
Community identity	0,26	1,74	0,71	1,29	1,09	1,35	0,78	0,78
Heritage products	0,48	1,52	1,20	0,80	0,74	1,39	1,28	0,58

Table 4.3.8. Vulnerability of impacts for specific European regions (TEQUILA2 – CAP policy)

	Urban	Rural	Advanced	Developing	Northern	Southern	Western	Eastern
Economic growth	0,93	1,07	0,59	1,41	0,64	0,84	0,78	1,75
Unemployment	1,00	1,00	0,58	1,42	0,82	0,78	0,56	1,85
Tourism diversification	0,65	1,35	1,00	1,00	0,66	1,08	0,86	1,39
Environmental quality	0,93	1,08	0,83	1,17	0,54	1,04	1,20	1,23
Community viability	0,61	1,39	0,65	1,35	0,55	1,53	0,52	1,40
Emissions	1,13	0,88	1,00	1,00	0,62	0,71	1,09	1,58
Risk of soil erosion	0,23	1,78	0,43	1,58	0,48	1,76	0,78	0,98
Landscape diversity	0,50	1,50	1,00	1,00	0,66	1,10	1,01	1,23
Community identity	0,48	1,52	0,83	1,17	0,54	1,43	1,14	0,90
Heritage products	0,96	1,04	0,63	1,38	0,50	1,43	1,07	1,00

Except for Unemployment and Emissions, policies impacting on the other selected criteria are more desirable for rural European NUTS2 regions than for regions which can be marked as urban (Table 4.3.7). Environmental quality, Heritage products and Emissions are relatively more desirable for advanced than for developing regions.

Measures influencing Territorial efficiency will affect Northern and Eastern European NUTS2 regions more than others (Table 4.3.7). Also, measures aimed at improving Territorial quality and Territorial Identity seem to be more desirable for Western European regions than for the others. Overall, however, the differences between regions are small on most sub-criteria.

Finally, especially rural regions are vulnerable to impacts on most criteria but Emissions (Table 4.3.8). Also, the experts indicated that developing regions are more

vulnerable to impacts on the various criteria. Eastern regions are more vulnerable to impacts on Territorial efficiency and territorial quality, whereas Southern regions are more vulnerable to impacts on Territorial identity.
In conclusion, the expert knowledge gathered allowed us to specify the components of the current version of the TEQUILA model in more detail. The results obtained allow us to adjust the weight values for the main categories of TEQUILA criteria. In fact, more emphasis should be put on Territorial efficiency and Territorial Quality and less be given to Territorial identity. Also, Tourism diversification should be considered the most important criterion when designing policies which focus on territorial cohesion (Table 4.3.3).
Furthermore, the application of holistic scaling resulted in a more detailed specification of the value functions for the various criteria. In several cases, value functions take a more complex form than the linear one.
AHP has been successfully applied to obtain weight values reflecting the desiderability for and the vulnerability of a region for a specific impact. The weight values obtained can be used in the current TEQUILA model to adjust impacts on criteria for different types of regions, as described in section 2.1 (point 6).

5. RESULTS AND MAPS

5.1. CAP Policy

5.1.1. Calculating impacts on single dimensions / criteria

Impacts on single criteria may be analysed separately, giving answer to a series of general questions: a) which impact on the economy? b) Which impact on society? c) Which impacts on environment? d) Which impacts on climate change? e) Which impacts on landscape and territorial identity?

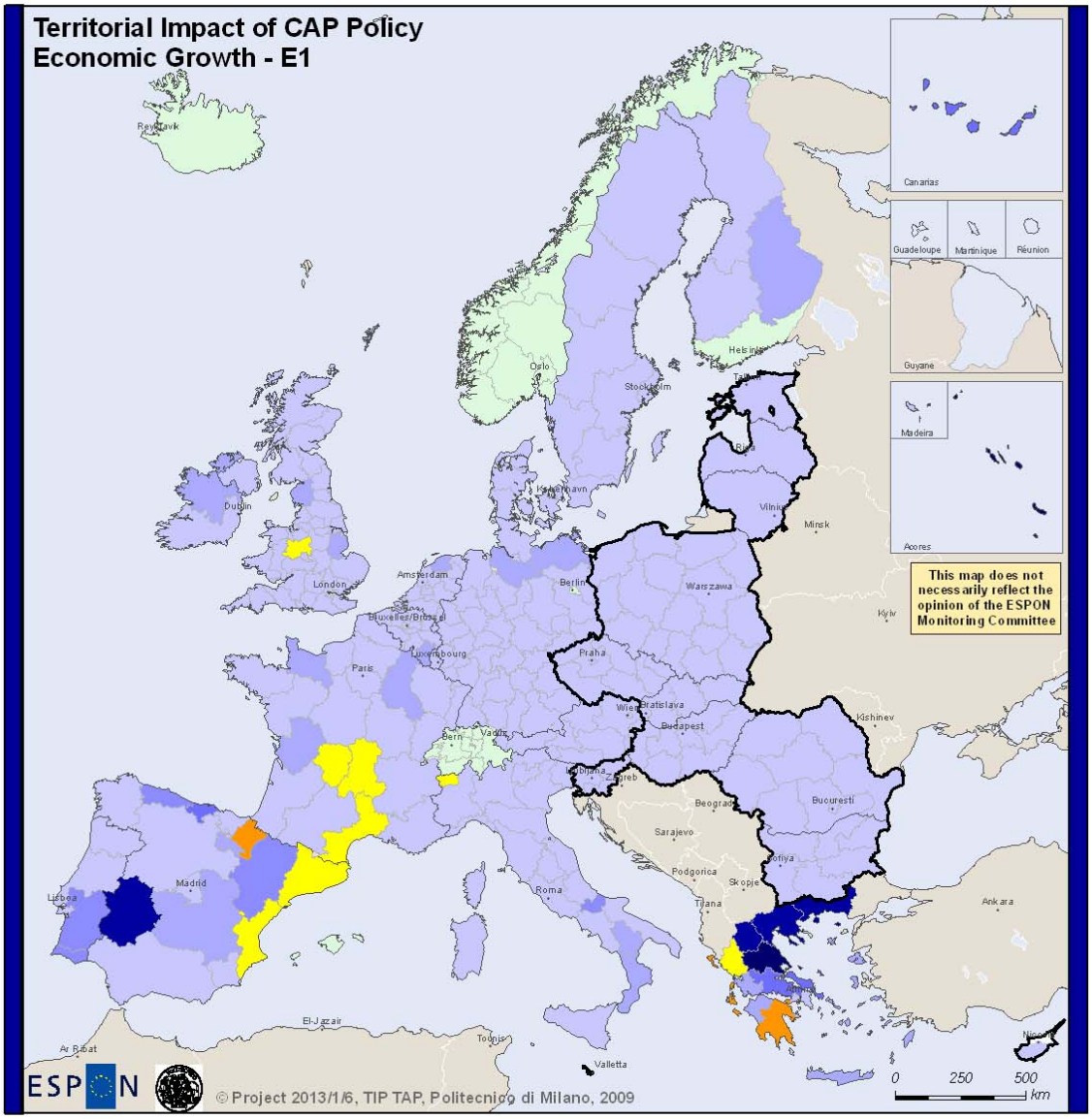
Possible impacts on competitiveness are not inspected, as competitiveness does not represent any explicit goal of CAP in the present scenario.
In the maps, the border EU15-EU12 is emphasized, due to the difference in the scenario conditions in the two areas (1/4 modulation in EU15; ½ modulation in EU12).

5.1.1.a. Impacts on economy

The scenario that was hypothesized, concerning an unbalanced modulation out from Pillar 1 to Pillar 2 implies generally a reduction in income an regional GDP. As shown in Map 5.1.1.1., (E1), most countries both in the western and in the eastern part of the EU, suffer from a slight reduction in GDP, ranging around 0,4% and 0,2% respectively of their GDP per capita (see PIM-E1 values in Annex). This reduction is more severe, or more severely felt, in some lagging regions as northern Greece and Estremadura, but also in some southern Italian regions, in Aragon and Sterea Ellada. On the other hand, some regions succeed in taking advantage of modulation, thanks to their ability in engaging in agri-environment schemes: Languedoc-Roussillon, Auvergne and Limousin in France, Cataluña, Navarra and Comunidad Valenciana in Spain, Ipeiros and Peloponnisos in Greece, Valle d'Aosta in Italy, West Midlands in United Kingdom.

A second impact indicator concerning the economic structure refers to capability of tourism diversification (Map 5.1.1.2., E3). Here impacts are mainly positive, and the strongest conditions are found in Algarve, some Spanish regions along the Pyrenees, Auvergne and Franche-Comtée in France, Trentino-Alto Adige, Friuli, Marche, Abruzzo and Calabria in Italy, in many regions along the Baltic Sea in Germany, Poland and Latvia and in many internal regions in New Member countries like southern Poland, Czech Republic, Slovakia and Romania. Eastern Countries regions on the Black and the Adriatic seas could also benefit strongly from such diversification in economic activities.

Map 5.1.1.1.



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Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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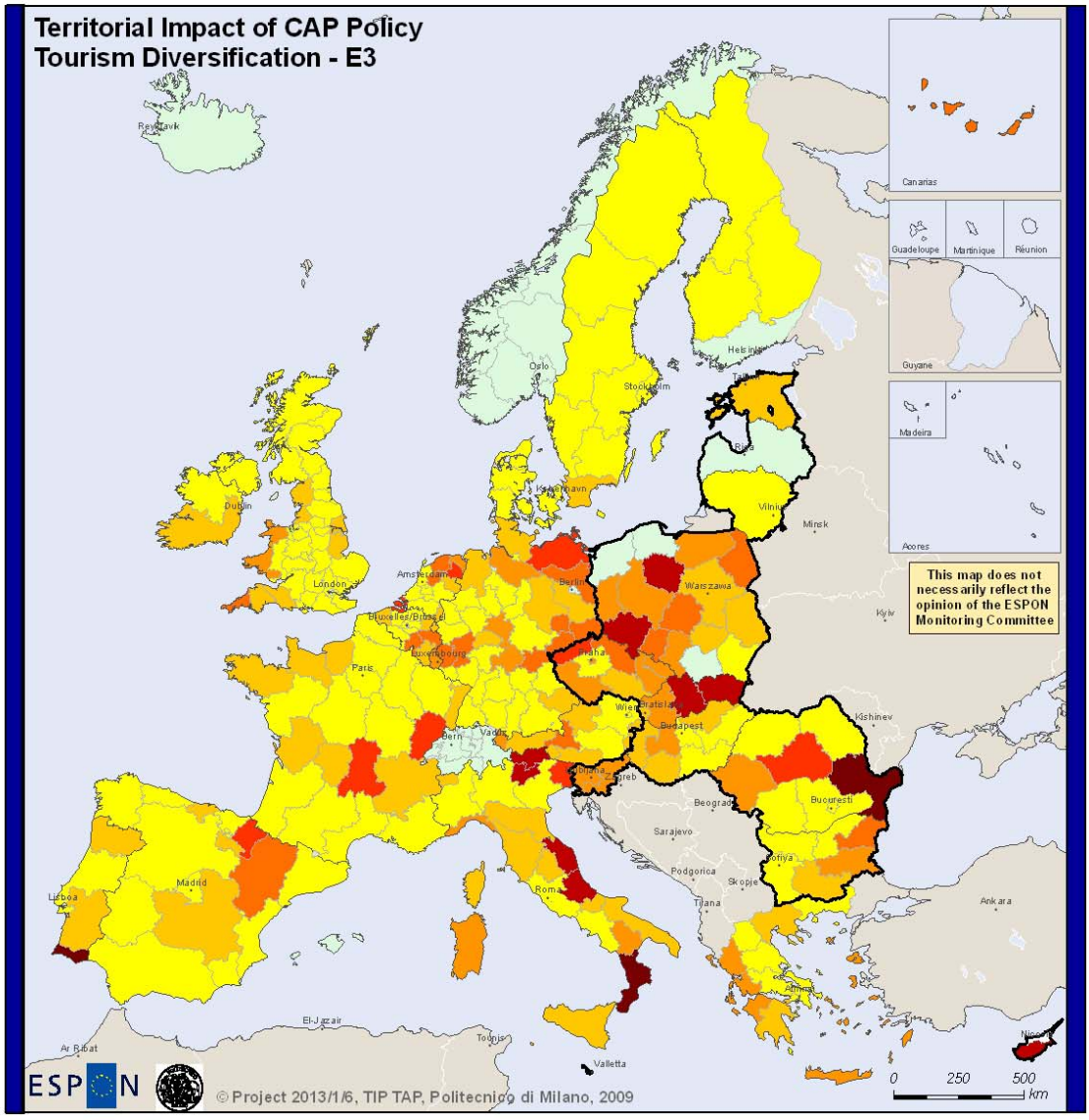
Legend

- New Member States
- NA
- -0.66 - -0.56
- -0.55 - -0.47
- -0.46 - -0.37
- -0.36 - -0.28
- -0.27 - -0.19
- -0.18 - -0.09
- -0.08 - 0.00
- 0.01 - 0.09
- 0.10 - 0.19

Map 5.1.1.2.


Territorial Impact of CAP Policy
Tourism Diversification - E3
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
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ESPON
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0 250 500 km
EUROPEAN UNION
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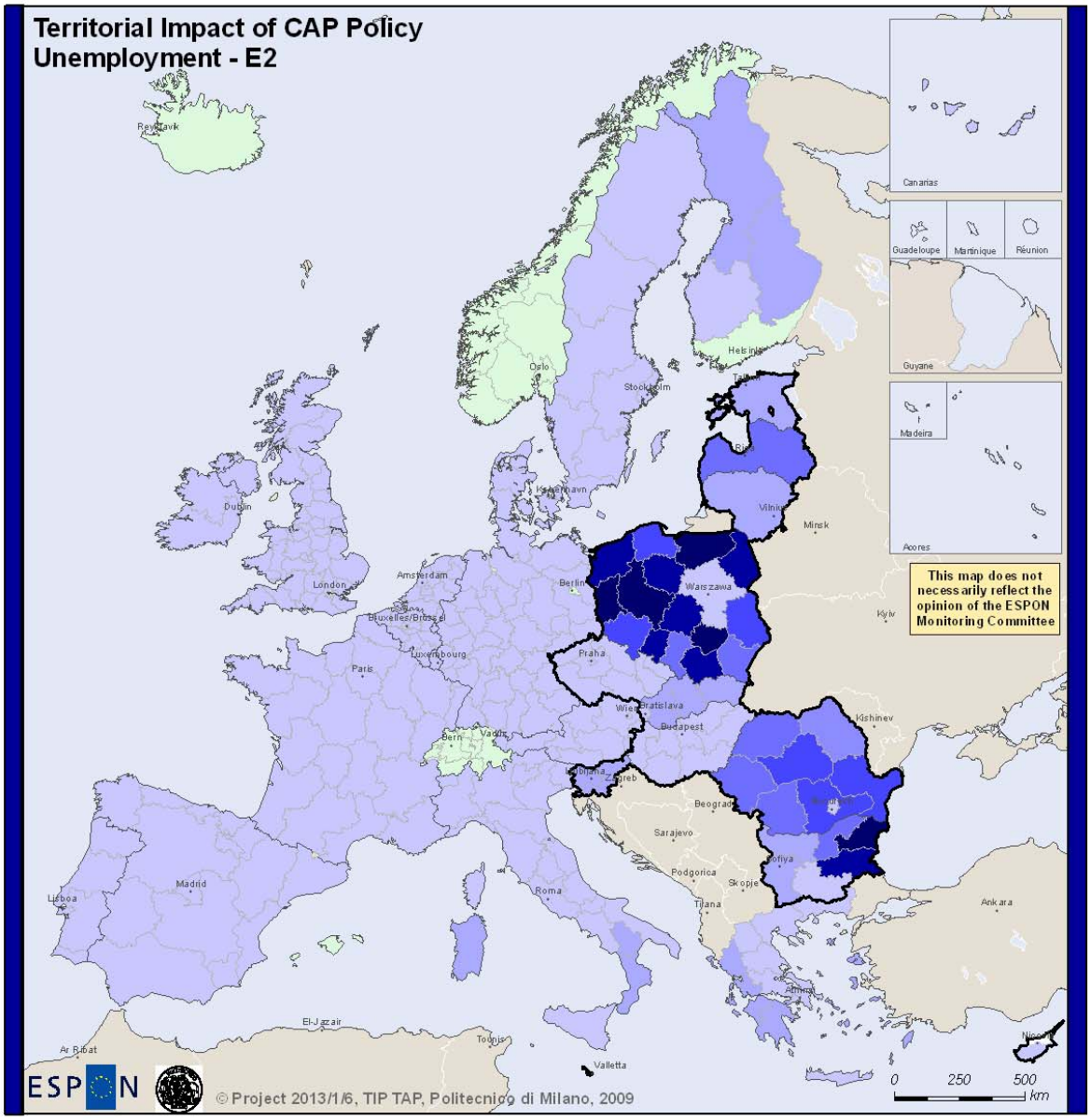
INVESTING IN YOUR FUTURE
Legend
New Member States
NA
0.00 - 0.38
0.39 - 0.75
0.76 - 1.13
1.14 - 1.51
1.52 - 1.89
1.90 - 2.26
2.27 - 2.64
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
©EuroGeographics Association for administrative boundaries

5.1.1.b. Impacts on society

The first and most important impact on society refers to unemployment (Map, 5.1.1.3., E2). In this case, as in impacts on GDP, the effects are in all cases negative, but eastern countries would suffer most – even if modulation in their case is less severe in terms of cut in public resources. Poland will suffer in almost all regions, with the exception of the Warsaw region, but also many regions in Slovakia, Romania and Bulgaria. In all these cases the huge impact derives from many concomitant elements: the high share of employment in agriculture, high present unemployment rate, high priority of employment goals and high vulnerability to unemployment.

A second impact indicator is "community viability", an indicator of social deprivation (Map, 5.1.1.4., Q2). In this case, negative impacts will be felt in a number of scattered areas, both in the east and in the west. Too small farm size, ageing population and high share of agri-employment make these regions sensitive to changes in EU support: the northern belt in Spain, Algarve, Marche, Abruzzo and Calabria in Italy (but also more productive regions like Trentino-Alto Adige and Friuli, where a tradition of cooperation in fruit and wine production may help overcoming difficulties); in eastern countries Estonia, Latvia, many regions in Poland and, to a lesser extent Czech Republic and Slovakia.

Map 5.1.1.3.


Territorial Impact of CAP Policy
Unemployment - E2
Reykjavik
Oslo
Stockholm
Helsinki
Tallinn
Riga
Vilnius
Minsk
Dublin
København
London
Amsterdam
Berlin
Warszawa
Bruxelles/Brussel
Luxembourg
Paris
Praha
Kyiv
Wien
Bratislava
Budapest
Kishinev
Bern
Vaduz
Ljubljana
Zagreb
Beograd
Sarajevo
Podgorica
Skopje
Tirana
Madrid
Lisboa
Roma
Ankara
El-Jazair
Tunis
Ar Ribat
Valletta
Nicosia
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
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0 250 500 km
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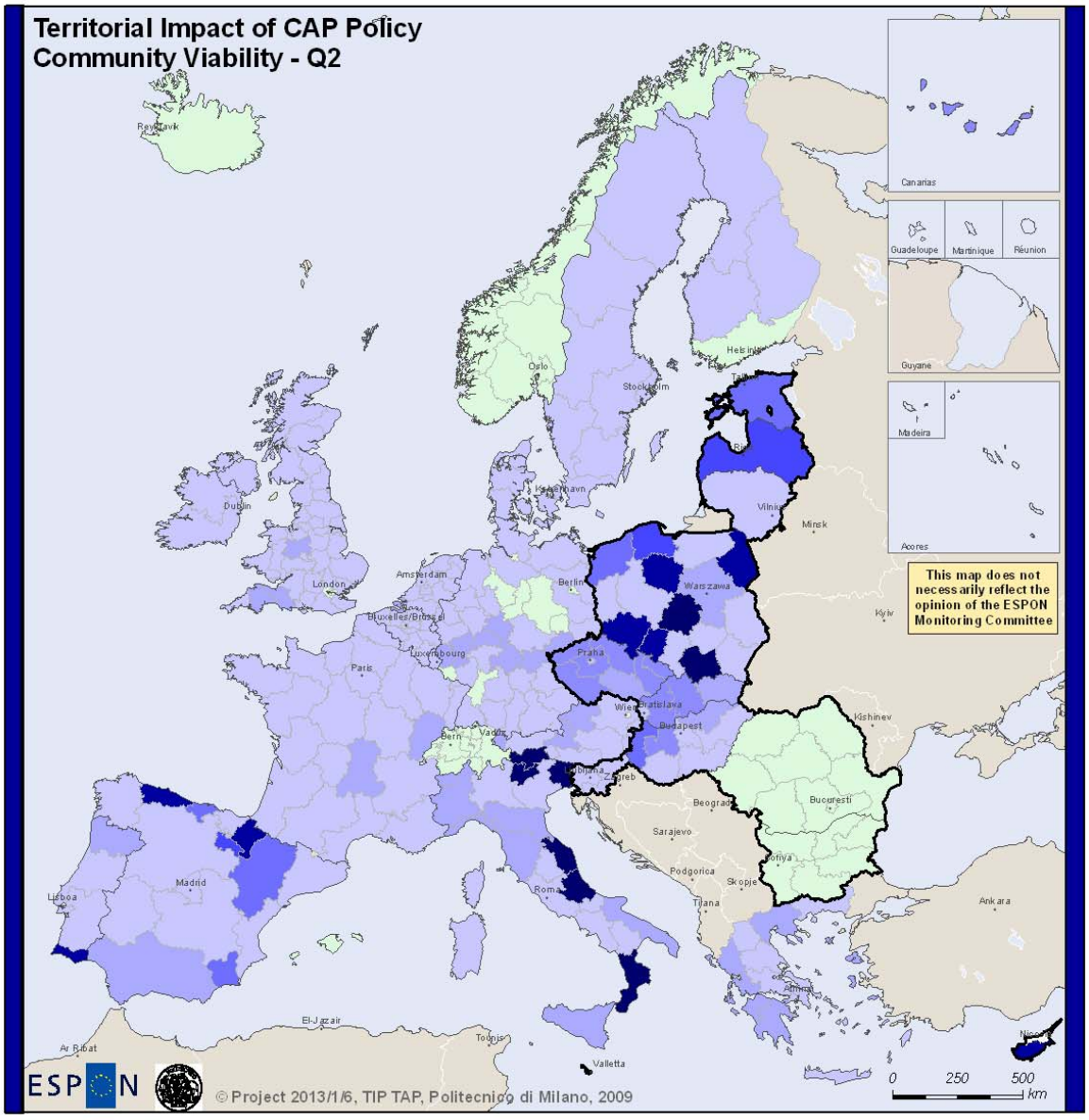
INVESTING IN YOUR FUTURE
Legend
New Member States
NA
-3.60 - -3.08
-3.07 - -2.57
-2.56 - -2.06
-2.05 - -1.54
-1.53 - -1.03
-1.02 - -0.51
-0.50 - 0.00
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries

Map 5.1.1.4.



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Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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Legend

- New Member States
- NA
- -5.65 - -4.84
- -4.83 - -4.04
- -4.03 - -3.23
- -3.22 - -2.42
- -2.41 - -1.61
- -1.60 - -0.81
- -0.80 - 0.00

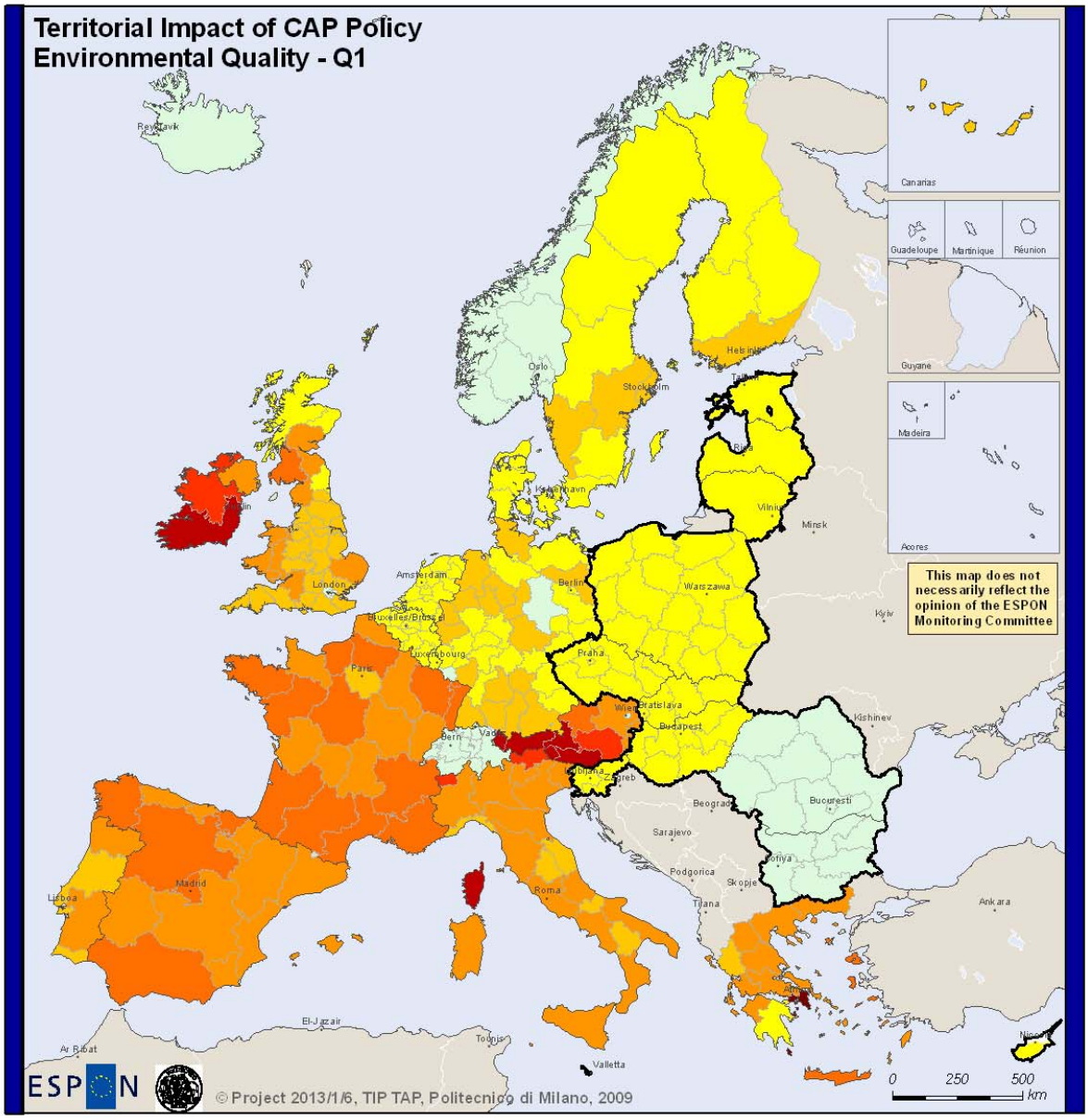
5.1.1.c. Impacts on environment

The main goal of modulation residing in enhancing environmental content of agricultural management, not surprisingly we find positive environmental impacts in all EU regions (Map 5.1.1.5., Q1). Positive outcomes are mainly visible in southern and western European regions, with strong country effects due to the national management of funds allocation among axes of Pillar 2. Most important impacts are forecasted in Southern Ireland, southern and western Austria and Attiki, but very good performances are shown by mainly all regions in Spain, France, UK, Italy and Greece. The lowest impacts are visible on New Member Countries.
A more targeted indicator is represented by impacts on risks of soil erosion (Map 5.1.1.6., Q4). In this case, the most important negative impacts are shown in southern Europe: Thessaly and Kentriki Makedonia in Greece, Calabria, Marche, Friuli and Abruzzo in Italy, Algarve in Portugal, as a consequence of risk of abandonment of agricultural land and present soil erosion risk.

5.1.1.d. Impacts on climate change

As far as impacts on climate change are concerned, a direct indicator is represented by livestock emissions (Q3). Regions mainly concerned regard Dutch and to a lesser extent Danish regions. In all other cases, impacts are negative but of a lower intensity.

Map 5.1.1.5.



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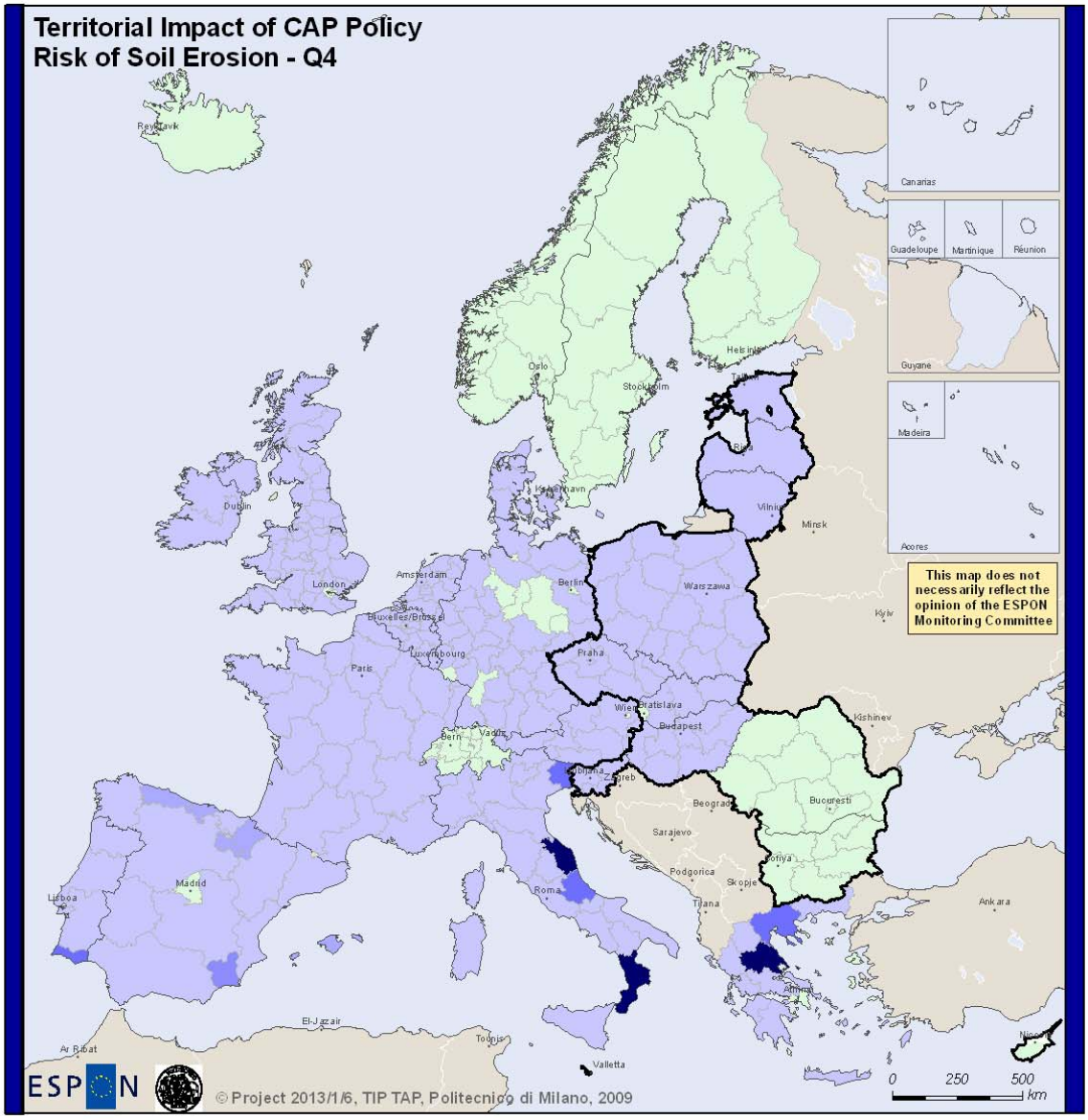
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation

Legend

- New Member States
- NA
- 0.00 - 0.12
- 0.13 - 0.24
- 0.25 - 0.37
- 0.38 - 0.49
- 0.50 - 0.61
- 0.62 - 0.73
- 0.74 - 0.86

Map 5.1.1.6


Territorial Impact of CAP Policy
Risk of Soil Erosion - Q4
Reykjavik
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
Helsinki
Oslo
Stockholm
Riga
Vilnius
Minsk
Dublin
Kobenhavn
London
Amsterdam
Berlin
Warszawa
Bruxelles/Brussel
Luxembourg
Paris
Praha
Kyiv
Wien
Bratislava
Budapest
Kishinev
Bern
Zagreb
Beograd
Bucuresti
Sarajevo
Sofiya
Podgorica
Skopje
Tirana
Madrid
Lisboa
Roma
Ankara
Athinai
El-Jazair
Ar Rabat
Tunis
Valletta
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ESPON
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0
250
500
km
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INVESTING IN YOUR FUTURE
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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Legend
New Member States
NA
-22.70 - -19.46
-19.45 - -16.22
-16.21 - -12.97
-12.96 - -9.73
-9.72 - -6.49
-6.48 - -3.24
-3.23 - 0.00

5.1.1.e. Impacts on landscape and territorial identity

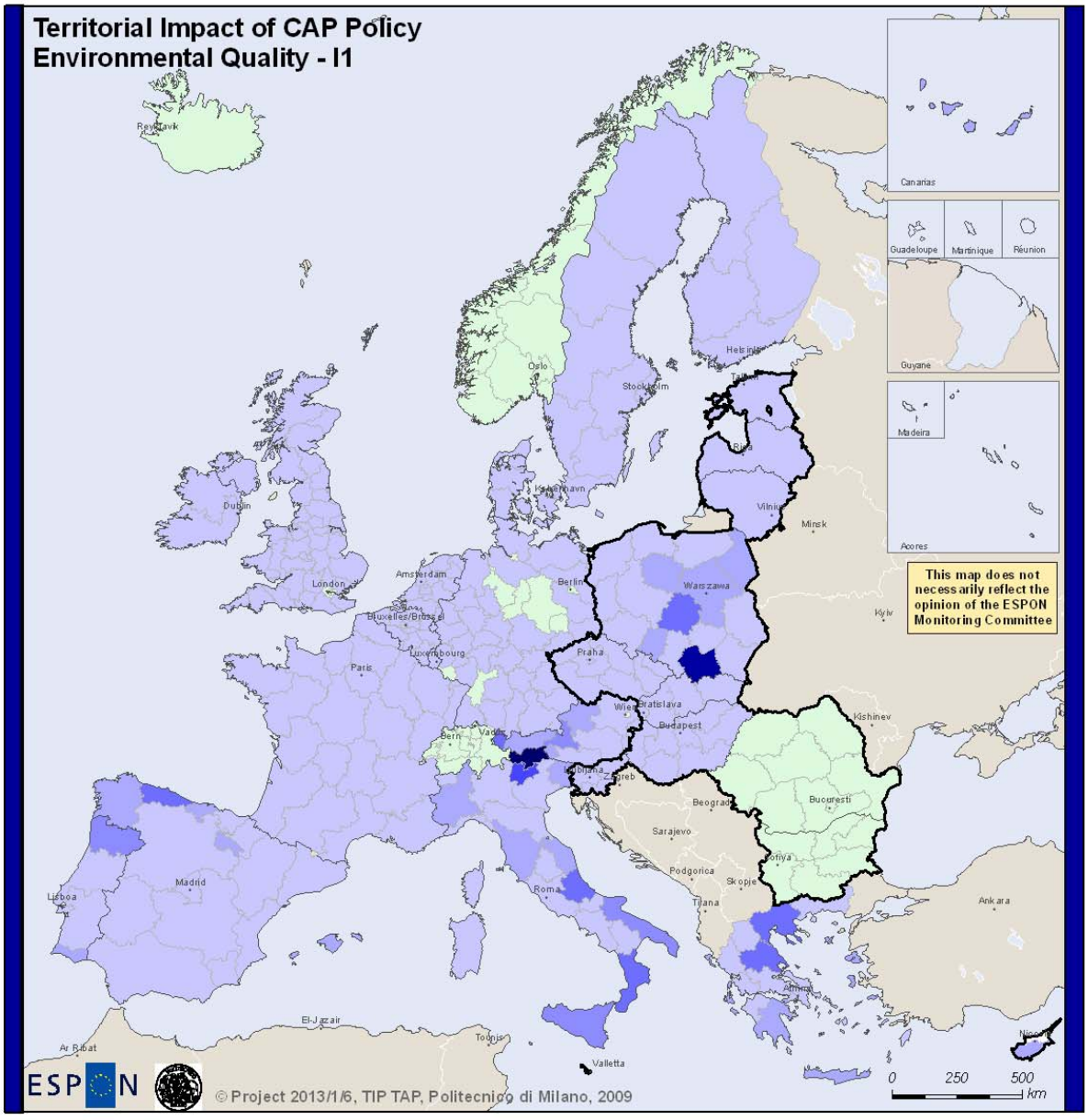
In this case three indicators are available. First of all, landscape diversity (Map, 5.1.1.7., I1), which shows negative impacts especially in the cases of: northern regions in the Iberian peninsula (Cantabria, Asturias, Galicia, Norte of Portugal), but also, to a lesser extent southern ones (Algarve, Andalucia, Murcia), in the central and southern Adriatic coast in Italy, plus Calabria and Sicily, in Thessaly and Kentriki Makedonia in Greece, in many regions in south-eastern and central Poland.

The second indicator refers to community identity, jeopardised by risk of outmigration (Map 5.1.1.8., I2): here regions at risk are almost all those mentioned with regard to the previous indicator, but also Aragon and Navarra in Spain, Cyprus, Estonia and Latvia, almost all regions in eastern Germany, the region of Malmö and many internal regions in Poland, Slovakia and Romania.

The third indicator refers to the possibility of enhanced development of heritage products (I3). In this case availability of data is not assured in all countries. Interesting cases appear, nevertheless: all regions on the western coast of Greece and the Aegean islands show strong and positive impacts; the same happens in Norte and Algarve in Portugal, in central and eastern Slovakia, in a north-south eastern belt in Germany, in some regions like Cornwall, Wales, South East and the region of Edinburgh in Britain, a south-eastern belt in France, from Alsace to Provence-Alpes-Côte d'Azur plus Haute Normandie in France.

In synthesis, our methodology apparently supplies convincing results – interesting when they are confirmations of more or less known conditions and even more interesting when they are counterintuitive, but likely results - in the analysis in case, in spite of the difficulties coming from lack of data, territorial detail and absence of a precise institutional breakdown of policy interventions by regions.

Map 5.1.1.7.


Territorial Impact of CAP Policy
Environmental Quality - I1
Reykjavik
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Açores
Oslo
Helsinki
Stockholm
Tallinn
Riga
Vilnius
Minsk
Dublin
London
Amsterdam
Berlin
Warszawa
Bruxelles/Brussel
Luxembourg
Paris
Praha
Kyiv
Wien
Bratislava
Budapest
Kishinev
Bern
Zagreb
Beograd
Bucuresti
Sarajevo
Sofiya
Podgorica
Skopje
Tirana
Ankara
Madrid
Lisboa
Roma
Athinai
El Jazair
Ar Ribat
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Valletta
Nicosia
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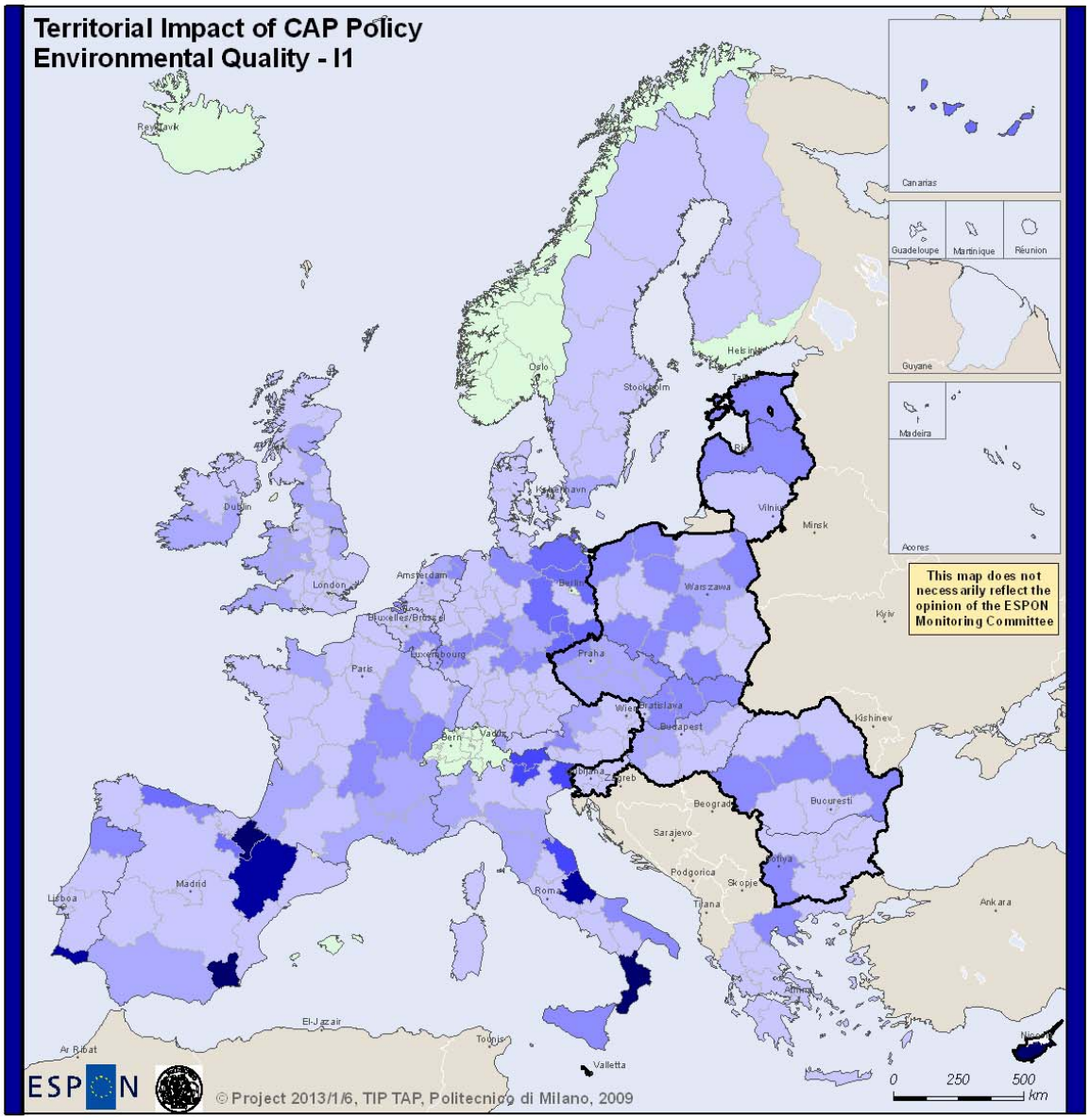
INVESTING IN YOUR FUTURE
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries
Legend
New Member States
NA
-1.73 - -1.48
-1.47 - -1.24
-1.23 - -0.99
-0.98 - -0.74
-0.73 - -0.49
-0.48 - -0.25
-0.24 - 0.00

Map 5.1.1.8.



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Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation

Legend

- New Member States
- NA
- -4.85 - -4.16
- -4.15 - -3.46
- -3.45 - -2.77
- -2.76 - -2.08
- -2.07 - -1.39
- -1.38 - -0.69
- -0.68 - 0.00

5.1.2. Calculating summative territorial impacts on regions, according to different preference systems

An appropriate confrontation and weighted mixing of the previous impact indicators supplies us with possible synthetic indicators of territorial impacts of CAP policy. Here we refer to the three macro-criteria of territorial impact, namely territorial efficiency, quality and identity, and to the summative, general territorial impact.

The weighting system, allowing the definition of the relative importance of the single impacts[39], is crucial in order to perform this operation, and a wide attention was devoted to it throughout the project. The initial weighting system employed in Tequila 1 – equal weights, taken as an initial step - was abandoned, and a new system was elaborated through:

- internal experts judgement (see the previous Table 1);
- questionnaire inquiry with policy makers and top national and regional officials.

The weighting system defined in the first way (experts) implies:

- among the three macro-criteria, territorial efficiency ranks first, with a relative weight as high as 58%, territorial quality ranks second, 30%, and territorial identity third, with only 12%
- inside territorial efficiency, a low importance of impacts on economic growth, namely 21%, a greater importance of impacts on unemployment, 34%, and the highest importance of impacts on diversification capability, 45%;
- inside territorial quality, the highest importance is assigned to environmental impacts, namely risk of soil erosion and environmental quality;
- inside territorial identity, the highest importance is assigned to community identity, the lowest to landscape diversity.

Impacts on territorial efficiency (Map 5.1.2.1, TE) show that main disadvantages will hit more peripheral, mainly rural areas: eastern countries in particular (Lithuania, almost all Polish regions with the exception of the Warsaw, Stettin and Dantzig regions, eastern Hungarian regions, almost all Romanian and Bulgarian regions with the exception of capital regions, all central and northern regions in Sweden and Finland, Castilla y Leon, Estremadura and Andalucia in Spain, Kentriki Makedonia, Thessalia and Sterea Ellada in Greece. On the other hand, the positive performance on the diversification indicator allow all central European countries, together with Britain, Italy, Czekia, Slovenia, Slovakia and western Hungary to show positive impacts. These impacts are particularly favourable to some regions: Algarve, Pais Vasco, Navarra and Aragon, Auvergne and Franche-Comté, Trentino-Alto Adige, Marche Abruzzi and Calabria, Cyprus, Latvia, an horizontal belt of German regions going from Aachen to Türingen and Dresden and a northern belt of marine regions going from Noord-Nederland to Mecklemburg (and continuing eastward in two Polish regions).

Impacts on territorial quality (Map 5.1.2.2, TQ) suffer from some lack of data concerning mainly soil erosion. Nevertheless some relevant results appear. Negative impacts show up mainly in peripheral countries, this time with the inclusion of many Italian, Portuguese and Greek regions. Also Scotland and Dutch regions belong to this

[39] And, implicitly, the compensation rate between criteria. In the case of CAP policies, no limits to single impacts are defined institutionally; therefore, the Flag model is not utilised here.

group. On the other hand, a positive, even if slightly, impact is shown by all France, southern Germany and Austria, Ireland and Northern Ireland, and central Spain.

Impacts on territorial identity (TI) is highly hit by lack of data. Nevertheless a negative impact is visible in all French regions, with the exception of Ile-de-France, Britain with the exception of Greater London area and Scotland, Austria and Czechia, with the exception once again of capital regions, Slovenia and Slovakia.

The same blank areas appear by consequence in the global territorial impact (SI), but the signs are now mainly positive. Main exceptions, with a negative sign, are almost all Greek regions, Algarve and Norte in Portugal, Lithuania and some regions in Czechia and Slovakia.

The second weighting system was prepared using a questionnaire delivered to attendants of the ESPON Prague seminar in June 2009 (42 respondents on CAP policies).

The table below provides the weighting system of different professional groups (e.g. policy makers, public officials, academics and practitioners). Interviewees were asked to provide us with their policy priorities by taking both a European and a national point of view.

Table 5.1.2.1. Preferences concerning relevance of policy goals - CAP policies

Criteria	EXPERTS	Policy makers		Public officials		Academics		Practitioners	
		EU view	National view	EU view	National view	EU view	National view	EU view	National view
TE[40]	58	45,00	42,50	49,16	46,66	39,75	36,50	39,00	39,00
TQ	30	30,00	33,75	31,31	33,81	36,75	38,00	34,00	34,00
TI	12	25,00	23,75	19,52	19,52	23,50	25,50	26,86	26,86
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
E1	21	40,00	37,50	38,18	42,92	38,82	38,53	37,14	35,00
E2	34	36,25	33,75	35,00	29,17	37,35	37,94	40,00	37,14
E3	45	23,75	28,75	26,82	28,33	23,82	23,53	22,86	27,86
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
Q1	38	33,75	32,50	40,45	41,25	34,12	34,71	32,14	35,71
Q2	8	26,25	25,00	22,27	28,33	24,71	25,88	30,00	32,86
Q3	1	23,75	23,75	18,18	15,42	23,53	20,00	22,14	17,14
Q4	53	16,25	18,75	19,09	15,00	17,65	19,41	16,43	11,43
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
I1	19	33,75	32,50	46,66	42,78	42,94	36,94	32,86	32,14
I2	49	41,25	40,00	23,03	23,61	31,47	36,65	40,00	37,14
I3	32	25,00	27,50	30,30	34,03	25,59	26,41	27,14	30,71
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

In all groups, Territorial efficiency is considered the most relevant macro criterion with reference to Territorial Cohesion goals, Territorial Quality coming second, regardless the view taken, either European or national. Nevertheless, there are some differences among the professional groups: Policy makers and Public Officials assign even a greater relevance to Territorial efficiency as compared Academics and Practitioners. On the other hand, Academics assign greater importance to Territorial quality. Territorial identity comes third as a macro-criterion, and – interestingly enough - is considered relatively more important by Policy makers, Practitioners and Academics than by Public Officials. The general ranking is consistent with the previous, experts' one (first column in Table 5.1.2.1), but the general view of all respondents to the

[40] The structure of the questionnaire was such that the interviewees were asked to assess the relative importance of TE, TQ and TI only once; the weight for the macro-criteria are thus necessarily the same for Transport policies and CAP policies.

questionnaire is much more equilibrated among the three macro-criteria, and in particular it shows more interest to the "novel" criterion of Territorial Identity (from 19% to 26% of relative importance) than the internal experts did (only 12%).
Concerning single dimension impact indicators inside Territorial efficiency, E1 ranks first in all groups, followed by E2 and E3 respectively: economic growth and unemployment are considered of greater relevance as compared to Tourism diversification. This contrasts with experts' weights that assign greater relevance to Tourism diversification as compared to Unemployment and Economic growth, which ranks last.
Concerning single dimension impact indicators inside Territorial quality, in all groups Q1 (environmental quality) ranks first, followed by Q2 (Community viability), Q3 (emissions) (but not for Officials) and Q4 (soil erosion) respectively. This sharply contrasts with, and somehow reverses, experts' weights that assign the greatest relevance to Q4 as compared to Q1 and assign very little role to Q2 and a marginal one to Q3.
Concerning single dimension impact indicators inside Territorial, I1 (landscape diversity) ranks first for the Academics and Officials groups while it ranks second in the others. The opposite occurs as far as I2 (community identity) is concerned. I3 (heritage products) ranks last for all groups, but for Officials. Again, this is partly consistent with experts' weights that assign the greatest relevance to I2, next to I3 and finally to I1.

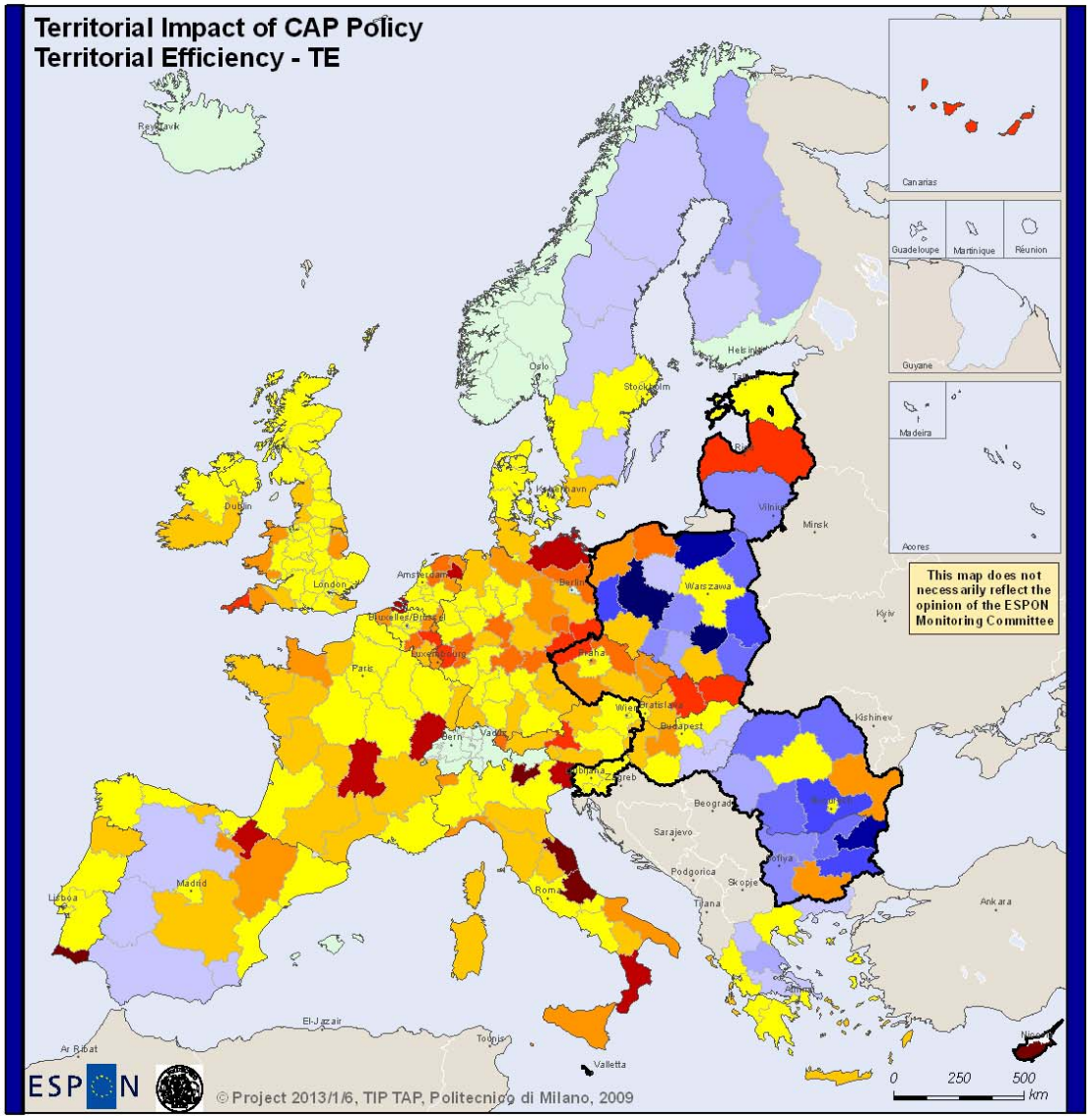
Each weighting system may give rise to different maps. In this report we assumed that the most important weighting system, alternative to the one given by internal experts, is the weighting system resulting from the preferences of policy makers, assuming a European view. Maps produced refer to this case.

The comparison between Map 5.1.2.1 and Map 5.1.2.3, which uses policy makers preference, provides a quick outlook on how different weighting systems can affect territorial impacts. Figure 5.1.2..1 captures such differences by showing the correlation between the TE impacts on each NUTS2 region in the two weighting system, namely the experts' one and the policy makers' one.

The comprehensive impact on the EU (summing impacts on all European regions) concerning the three macro-criteria are shown in the front spreadsheet of the TEQUILA2 model. presented in Figure 5.1.2.2. The weights assigned by experts are shown in the first column, while the weights assigned by policy makers are shown in the second column. The results of the four summative impacts are presented as "TIMs weighted mean", both for present run (experts' weighting) and previously saved run (policy makers' weighting): the value is aggregated for all the EU regions, but also the disaggregated values are shown in the lower part of the spreadsheet for each NUTS2 region.

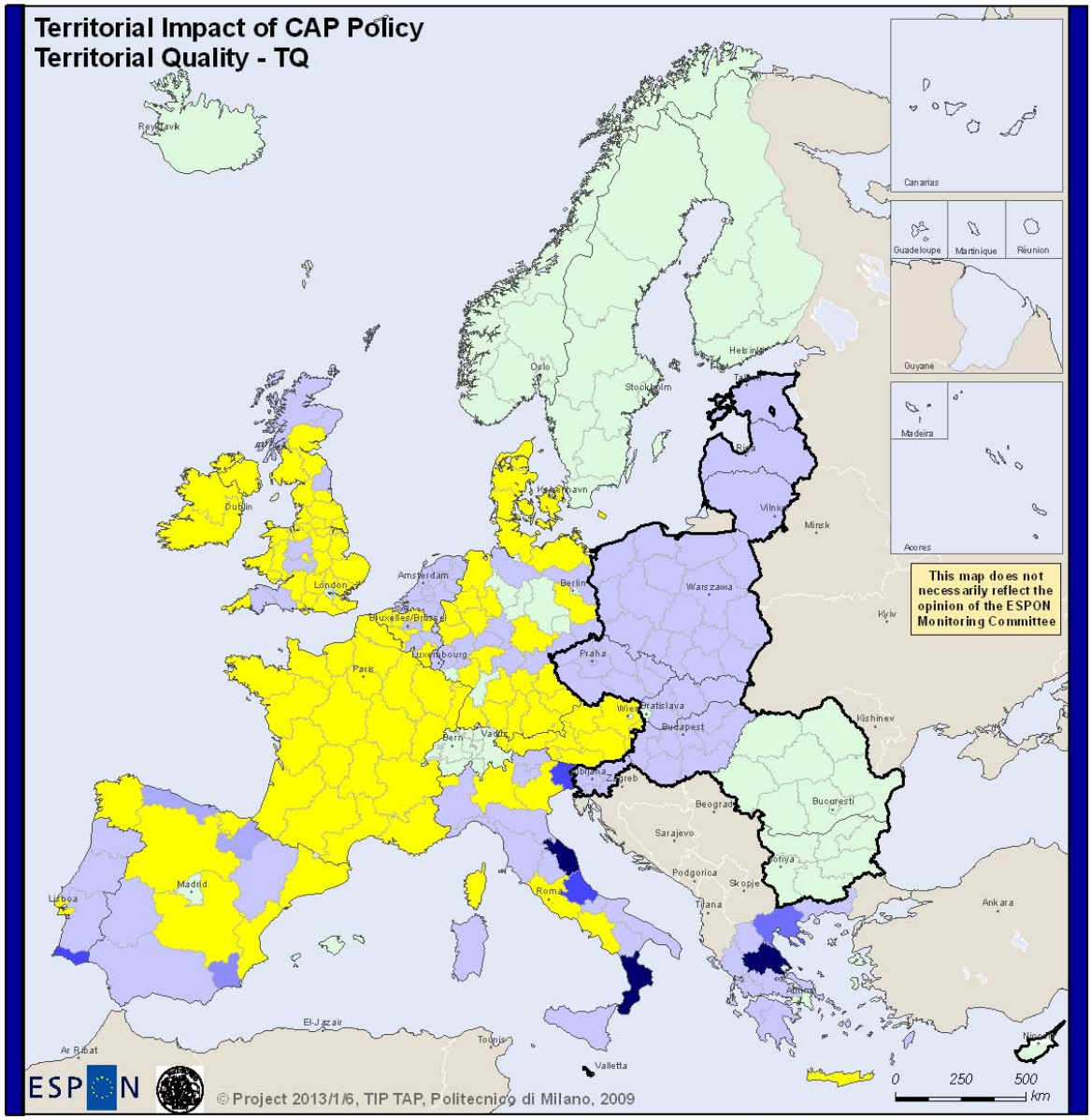
The comprehensive, aggregate European impact on each summative macro-criterion according to experts' judgement is as follows:
TE: 0,0981; TQ: -0,2996; TI: -0,2480; SI: 0,0267.
Adopting the policy makers' weighting system, the same impacts are as follows:
TE: -0,216; TQ: -0,231; TI: -0,267; SI: -0,068.
The most important changes refer to the value of impacts on Territorial Efficiency, which turns from a positive sign to a negative sign, pushing the Summative impact in

Map 5.1.2.1.

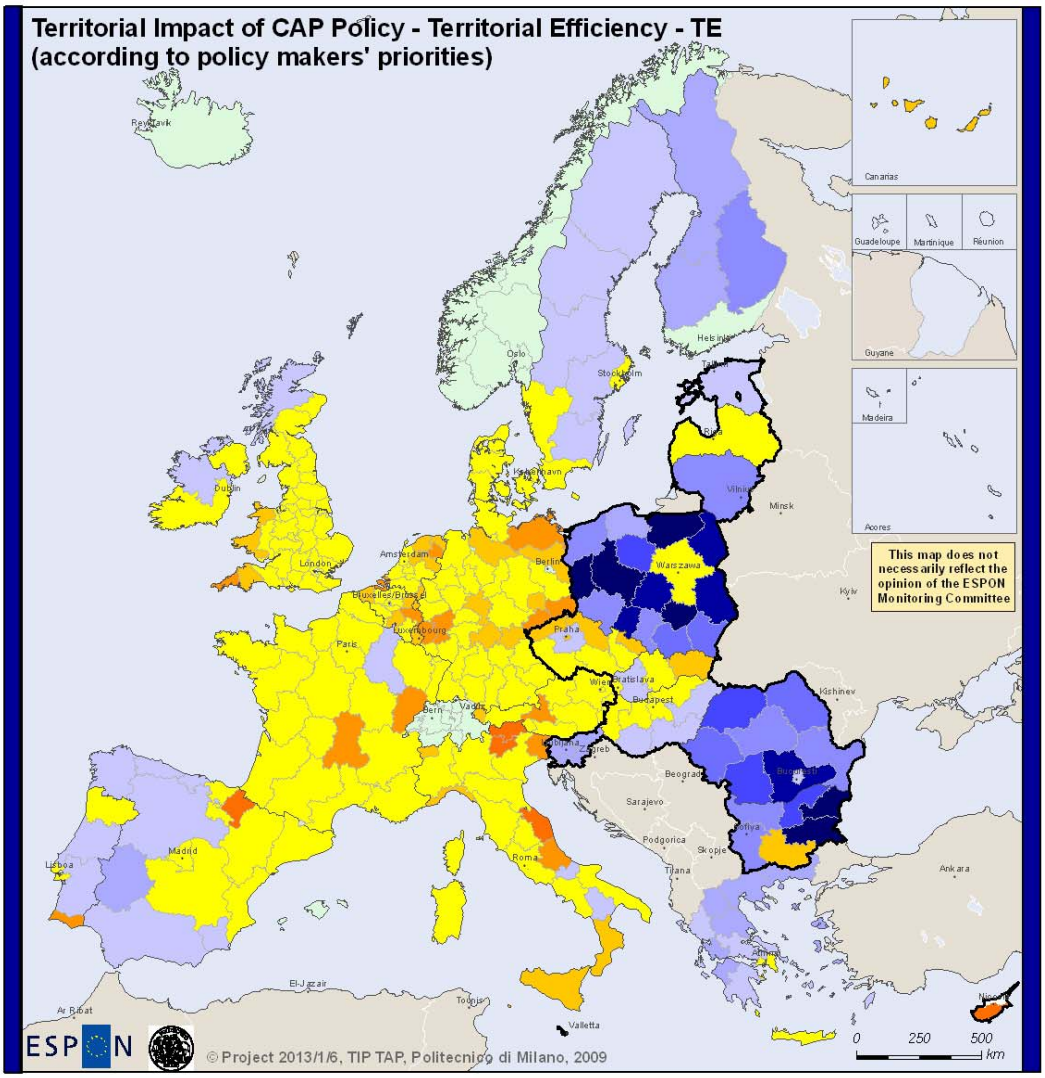


Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
©EuroGeographics Association for administrative boundaries

Map 5.1.2.2.


Territorial Impact of CAP Policy
Territorial Quality - TQ
This map does not necessarily reflect the opinion of the ESPON Monitoring Committee
ESPON
© Project 2013/1/6, TIP TAP, Politecnico di Milano, 2009
0 250 500 km
EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE
Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries
Legend
New Member States
NA
-11.92 - -10.22
-10.21 - -8.51
-8.50 - -6.81
-6.80 - -5.11
-5.10 - -3.41
-3.40 - -1.70
-1.69 - 0.00
0.01 - 1.70

Map 5.1.2.3



Regional level: NUTS2 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries

Figure 5.1.2.1. Correlation between impacts on Territorial efficiency in two weighting systems (experts' and policy makers')

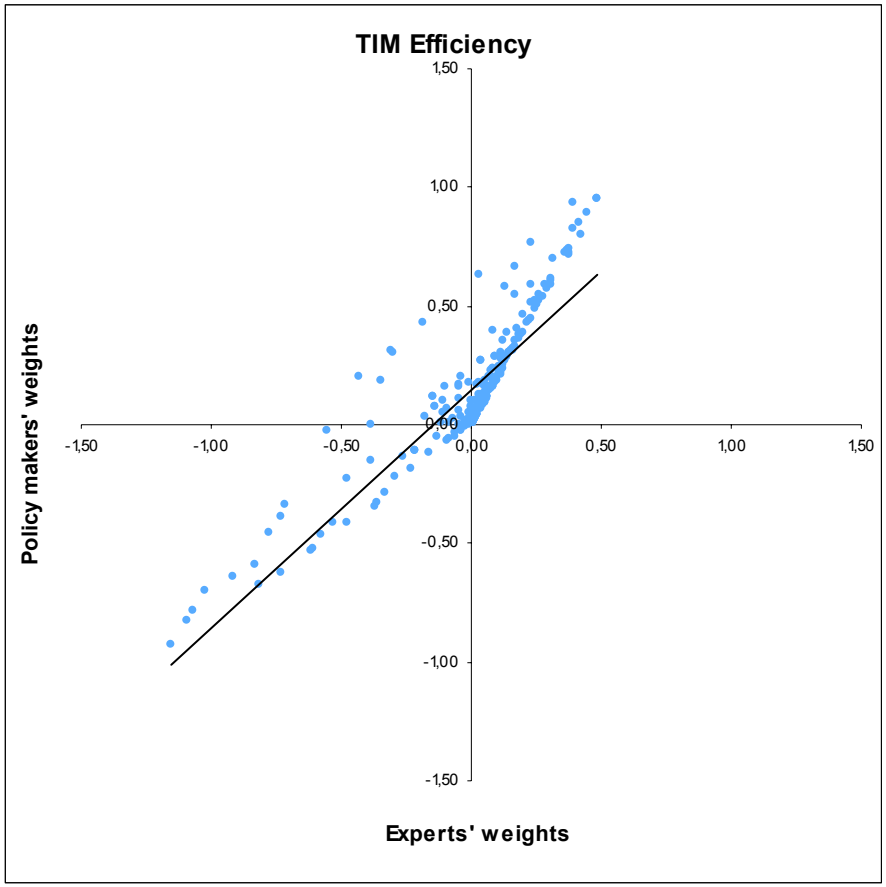
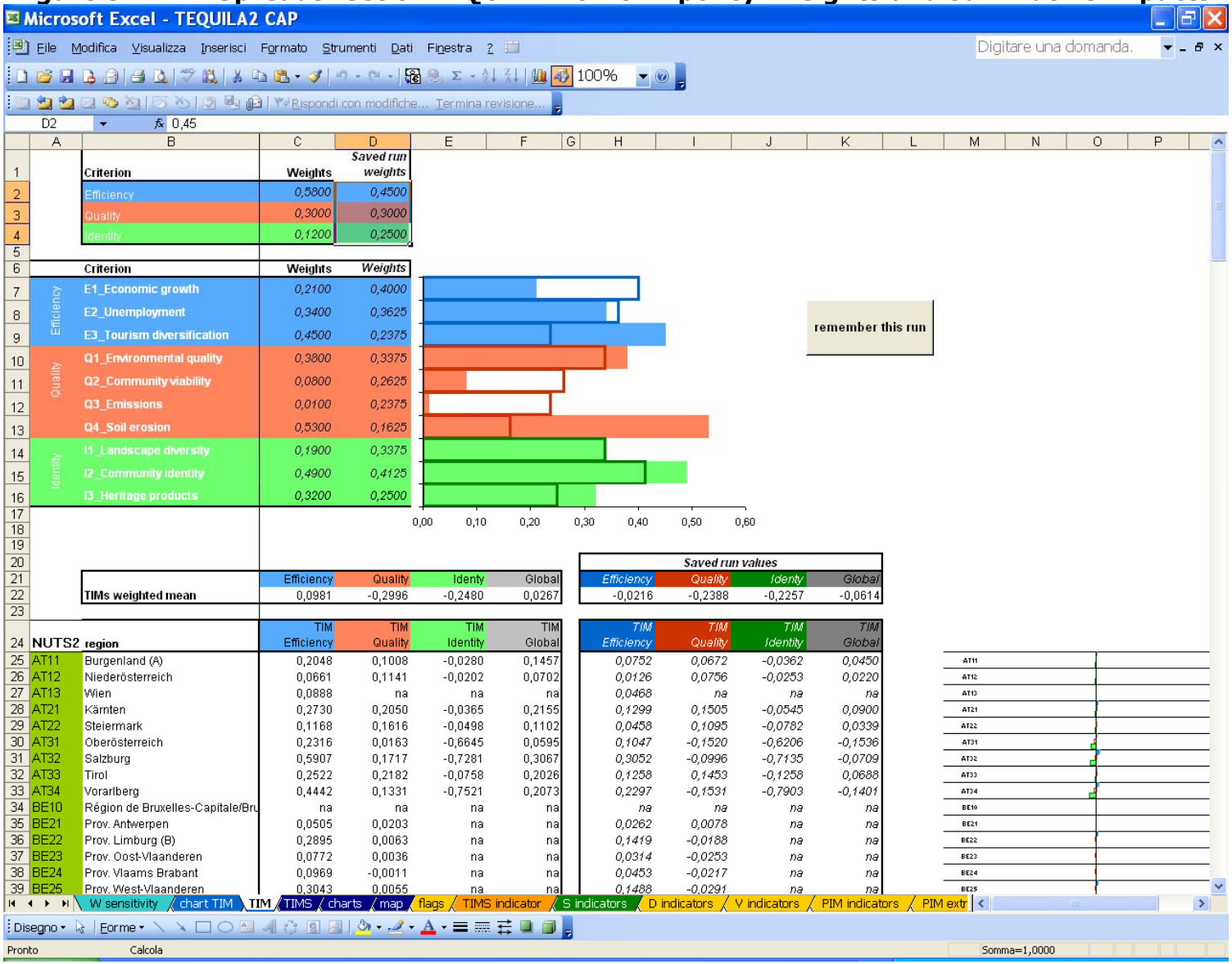


Figure 5.1.2.1 captures synthetically the differences between the impacts on Territorial Efficiency in each NUTS2 region according to Experts' weights (Y axis) and Policy makers' weights (X axis) respectively. The degree of correlation is pretty high (R2 is 0,78), however Experts evaluate Territorial Efficiency more positively as compared to Policy makers (the intercept is not in the origin of the axes); this is consistent with the greater weight they attribute to E3 (which shows positive impacts) as compared to policy makers.

Figure 5.1.2.2. Spreadsheet of TEQUILA2 on CAP policy: weights and summative impacts.



Criterion	Weights	Saved run weights
Efficiency	0,5800	0,4500
Quality	0,3000	0,3000
Identity	0,1200	0,2500

	Criterion	Weights	Weights
Efficiency	E1_Economic growth	0,2100	0,4000
Efficiency	E2_Unemployment	0,3400	0,3625
Efficiency	E3_Tourism diversification	0,4500	0,2375
Quality	Q1_Environmental quality	0,3800	0,3375
Quality	Q2_Community viability	0,0800	0,2625
Quality	Q3_Emissions	0,0100	0,2375
Quality	Q4_Soil erosion	0,5300	0,1625
Identity	I1_Landscape diversity	0,1900	0,3375
Identity	I2_Community identity	0,4900	0,4125
Identity	I3_Heritage products	0,3200	0,2500

	Efficiency	Quality	Identy	Global	Saved run values: Efficiency	Quality	Identy	Global
TIMs weighted mean	0,0981	-0,2996	-0,2480	0,0267	-0,0216	-0,2388	-0,2257	-0,0614

NUTS2	region	TIM Efficiency	TIM Quality	TIM Identity	TIM Global	TIM Efficiency	TIM Quality	TIM Identity	TIM Global
AT11	Burgenland (A)	0,2048	0,1008	-0,0280	0,1457	0,0752	0,0672	-0,0362	0,0450
AT12	Niederösterreich	0,0661	0,1141	-0,0202	0,0702	0,0126	0,0756	-0,0253	0,0220
AT13	Wien	0,0888	na	na	na	0,0468	na	na	na
AT21	Kärnten	0,2730	0,2050	-0,0365	0,2155	0,1299	0,1505	-0,0545	0,0900
AT22	Steiermark	0,1168	0,1616	-0,0498	0,1102	0,0458	0,1095	-0,0782	0,0339
AT31	Oberösterreich	0,2316	0,0163	-0,6645	0,0595	0,1047	-0,1520	-0,6206	-0,1536
AT32	Salzburg	0,5907	0,1717	-0,7281	0,3067	0,3052	-0,0996	-0,7135	-0,0709
AT33	Tirol	0,2522	0,2182	-0,0758	0,2026	0,1258	0,1453	-0,1258	0,0688
AT34	Vorarlberg	0,4442	0,1331	-0,7521	0,2073	0,2297	-0,1531	-0,7903	-0,1401
BE10	Région de Bruxelles-Capitale/Bru	na	na	na	na	na	na	na	na
BE21	Prov. Antwerpen	0,0505	0,0203	na	na	0,0262	0,0078	na	na
BE22	Prov. Limburg (B)	0,2895	0,0063	na	na	0,1419	-0,0188	na	na
BE23	Prov. Oost-Vlaanderen	0,0772	0,0036	na	na	0,0314	-0,0253	na	na
BE24	Prov. Vlaams Brabant	0,0969	-0,0011	na	na	0,0453	-0,0217	na	na
BE25	Prov. West-Vlaanderen	0,3043	0,0055	na	na	0,1488	-0,0291	na	na

the same direction. In fact, policy maker assign a lower importance to a generally positive criterion like diversification capability and a wider importance to a generally negative criterion like unemployment impact, with respect to what experts do.

More relevant appears the fact that in both cases impacts on Territorial Quality and Identity look negative, as a consequence of the effects of the policy scenario on land abandonment, consequent soil erosion risk and community viability.

5.1.3. Calculating Single-dimension and Summative impacts at national and European level

Following the 3-level approach proposed by ESPON, the TEQUILA 2 model enables to compute single dimension and summative impacts both at the national and European level as (weighted) averages of regional impacts. Table 5.1.3.1 below provides these figures (according to the usual weights assigned by experts).
Inside Territorial efficiency, single dimension impacts E1 (GDP) and E2 (employment) are negative in all countries and, thus, also at the EU level. Differently, E3 (diversification capability towards tourism) is positive, somehow balancing the effect of E1 and E2. By consequence, summative TE impact shows positive values in several countries and in the EU (as said before).
Inside Territorial quality, single dimension impact Q1 (environmental quality) is positive in all countries (and consequently in the EU), while the other three are negative or nil at maximum. Summative TQ impact shows negative values in several countries as well as at the EU level.
Inside Territorial identity, single dimension impacts I1 (landscape) and I2 community identity) are negative in all countries and at the EU level, while I3 is positive both at each country and the EU level. Summative TI impact shows negative values in several countries as well as at the EU level.
Finally, as of SI, a few countries are negatively affected by the policy scenario considered, namely Greece, Latvia, and Portugal. However, SI shows a positive value at the EU level, maily because the high importance attributed to TE largely balances the negative values of TQ and TI[41].

[41] As seen before, this general result is not achieved using the policy makers' preference system.

Table 5.1.3.1. CAP policy: Average impacts by country

	TE	TQ	TI	SI	E1	E2	E3	Q1	Q2	Q3	Q4	I1	I2	I3
EU	0,191	0,101	-0,213	0,105	-0,027	-0,028	0,458	0,563	-0,426	0,000	-0,027	-0,204	-0,420	0,138
AT	0,180	-0,007	0,000	0,000	-0,019	-0,024	0,428	0,059	-0,189	-0,008	-0,025	-0,041	-0,307	0,000
BE	-0,314	0,000	0,000	0,000	-0,015	-1,502	0,445	0,000	0,000	0,000	0,000	0,000	-0,496	0,000
BG	0,851	na	-2,212	na	-0,001	-0,172	2,022	0,000	-4,398	0,000	na	-0,302	-4,510	0,171
CY	0,337	-0,194	-0,552	0,046	-0,007	-0,290	0,971	0,000	-1,676	0,000	-0,113	-0,024	-1,163	0,061
CZ	0,168	0,009	-0,159	0,049	-0,013	-0,016	0,392	0,123	-0,213	0,000	-0,026	-0,049	-0,606	0,129
DE	0,117	0,003	-0,167	0,049	-0,007	-0,011	0,271	0,053	-0,111	-0,205	-0,011	-0,029	-0,345	0,023
DK	0,010	-0,247	na	na	-0,007	-0,637	0,506	0,000	-2,850	0,000	-0,036	-0,104	-1,602	na
EE	0,099	-0,336	0,000	0,000	-0,060	-0,044	0,282	0,353	-0,761	-0,032	-0,818	-0,154	-0,868	0,000
ES	-0,081	0,000	-0,013	0,000	-0,038	-0,289	0,055	0,122	-0,036	0,000	0,000	-0,012	-0,029	0,009
FI	0,136	0,098	-0,237	0,080	-0,015	-0,016	0,323	0,327	-0,213	0,000	-0,017	-0,049	-0,561	0,149
FR	0,065	-2,042	-0,116	-0,618	-0,219	-0,254	0,438	0,460	-0,544	0,000	-3,908	-0,324	-0,346	0,359
GR	0,071	-0,098	0,000	0,000	-0,012	-0,218	0,329	0,000	-0,916	0,000	-0,046	-0,067	-0,356	0,000
HU	0,003	0,004	0,000	0,000	-0,001	-0,002	0,007	0,012	-0,004	0,000	0,000	-0,001	-0,012	0,000
IE	0,237	-1,124	0,000	0,000	-0,016	-0,074	0,591	0,292	-1,277	0,000	-2,136	-0,293	-1,032	0,000
IT	-0,283	-0,022	-0,031	-0,175	-0,017	-0,953	0,098	0,000	-0,240	0,000	-0,005	-0,078	-0,046	0,019
LT	0,379	-0,031	-0,583	0,141	-0,013	-0,009	0,855	0,107	-0,619	0,000	-0,042	-0,053	-1,215	0,070
LU	0,632	-0,265	-0,878	0,182	-0,005	-1,631	2,639	0,000	-3,300	0,000	-0,002	-0,196	-1,784	0,104
LV	0,431	na	na	na	0,000	-0,070	1,011	0,000	-0,828	0,000	na	-0,401	-0,182	na
MT	0,177	-0,018	-0,108	0,084	-0,009	-0,009	0,405	0,000	-0,142	-0,620	-0,001	-0,038	-0,235	0,045
NL	-0,196	-0,432	0,000	0,000	-0,007	-2,322	1,322	0,000	-2,429	0,000	-0,449	-0,334	-0,969	0,000
PL	0,134	-0,712	-0,280	-0,169	-0,060	-0,058	0,362	0,228	-0,945	0,000	-1,364	-0,288	-0,849	0,482
PT	-0,258	0,000	0,000	0,000	-0,013	-1,768	0,768	0,000	0,000	0,000	0,000	0,000	-0,667	0,000
RO	0,032	0,000	0,000	0,000	-0,015	-0,079	0,138	0,122	-0,117	0,000	0,000	-0,017	-0,231	0,000
SE	0,076	-0,092	-0,062	0,009	-0,003	-0,975	0,906	0,000	-0,780	0,000	-0,055	-0,157	-0,080	0,023
SI	0,423	-0,206	-0,647	0,098	-0,009	-0,817	1,562	0,000	-1,528	0,000	-0,162	-0,038	-1,509	0,311
SK	0,067	0,049	-0,133	0,037	-0,013	-0,005	0,158	0,189	-0,224	0,000	-0,009	-0,032	-0,337	0,145
UK	0,191	0,101	-0,213	0,105	-0,027	-0,028	0,458	0,563	-0,426	0,000	-0,027	-0,204	-0,420	0,138

5.1.4. Calculating single-dimension and summative impacts on urban and rural areas

Different typologies of regions are differently affected by the policy scenario considered in this study; the differentiation between urban and rural regions looks as the most relevant in our case. In particular (Table 7), using the OECD classification also used by the EU, rural regions experience the greatest negative impact on economic growth and unemployment (E1 and E2, respectively) while intermediate regions are those that benefit most from tourism diversification (E3). All types of regions benefit equally from improvements in environmental quality (Q1), while intermediate regions are especially affected by negative impacts on community viability (Q2), on landscape diversity (I1) and community identity (I2), as well as on risk of soil erosion (Q4) and on heritage products (I3) together with rural regions. Turning to Summative impacts, intermediate regions are those which will benefit most in terms of Territorial Efficiency, but also suffer most in terms of Territorial Quality and Identity. All these differences are statistically significant (two tail T test) at the conventional level (i.e. t the 0.05 level) but SI, Q1, Q3 and I3.

Table 5.1.4.1. CAP policy: Average impacts by type of regions

	Urban	Intermediate	Rural
E1	-0,0043	-0,0329	-0,0514
E2	-0,1257	-0,3399	-0,2985
E3	0,2371	0,7426	0,3396
Q1	0,1775	0,2205	0,2174
Q2	-0,2706	-1,1657	-0,2750
Q3	-0,0530	-0,0034	-0,0177
Q4	-0,0505	-1,0537	-0,2306
I1	-0,0657	-0,1878	-0,0728
I2	-0,1827	-1,2574	-0,1167
I3	0,0688	0,1200	0,1113
TE	0,0631	0,2119	-0,1777
TQ	0,0053	-0,5605	-0,0217
TI	-0,0213	-0,2442	-0,0159
SI	0,0221	0,0010	0,0180

5.1.5. Key findings

All the previous findings are summarized in 10 single-dimension impact maps, plus 3+1 summative maps drawn on the basis of our experts weighting pattern, plus 3+1 summative maps drawn on the basis of policy makers stated preferences. All of them are uploaded as requested on ESPON INTRANET website. In this shorter Report, a selection of 5 + 2 + 1 maps is chosen, namely:
- single dimensional impacts on economic growth (E1), tourism diversification (E3), environmental quality (Q1), risk of soil erosion (Q4), community identity (I2);
- summative impacts on territorial efficiency and territorial quality (experts weighting);
- summative impacts on territorial efficiency (policy makers weighting).
The selection is made on the basis of the revealed importance of the single impacts and on the completeness of data available.

All tables concerning the impact indexes computations are also uploaded as requested on ESPON INTRANET website, and in particular (in the form of vectors of regional observations):
- the PIMs (potential impacts), referring to the value of impact indexes in their unit of measure; these indexes are the statistical starting points of all subsequent elaborations;
- the Normalized PIMs, or the PIMs translated in the +1/-1 scale by means of the value functions derived from the experts judgement;
- the TIMs, or Territorial Impacts, consisting on the normalised PIMs multiplied by the S (sensitivity of regions to impacts, where S = D x V - desirability of impacts for each region times vulnerability to impacts of each region). These are the final impacts analysed;
- the Ds and Vs used in the previous point;
- the four summative TIMs: for Territorial Efficiency, Territorial Quality, Territorial Identity and for the general Summative Impact;
- the same summative TIMSs in the case of policy makers weighting system.

Since the scenario considered entails a net budgetary reduction, *ceteris paribus* one would expect there to be more negative territorial impacts than positive, and indeed this is the case in several regions.

However, in spite of the important cut in transfer payments to farms that are implied by our policy scenario, with only partial recuperation through modulation and increase in Pillar 2 expenditure, the general impact on territorial efficiency will not be negative. Only peripheral and rural regions in Scandinavia, eastern countries and Spain will suffer a negative impact, but the bulk of central European - together with British, Irish, Italian regions and many western regions in New Member Countries – will benefit from positive impacts, manly thanks to differentiation possibility to tourism (but also to other activities). Impacts on environmental and territorial quality will still have a more severe impact on peripheral and mainly rural countries and regions, with also Italian, Greek, Portuguese and some Spanish regions like Pais Vasco and Andalucia equally hit. Countries and regions located more closely to the European barycentre, from Ireland to the Po valley, from Denmark to Austria, France and many central and eastern regions in Spain will show a slight but positive impact of these policies.

Overall, summing up in a weighted way impacts on all European regions (see Figure 5.1.2.1) impact on territorial efficiency is slightly positive, while impact on territorial quality is negative with a higher value. It is interesting to note that the global SI is still positive given the high weight assigned by experts to the macro-criterion of territorial efficiency – differently from what would happen if policy makers weight system were used.

Generalised territorial impact is difficult to draw as a consequence of many missing data; but territorial efficiency and quality, for which a wider and sufficient data availability is granted, sum up to almost 90% of it.

The calculated impacts can be summarised statistically, and tested for significance. This analysis reveals that the only statistically significant correlations are as follows:

- The impact on territorial efficiency hits areas of high unemployment especially.
- The impact on territorial identity favours richer areas with higher GDP/head.
- The impact on territorial efficiency is highly negatively correlated with the impacts on territorial quality and territorial identity – in other words these impacts offset one another, and this is the reason for the rather slight overall territorial impacts.

These results may be compared only loosely with the earlier study of the Territorial Impact of the CAP (ESPON 2.1.3), which assessed the geographical distribution or "incidence" of CAP support and the extent to which changes in the CAP have been associated with observable changes in the economic, social and environmental conditions in areas at the NUTS 3 level or equivalent. It did include assessment of the potential territorial impact of the CEC's Mid-Term Review (MTR) proposals of 2003, but this was a quite different policy scenario from that considered by TIPTAP[42].

[42] Specifically, the MTR proposals introduced a single payment to farmers under Pillar 1, decoupled from production, replacing the previous array of direct payments which had compensated farmers for the reduction in market price support since 1992. It also proposed limited modulation from Pillar 1 to Pillar 2, with the full amount retained by farmers. There was no attempt to make budget savings through modulation. This assessment also excluded the NMS and pertained only to the EU-15.

Summarising the results of the earlier study, total Pillar 1 support was found to be distributed in such a way that it tends to benefit richer regions with lower unemployment rates and higher than average population growth. The pattern differed, though, between the two policy instruments that comprise Pillar 1 – market price support and direct income payments. While market price support (like total Pillar 1 support) was distributed in 1999 in favour of richer regions, direct income payments were found to be generally higher in areas with a low GDP per capita and with high unemployment rates, more in accordance with cohesion objectives. Further regression analysis showed that the geographical incidence of Pillar 1 support is largely explained by the distribution of farm types and sizes across Europe. Another key finding was that the level of total Pillar 1 support is positively correlated with accessibility at an EU level: more accessible regions of Europe tend to get higher levels of support (Table 5.1.5.1).

Table 5.1.5.1: The relationship between level of Pillar 1 support and cohesion indicators: Correlation coefficients for EU15 at NUTS 3, 1999

	GDP per capita	Unemployment rate	Population change, 1989-99
Total Pillar 1 support per ha	.088(**)	-.305(**)	.216(**)
Market price support per ha	.113(**)	-.371(**)	.199(**)
Direct Income payments per ha	-.156(**)	.209(**)	-.028

** Correlation is significant at the 0.01 level (2-tailed).

Simple correlation analysis also showed that at the EU level the incidence of Pillar 2 support was also not consistent with cohesion objectives, favouring the more economically viable and growing areas of the EU. This was mainly because the richer regions made more use of these measures, especially agri-environmental measures, as well as reflecting the difficulties poorer regions had in co-financing these Pillar 2 measures[43].

Clearly, these results are not easily comparable to the TIPTAP results since they modelled the impact of a different policy proposal/ scenario, and the earlier study excluded the NMS which appear to be more affected by the impacts studied in TIPTAP. In both studies, however, the impacts of the proposed changes are rather small, with few overall winners or losers, and little change to the overall pattern of CAP expenditure favouring richer, core regions of Europe.

[43] The impact of the MTR proposals was assessed using the results from an existing agricultural policy model, the "CAPRI" model and apportioning these from NUTS 2 to NUTS 3 level and then analysing these, using mapping and linear regression techniques, with respect to the EU's social and economic cohesion objectives. The modelling system involved physical consistency balances, economic accounting, considerable regional specification (e.g. set-aside rates, direct payment rates, etc.; for non-EU regions, OECD PSE/CSE data are used), and standard micro-economic assumptions. The results showed that farm incomes in the EU 15 (including both CAP premiums and farm GVA) would be only marginally affected by the MTR proposals, with changes of more than 5% apparent only in a small number of NUTS 3 regions in France (mainly in the south) and Austria (both show falling incomes) and in some or all of Northern Ireland, Belgium, northern Italy, Denmark and Sweden (all show rising incomes). Analysis found no statistically significant relationship between MTR impacts and cohesion indicators (GDP per head, unemployment rate and population change). This led to the conclusion that the MTR reform proposals would do nothing to remove the existing inconsistencies between the CAP and cohesion policy unless they were accompanied by specific national priorities aimed at regional specific programme implementation.

5.2. Impact of the new Transport Policy

5.2.1. Calculating impacts on single dimensions / criteria.

As in the previous case of CAP policies, impacts are first of all calculated on single dimensions, and presented under the form of:
a. impacts on the economy
b. impacts on competitiveness
c. impacts on society
d. impacts on environment and climate change
e. impacts on landscape and local identities

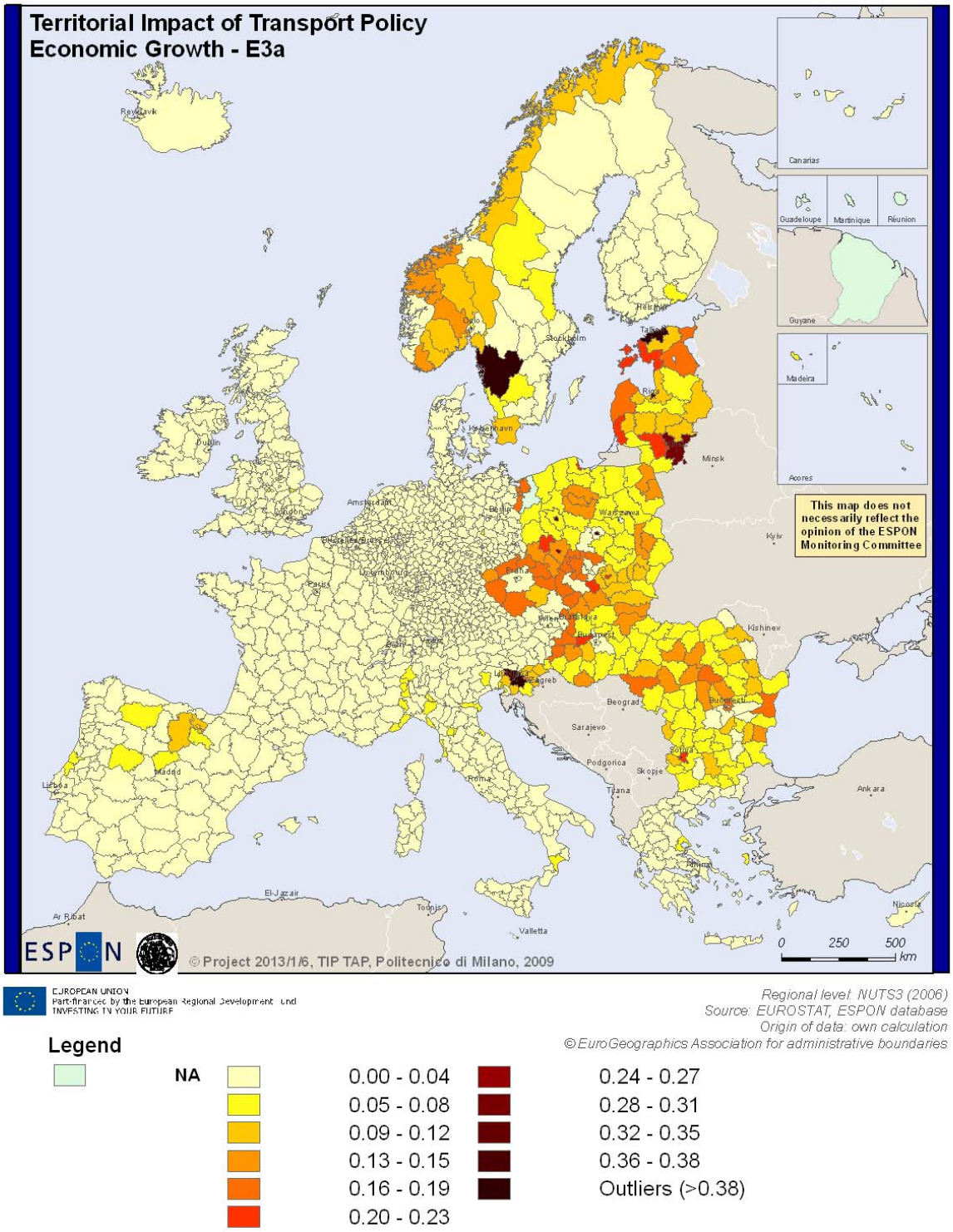
Of course, single impacts may refer to multiple dimensions: for example congestion is both an element of territorial competitiveness and quality of life of the local society. We have allocated single impacts to their priority class according to our judgement, but of course impact measures are open to other interpretations.

Illustrations of results will confront directly the outcomes of the three scenarios: Baseline scenario a, Infrastructure Enhancement scenario b, and Pricing scenario c.

5.2.1.a. Impacts on economy
The first indicator in this case is impact on economic growth (E3a). In the baseline scenario a generalized positive impact, though limited, is found throughout Europe, thanks to a sufficiently spread out new infrastructure provision and to processes of growth diffusion. An increase between 2005 and 2030 ranging around 25.000 euro per capita (see PIM_E3) will be relatively less appreciated in rich regions, while more important impacts will show up in eastern countries. Most relevant positive impacts will touch:
- capital city regions in central-eastern Europe: Vienna, Bratislava, Tallinn, Riga, Vilnius, Bucuresti, Sofiya,
- border regions, benefiting from lowering of international institutional barriers: the areas of Pécs, Nova Gorica, Stettin, Timisoara, Katowice-Krakov, the entire south-western Poland, the entire western border of Czechia,
- big and medium city regions at the crossroad of, or along the new important transportation axes: Poznan, Lodz, Ostrava, Brno, Linz and Graz,
- port and maritime areas: Dantzig, Umea, Trieste, Koper, Costanza, the entire coast of the three Baltic republics.

In most of these areas, new infrastructure provision will represent quantum jumps with respect to previous accessibility conditions; moreover, these increases will be highly desirable given the lagging conditions of these areas in economic terms. It looks relevant to highlight the emerging reality of a new central European macro-area, encompassing southern Poland, Czechia, eastern Austria and western Slovakia and Hungary, around the crossroad between a north-south axis (Dantzig – Vienna) and a east-west axis Munich – Vienna – Budapest – Costanza (Map 5.2.1.1.).

Map 5.2.1.1.


Territorial Impact of Transport Policy
Economic Growth - E3a
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
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0 250 500 km
EUROPEAN UNION
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INVESTING IN YOUR FUTURE
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries
Legend
NA
0.00 - 0.04
0.05 - 0.08
0.09 - 0.12
0.13 - 0.15
0.16 - 0.19
0.20 - 0.23
0.24 - 0.27
0.28 - 0.31
0.32 - 0.35
0.36 - 0.38
Outliers (>0.38)

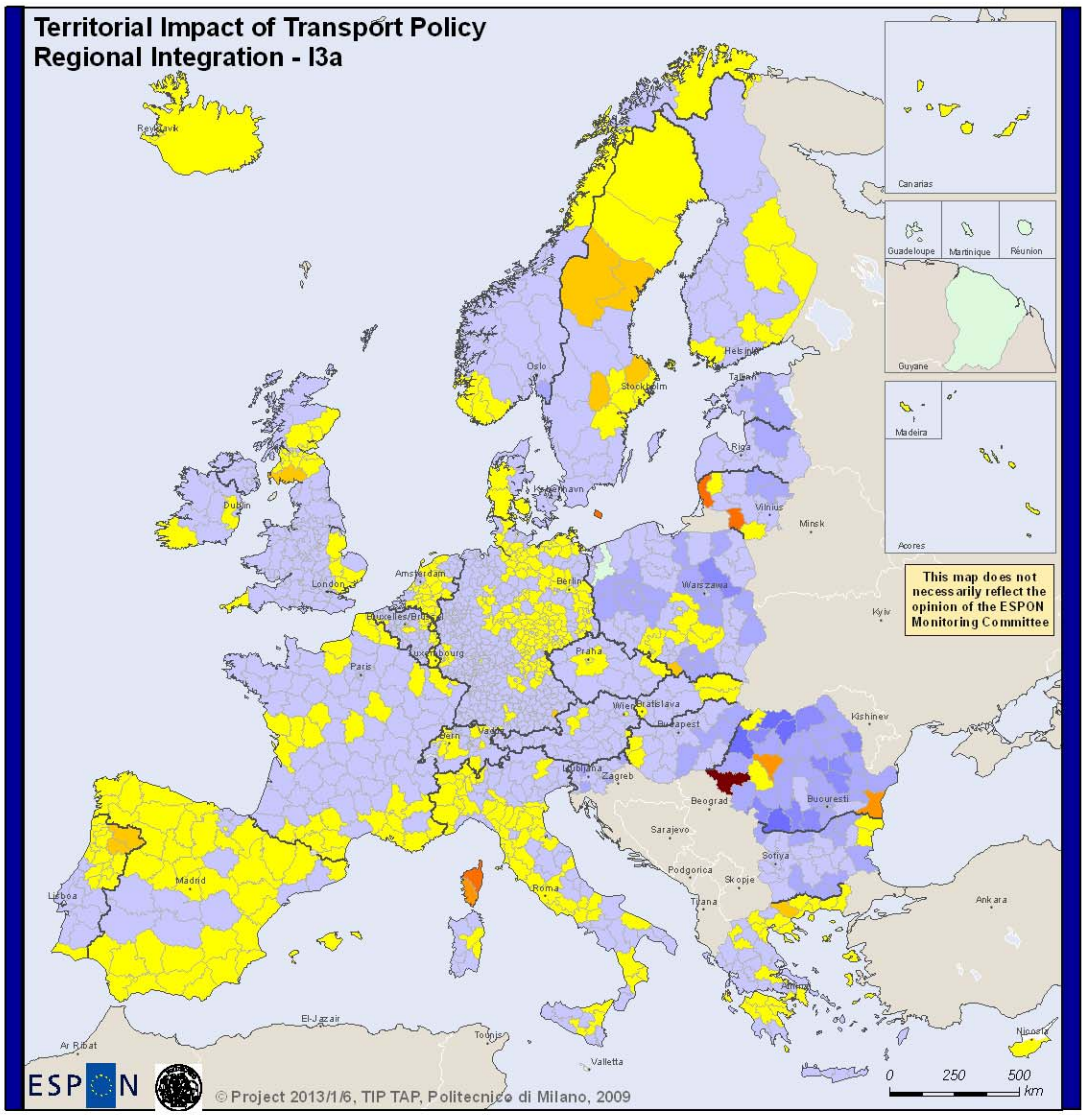
Passing to the Infrastructure Enhancement scenario (E3b), a more varied outcome emerges. Countries where new infrastructures are envisaged – like Spain, Italy, Greece and UK – still show an (extra) positive impact on GDP in almost all regions. In New Member states, important benefits will come to Czechia (thanks to both road and rail improvements), Hungary (mainly rail improvements), Bulgaria, Estonia and Lithuania (mainly road improvements).

In the Pricing Scenario (E3c) more peripheral countries will lose (but also France apparently will) and more central countries will gain (but also UK, Greece and Finland will).

A second impact indicator concerning economic structure refers to (intra-)regional integration (I3a, Map 5.2.1.2.), an indicator that is also relevant for enhancing local identity. Increases are visible only in those countries in which present infrastructure engagement is higher, namely Spain and Germany. Other positive impacts are visible along the Tyrrhenian coast in Italy, along the Paris-Nantes-Bordeaux axis, interested by the new high speed train line, and the axis moving southward of Warszawa. Eastern countries in general show negative impacts, as a result of increasing congestion on main intra-regional links which are not sufficiently upgraded. On the other hand, this condition of New Member countries is due to change in the Enhanced Infrastructure scenario (I3b, Map 5.2.1.3.), where consistent positive impacts on internal integration show up, particularly in Romania and Bulgaria but also in the Baltic Republics, north-eastern Poland and Slovakia. Among Old Member Countries, Portugal, UK and south-western Sweden show some positive impacts.

Interestingly enough, the Pricing scenario appears very advantageous for most EU regions in terms of internal integration, with the highest positive impacts in eastern countries, Ireland and UK, but also in Spain, Portugal, Northern Italy, south-western France (I3c).

Map 5.2.1.2.


Territorial Impact of Transport Policy
Regional Integration - I3a
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
This map does not necessarily reflect the opinion of the ESPON Monitoring Committee
Reykjavik
Oslo
Helsinki
Tallinn
Stockholm
Riga
Dublin
Kobenhavn
Vilnius
Minsk
London
Amsterdam
Berlin
Warszawa
Kyiv
Bruxelles/Brussel
Luxembourg
Praha
Paris
Wien
Bratislava
Budapest
Kishinev
Bern
Ljubljana
Zagreb
Beograd
Bucuresti
Sarajevo
Sofiya
Podgorica
Skopje
Madrid
Lisboa
Roma
Tirana
Ankara
El Jazair
Ar Ribat
Tunis
Valletta
Nicosia
ESPON
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0
250
500
km
EUROPEAN UNION
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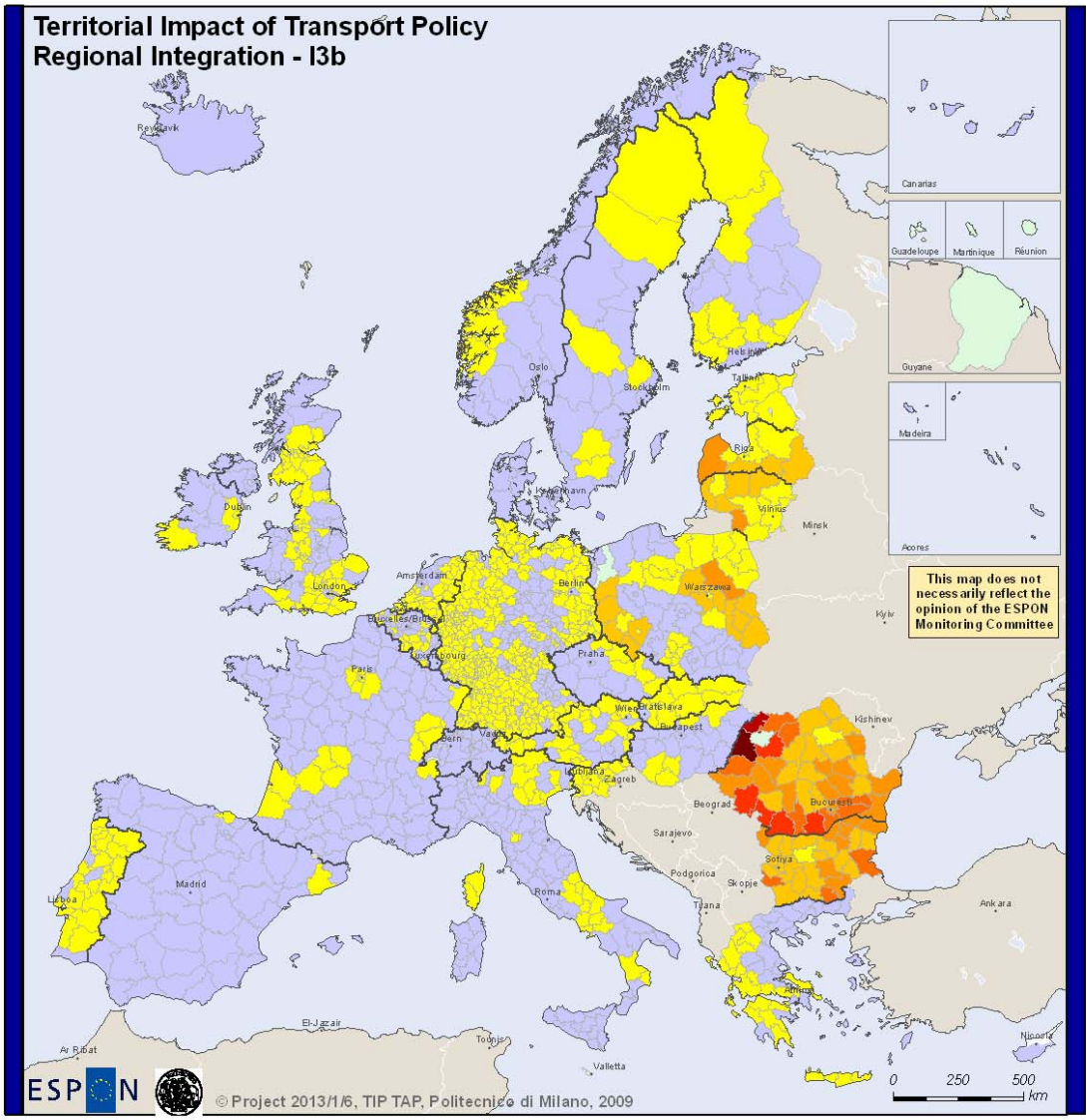
INVESTING IN YOUR FUTURE
Legend
NA
-0.27 - -0.22
-0.21 - -0.15
-0.14 - -0.07
-0.06 - 0.00
0.01 - 0.07
0.08 - 0.15
0.16 - 0.22
0.23 - 0.29
0.30 - 0.36
0.37 - 0.44
0.45 - 0.51
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries

Map 5.2.1.3.


Territorial Impact of Transport Policy
Regional Integration - I3b
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
This map does not necessarily reflect the opinion of the ESPON Monitoring Committee
0 250 500 km
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EUROPEAN UNION
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INVESTING IN YOUR FUTURE
Legend
NA
-0.32 - -0.30
-0.29 - 0.00
0.01 - 0.30
0.31 - 0.59
0.60 - 0.89
0.90 - 1.18
1.19 - 1.48
1.49 - 1.77
1.78 - 2.07
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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5.2.1.b. Impacts on competitiveness

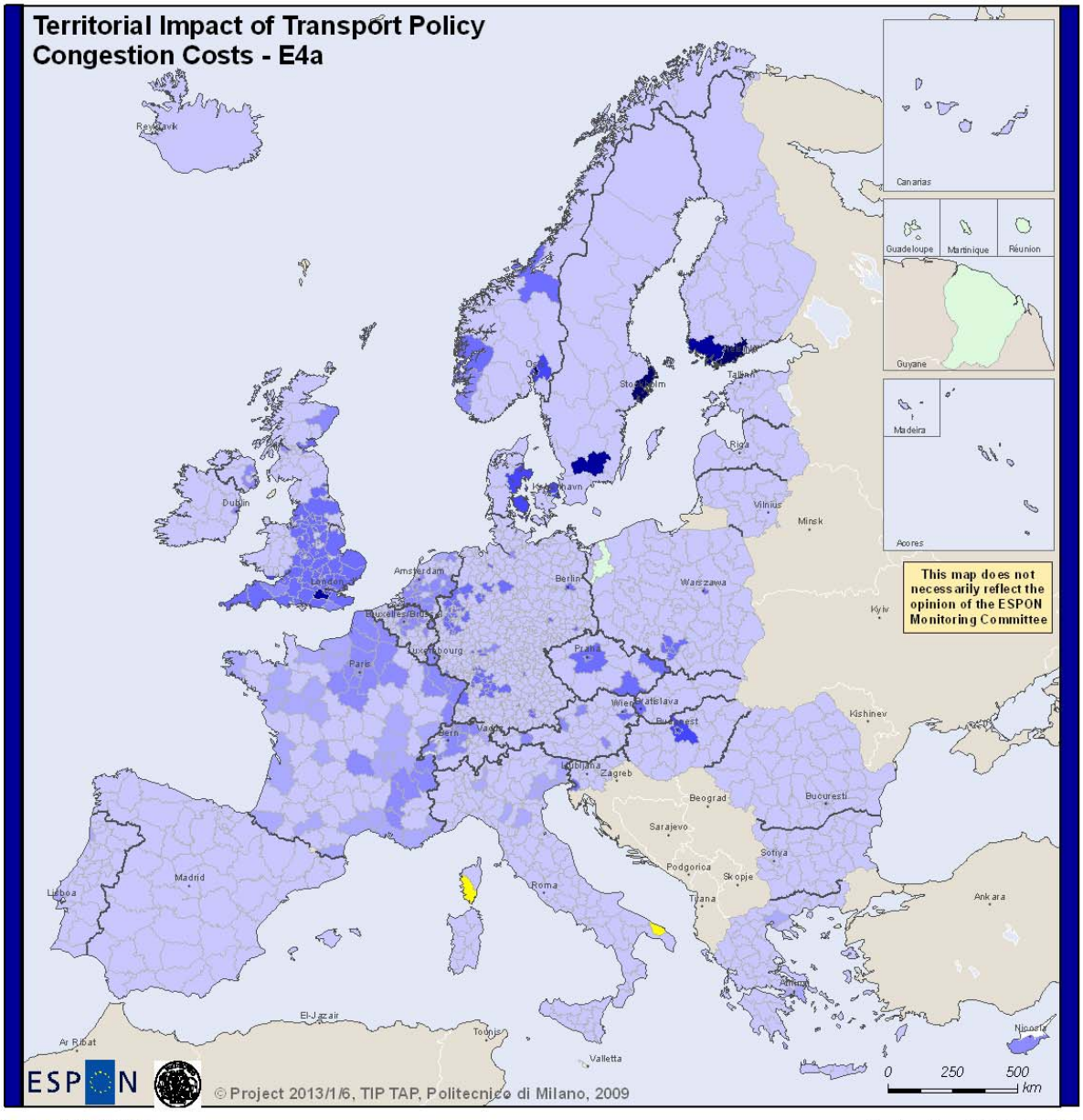
Productivity increases on infrastructures, measured by increase in traffic/km, and reduction of congestion costs may be rightly interpreted as contributing to territorial competitiveness. Concerning the productivity indicator on inland traffic infrastructure (E1a), a generalized increase shows up, particularly intense along some major transportation axes in eastern countries (as the Warszawa-Krakow axis, and its continuation from Vienna to Gyor) and around some of their major urban areas (Dantzig, the Trieste-Koper integration area, Ljubljana, Bucuresti and Sofiya). Some productivity reductions also show up in some rare, scattered areas. Similar positive results are shown by the airport productivity indicator (E2a), where major increases concern French and British regions, but in particular main increases apparently concern second and third level airports.

Opposite results are of course pointed out by the congestion indicator (E4a, Map 5.2.1.4.), where the negative sign is pervasive, in particular in many major northern metropolitan areas (the entire England and London in particular, København, Malmö, Stockholm, Helsinki, Amsterdam and Rotterdam, many areas in Westfalen, Berlin, Warszawa and Praha).

Considering the Infrastructure Scenario, an increase in network productivity with respect to the baseline scenario is confirmed (E1b), especially in main eastern corridors, while airport productivity (E2b) still concerns, in the positive sense, not really big airports but second and third level airports (e.g., Florence, Pisa, Brescia, Naples, Sassari and Brindisi in Italy), especially in countries like Germany and Portugal. Concerning congestion (E4b), this scenario brings strong support to eastern countries, northern countries like Sweden, Germany, Denmark, and southern countries like Greece and Portugal.

Interesting results come also from the Pricing scenario. Regulatory and pricing measures will overall reduce traffic per km on the entire network (E1c), increase air traffic (E2c) in areas characterized by congested transport networks (western German regions and Dutch regions, London, Milan, Rome) or by huge distances from the European barycentre (Lisbon, Ljubljana, Budapest, Praha, Bucuresti, Sofiya). Interestingly enough, pricing policies will reduce congestion overall and in particular in already heavily congested areas; exceptions regard mainly southern Italian and a few Spanish regions (E4c) (Map 5.2.1.5.).

Map 5.2.1.4.



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Legend

NA	-1.28 - -1.03
	-1.02 - -0.86
	-0.85 - -0.68
	-0.67 - -0.51
	-0.50 - -0.34
	-0.33 - -0.17
	-0.16 - 0.00
	0.01 - 0.17

Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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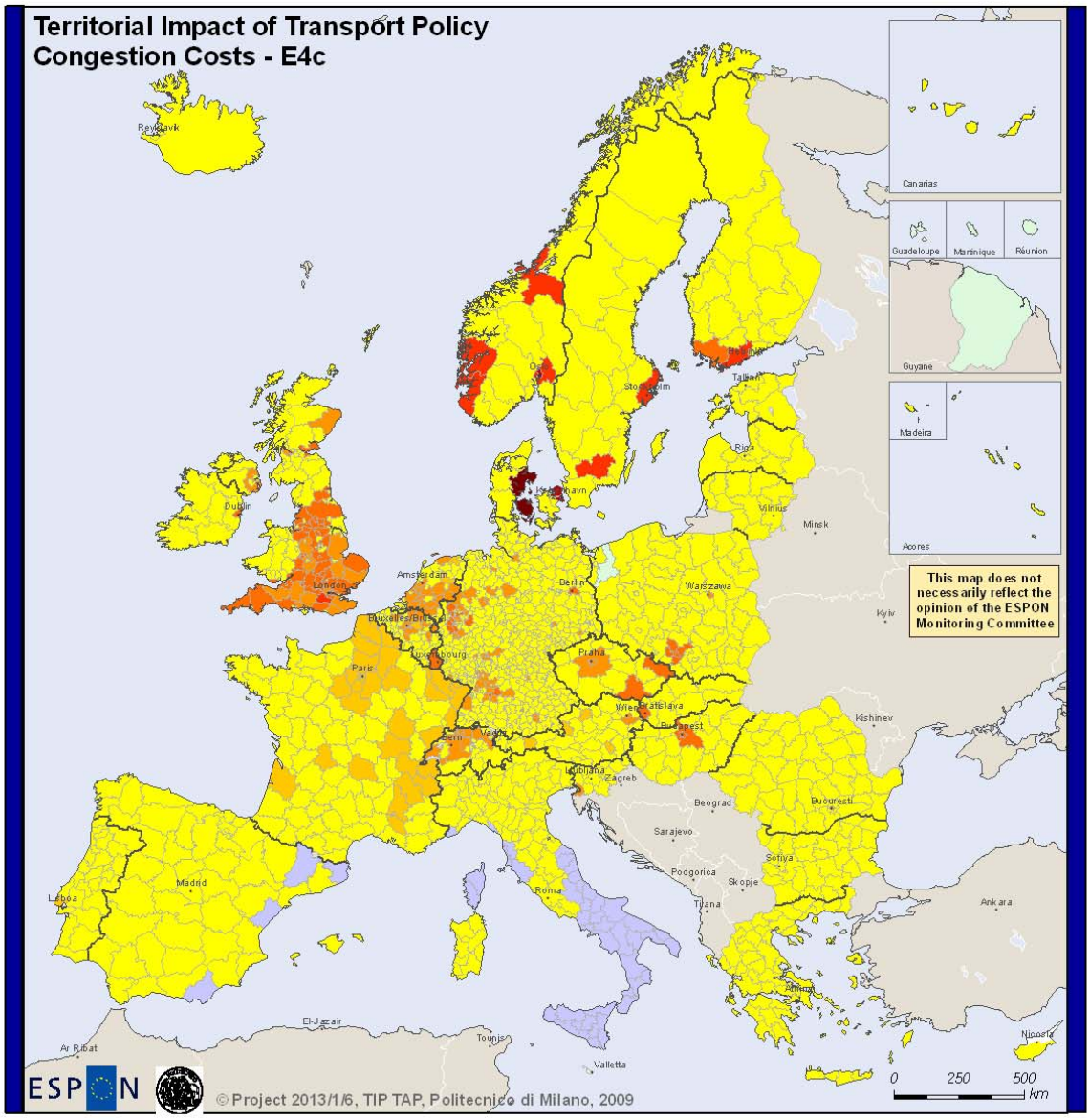
Map 5.2.1.5.



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Legend

NA	-0.12 - 0.00
	0.01 - 0.17
	0.18 - 0.34
	0.35 - 0.51
	0.52 - 0.68
	0.69 - 0.85
	0.86 - 1.02
	1.03 - 1.19

Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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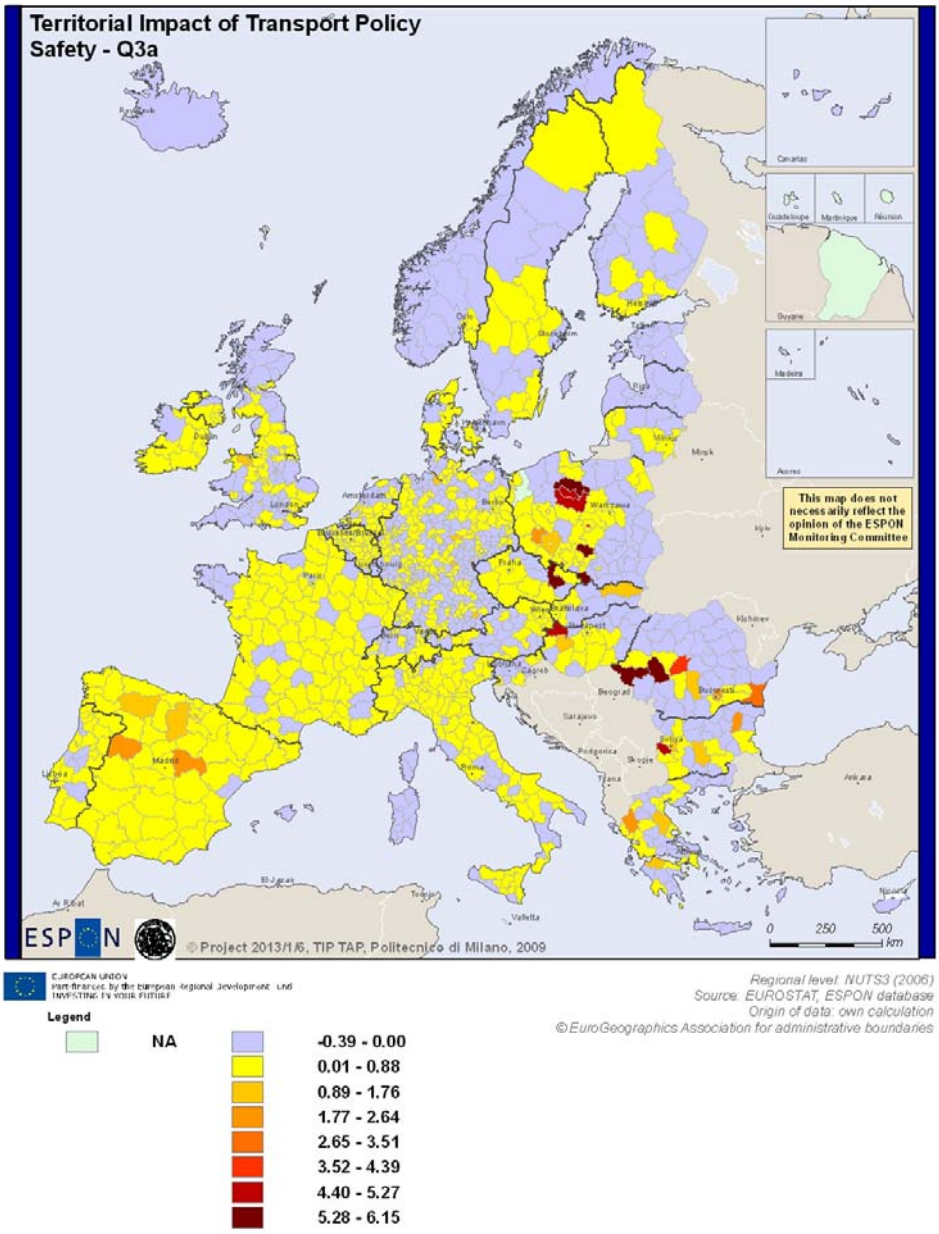
5.2.1.c. Impacts on society

Impacts on safety and market opportunities (Q3 and Q4) refer to societal impacts. Safety will increase pervasively according to the baseline scenario (Q3a, Map 5.2.1.6.) and in eastern countries and Germany in the Infrastructure one (Q3b). Positive impacts from regulations (Q3c), contrary to expectations, do not regard the main metro areas, where road pricing will mainly apply, but concern scattered areas and, interestingly, the entire EU eastern border, from Finland to Greece.

New market opportunities, measured by the increased income potential thanks to new accessibilities, are pervasive in the Baseline Scenario (Q4a) and particularly intense in wide areas of southern and central Poland and in the greater Praha area. These opportunities would further increase in the case of the Enhanced Infrastructure Scenario (Q4b) and expand towards the greater Budapest area (Map 5.2.1.7.); they would not be reduced in a Pricing Scenario (Q4c). Only some congested areas around large metropolitan areas could suffer from some reductions: the areas of London, Dublin, Amsterdam and Rotterdam, the Kiel-Hamburg axis, Berlin, Madrid, Milan, Rome, Naples and Côte d'Azur.

Map 5.2.1.6.


Territorial Impact of Transport Policy
Safety - Q3a
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0 250 500 km
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Legend
NA
-0.39 - 0.00
0.01 - 0.88
0.89 - 1.76
1.77 - 2.64
2.65 - 3.51
3.52 - 4.39
4.40 - 5.27
5.28 - 6.15
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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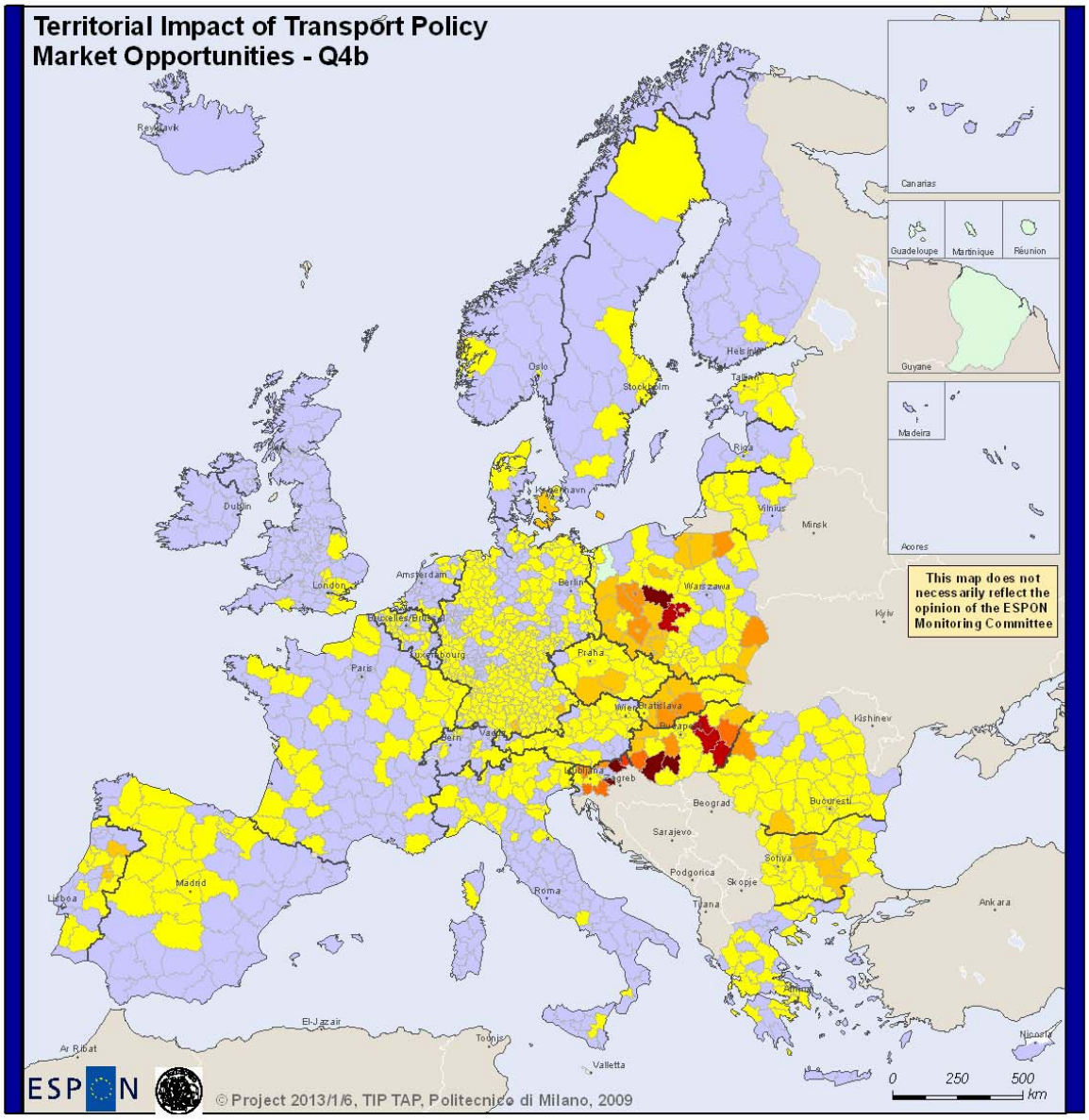
Map 5.2.1.7.



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Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries

Legend

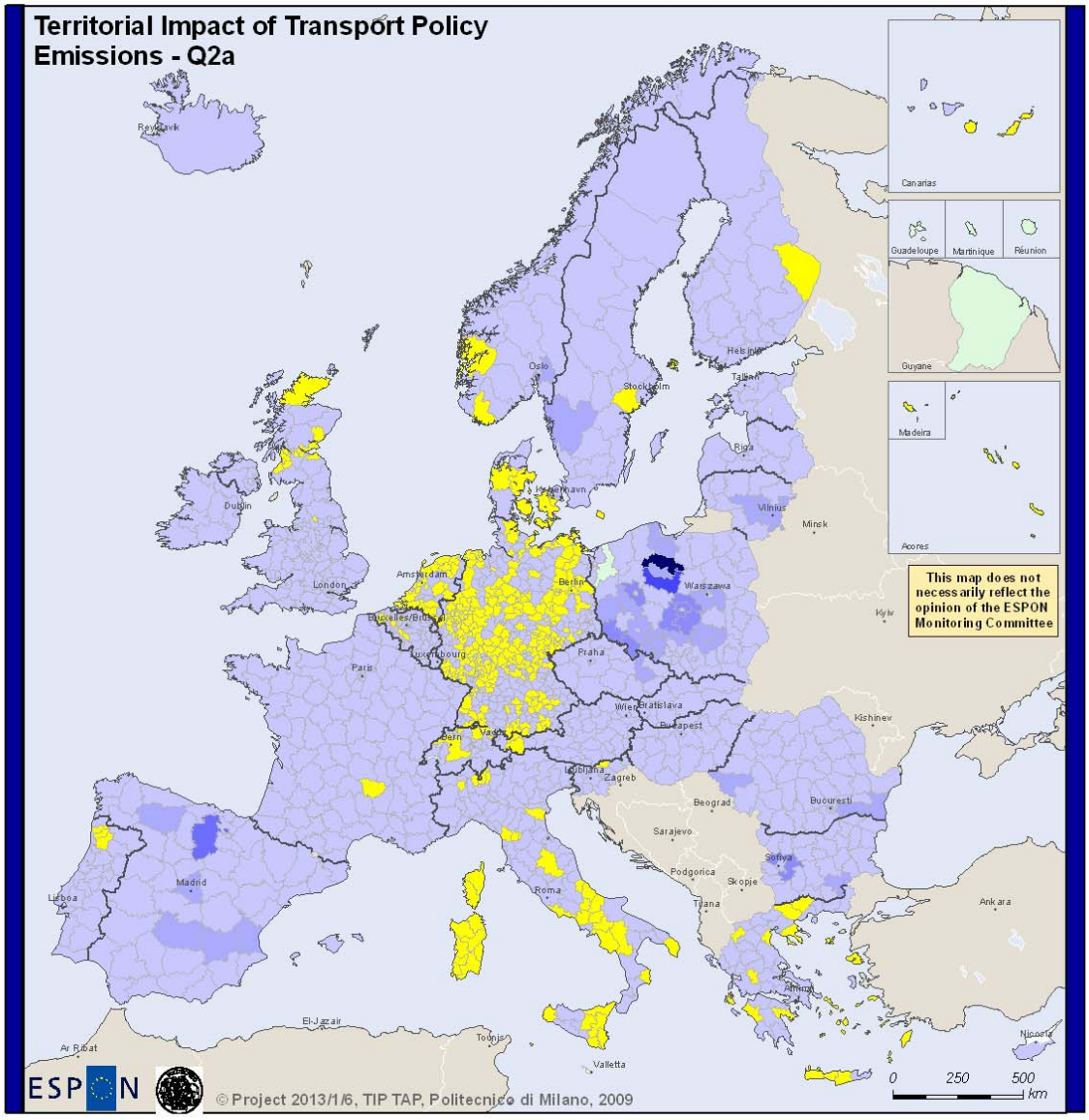
NA	-0.0122 - 0.0000
	0.0001 - 0.0209
	0.0210 - 0.0418
	0.0419 - 0.0628
	0.0629 - 0.0837
	0.0838 - 0.1046
	0.1047 - 0.1255
	0.1256 - 0.1464

5.2.1.d. Impacts on environment and climate change

Traffic passing through the region generates negative externalities and no benefit (except for highway owners, gas stations and some highway restaurants); therefore they are considered as costs in the territorial impact assessment exercise. In the Baseline Scenario these costs are visible, though limited (Q1a); in some rare cases through traffic will be reduced thanks to re-assignment to other trunks. A stronger reduction would derive from pricing policies (Q1c): in many regions in Austria, Germany, Denmark, Ireland and UK and in some peripheral areas hit by rise in transport cost. But also new infrastructure provision could reduce the related externalities (Q1b): this is visible in many northern countries, in Germany and also in the Iberian peninsula.

Impacts on emissions are mapped in Q2a (Map 5.2.1.8.): they are not huge but pervasive in the Baseline Scenario, being positive only in many German and Dutch areas and in some regions in southern Italy. Enlargement of the network generates some even robust increases, especially in Spain and Poland. In the Enhanced Infrastructure Scenario (Q2b), some new benefits are forecasted, mainly in old Member States but rarely in eastern countries, thanks to the hypothesis of relevant improvements in fuel efficiency of vehicles, while in the regulatory, Pricing Scenario, these benefits would appear pervasive and mostly visible in Spain, Portugal, central Italy and Poland (Q2c) (Map 5.2.1.9.).

Map 5.2.1.8.



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Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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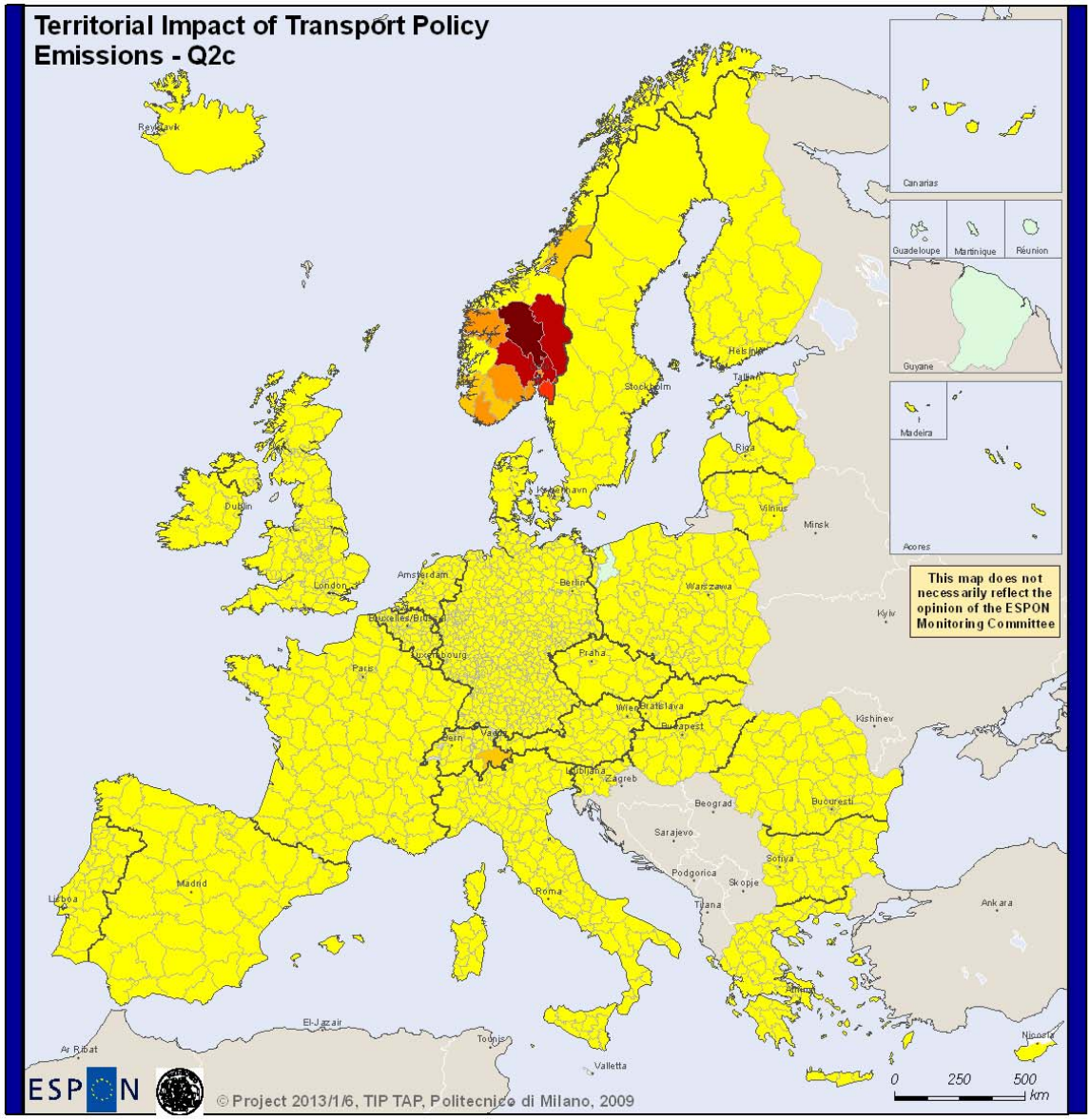
Legend

NA	
	-1.1062 - -0.9482
	-0.9481 - -0.7901
	-0.7900 - -0.6321
	-0.6320 - -0.4741
	-0.4740 - -0.3161
	-0.3160 - -0.1580
	-0.1579 - 0.0000
	0.0001 - 0.1580

Map 5.2.1.9.


Territorial Impact of Transport Policy
Emissions - Q2c
Reykjavik
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
Helsinki
Tallinn
Stockholm
Riga
Kobenhavn
Dublin
Vilnius
Minsk
Amsterdam
London
Berlin
Warszawa
Bruxelles/Brussel
Luxembourg
Praha
Paris
Kyiv
Wien
Bratislava
Budapest
Kishinev
Bern
Vaduz
Ljubljana
Zagreb
Beograd
Bucuresti
Sarajevo
Sofiya
Podgorica
Skopje
Tirana
Madrid
Lisboa
Roma
Ankara
El Jazair
Ar Rabat
Tunis
Valletta
Nicosia
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0 250 500 km
EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE
Legend
NA
0.0000 - 0.0092
0.0093 - 0.0183
0.0184 - 0.0275
0.0276 - 0.0367
0.0368 - 0.0458
0.0459 - 0.0550
0.0551 - 0.0642
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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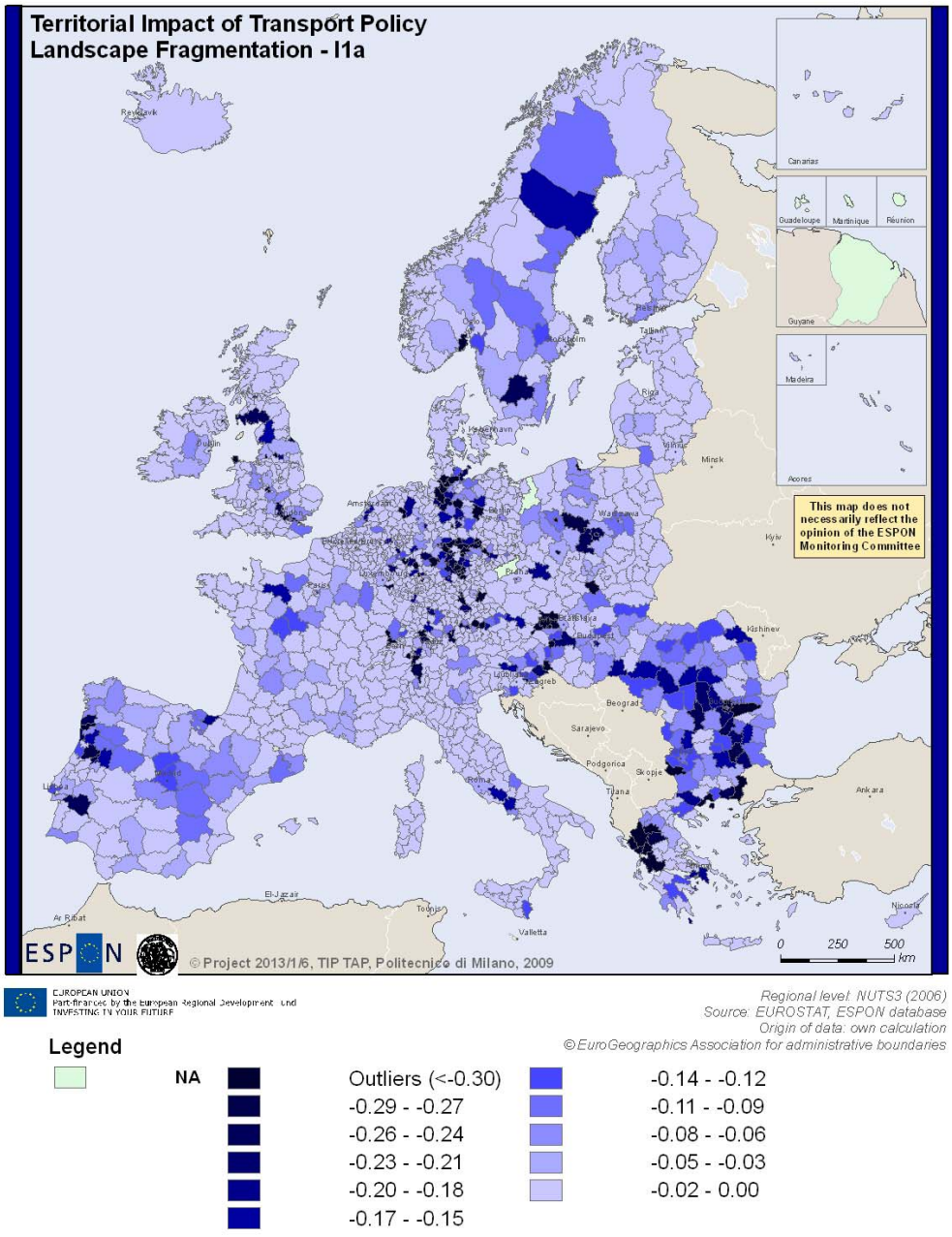
5.2.1.e Impacts on landscape and local identities.

Landscape fragmentation and exposure to external visitors (I1 and I2) are the main impact indicators in this case. An increase in landscape fragmentation in the Baseline Scenario (I1a) will mainly happen in countries where most infrastructure will be built, and namely in Spain, Ireland, central Britain and along a large cross inside Poland (Map 5.2.10.). Adding new infrastructure will generate damage in almost all regions (I1b).

Map 5.2.1.10.



Excessive exposure to external visitors, determining huge negative externalities to resident population and possibly to its cultural identity will hit mainly old Member countries, but also many capital cities in new Member countries (Warszawa, Praha, Budapest, Bucuresti, Sofiya, Tallinn and Riga) (I2a). Pricing would not change much this situation, though reducing it a little especially in large eastern capitals (I2c), while new infrastructure would multiply and possibly diffuse the phenomenon throughout almost the entire territory (I2b).

5.2.2. Calculating summative territorial impacts

Let's analyse now the results of the weighted averaging of single dimension impacts, in order to build summative impacts: on territorial efficiency, quality, identity and the general impact (overall Summative Impact). Concerning the weights, the same indications given in sect. 2.2.6 hold in this case: they were defined in two ways, through experts meetings, and through the questionnaire delivered during the 2009 ESPON meeting in Praha..

In the case of transport policy, the weights change with respect to CAP, as the impact criteria necessarily change. According to previous Table 1, they are defined as follows according to experts judgement:

- concerning the weight of the three macro-criteria, territorial efficiency scores 43% (still the highest, but with a lower weight with respect to CAP policy), territorial identity comes second with 30% and territorial quality third with 27%;
- inside territorial efficiency, the most important score is given to economic growth (54%), the other criteria ranging between 18% (congestion and network productivity) and 10% (airport productivity);
- inside territorial quality, the maximum score is given to safety (35%), around 25% is given to emissions and market opportunities, 16% to through traffic;
- inside territorial identity, the maximum score is attributed to landscape fragmentation (45%), followed by exposure to external visitors (38%) and by regional integration (17%).

In Figures 5.2.2.1., 5.2.2.2. and 5.2.2.3 the spreadsheets concerning synthetic summative impacts are presented for the Baseline Scenario, the Infrastructure Scenarioand the Pricing Scenario.

Impacts on territorial efficiency in the baseline scenario (TEa) show up generally positive throughout the EU, more pervasively in eastern countries and Germany, but negative signs appear in those areas where congestion costs are higher. The picture does not change much in the Infrastructure Scenario (TEb) but changes in the Pricing scenario (TEc) where many punctual strong positive impacts show up, particularly in UK and in more congested areas like the capitals and big city regions (Map 5.2.2.1). The general synthetic value for this impact is negative (-0,01: see Fig. 5.2.2.1), but it increases slightly in the Infrastructure Scenario (+0,005) and more in the Pricing Scenario (+0,023). This last result is mainly linked to the fact that in the Pricing Scenario a relevant reduction in congestion is achieved (synthetic impact + 0,17), which counterbalances the negative impacts on GDP per capita and productivity of infrastructure (Table. 5.2.2.1).

Figure 5.2.2.1. Spreadsheet of TEQUILA2 on Transport policy – Baseline scenario: weights and summative impacts.

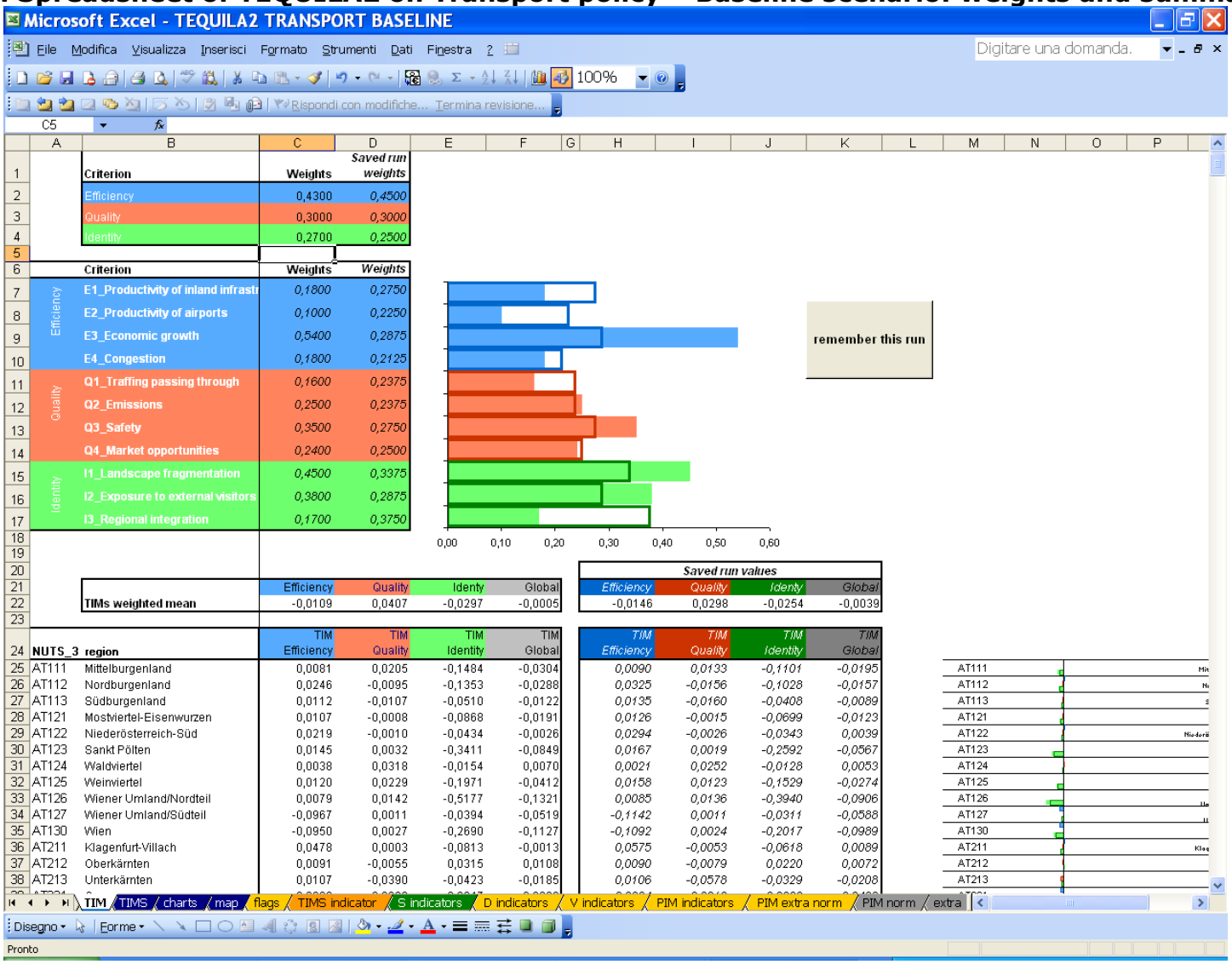


Figure 5.2.2.2. Spreadsheet of TEQUILA2 on Transport policy – Infrastructure scenario: weights and summative impacts.

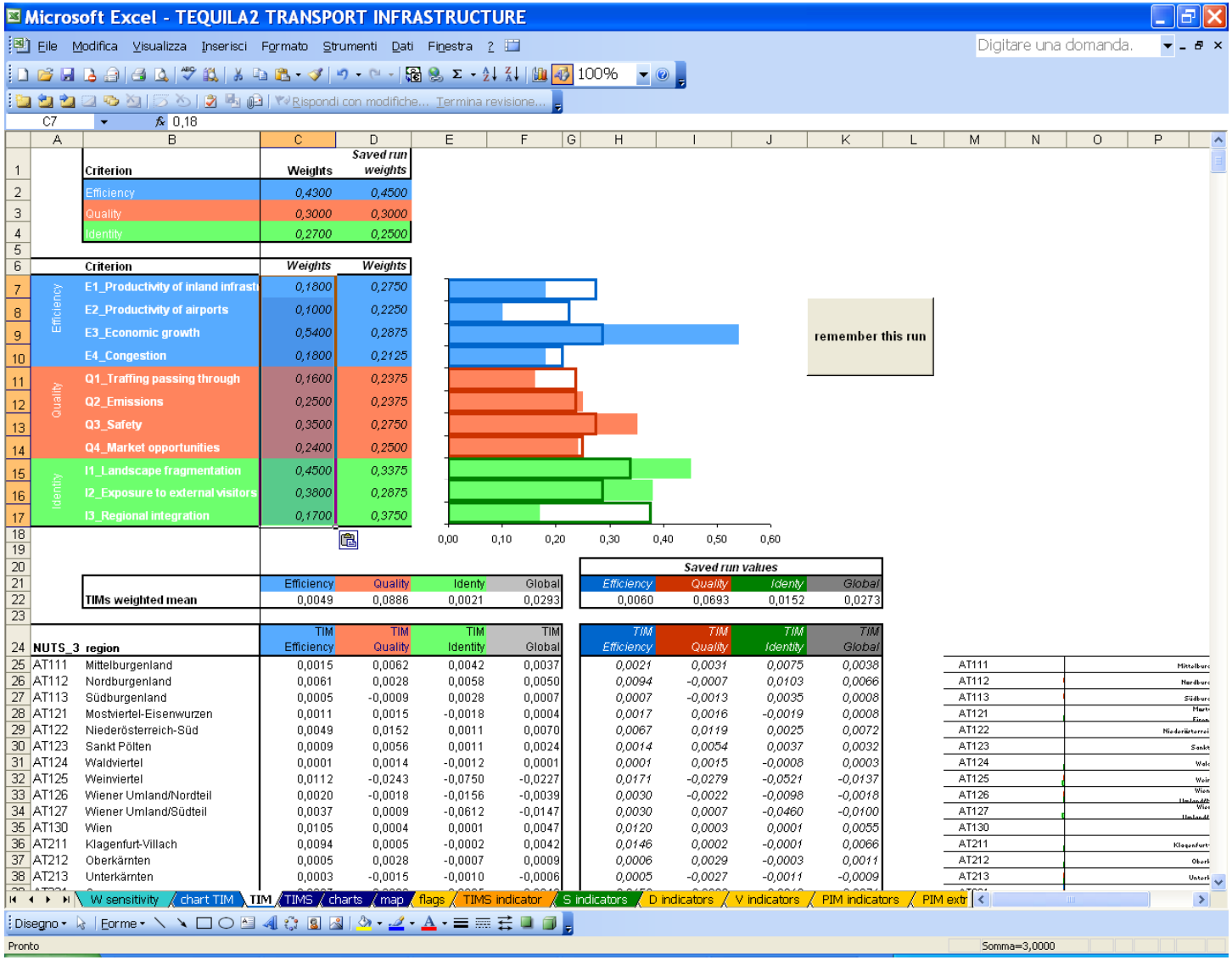
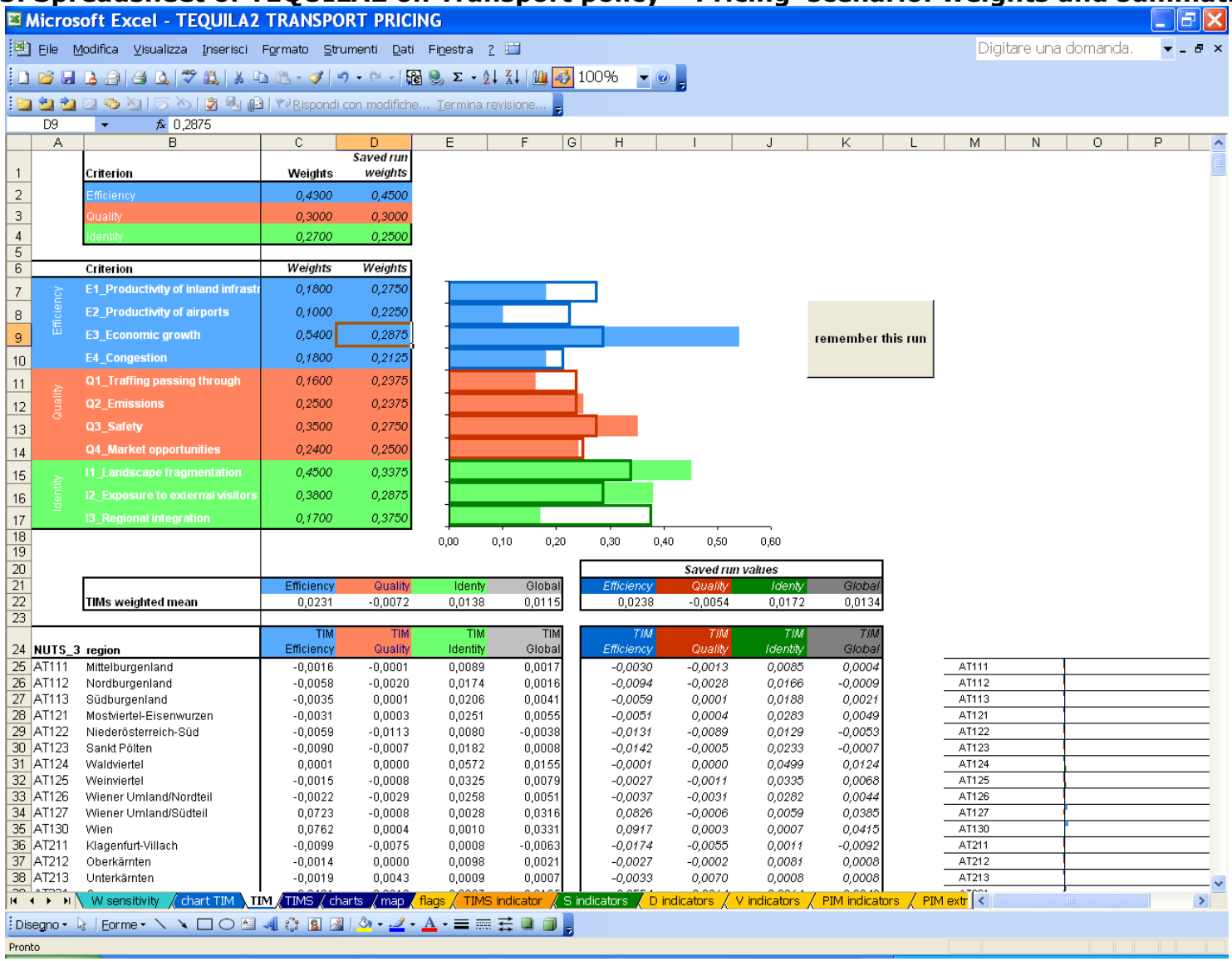
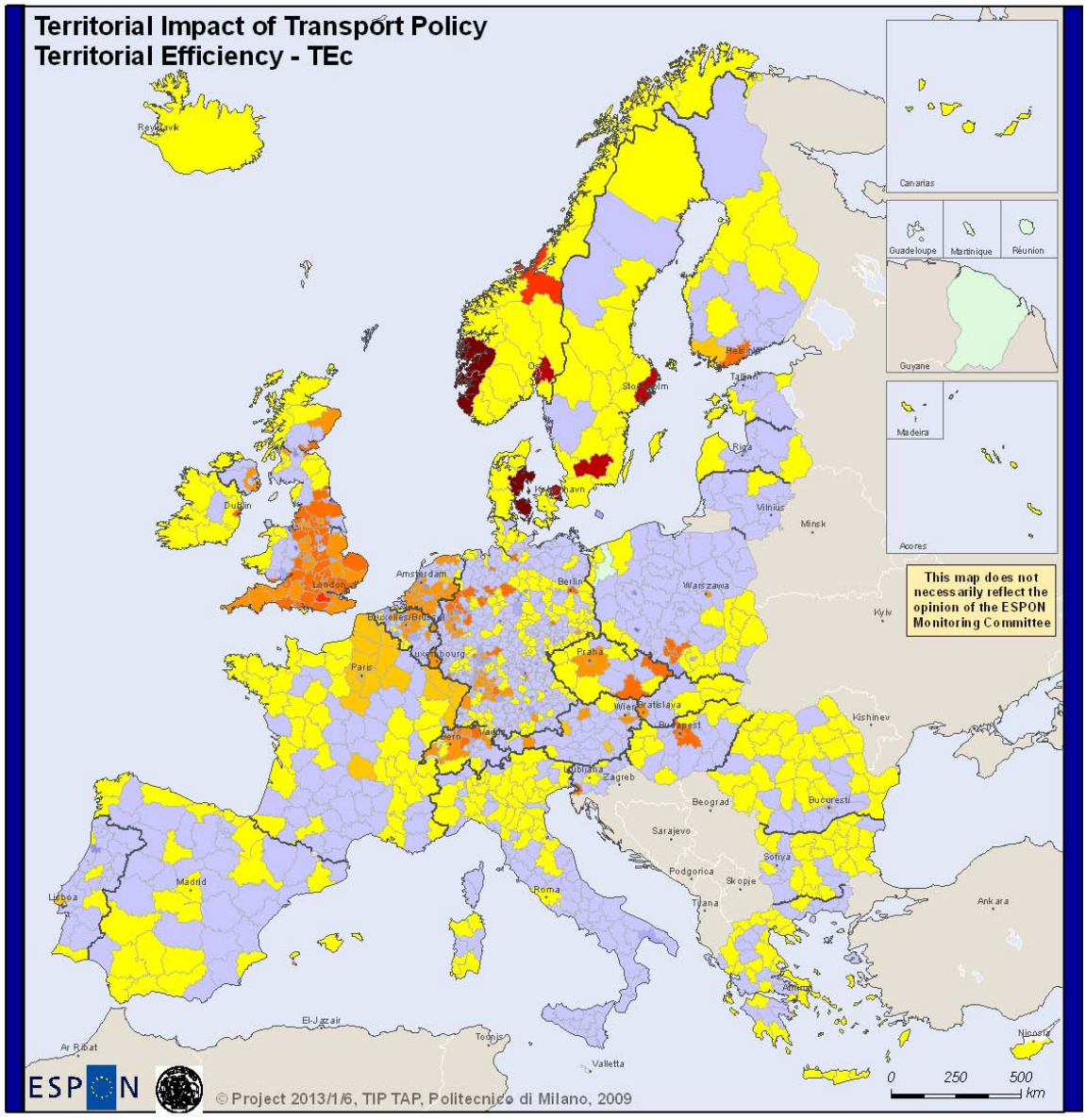


Figure 5.2.2.3. Spreadsheet of TEQUILA2 on Transport policy – Pricing scenario: weights and summative impacts.



Map 5.2.2.1.


Territorial Impact of Transport Policy
Territorial Efficiency - TEc
Canarias
Guadeloupe
Martinique
Réunion
Guyane
Madeira
Acores
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ESPON
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0 250 500 km
EUROPEAN UNION
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INVESTING IN YOUR FUTURE
Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
© EuroGeographics Association for administrative boundaries
Legend
NA
-0.15 - -0.14
-0.13 - -0.12
-0.11 - -0.09
-0.08 - -0.06
-0.05 - -0.03
-0.02 - 0.00
0.01 - 0.03
0.04 - 0.06
0.07 - 0.09
0.10 - 0.12
0.13 - 0.14
0.15 - 0.17
0.18 - 0.20

Impacts on territorial quality are generally positive in the baseline scenario (TQa) throughout the EU regions, with some exceptions along the entire eastern border of the Union. Also the synthetic impact (weighted average along all regions) is, counter-intuitively positive (+0,040): this result is mainly due to the very positive score of the safety indicator (+0,137) and the positive score of the market opportunity indicator (0,011) which counterbalance the negative scores reached in the through traffic and emissions criteria (Table 10). The Infrastructure scenario adds new positive impacts on territorial quality (+0,088), mainly located in eastern countries (TQb) still thanks to the increase in benefits on safety (+0,25), while the Pricing scenario shows a slightly negative impact with respect to the Baseline scenario mainly due to a slight negative (and counterintuitive) impact on safety (-0,022).

Impact of transport policy on territorial identity (TIa) looks negative (-0,029), mainly due to a relevant negative impact on landscape fragmentation (-0,056). This last effect remains somehow negative in the Infrastructure Scenario (TIb), but it is more than counterbalanced by a positive impact on intra-regional integration (+0,055), showing up mainly in Romania, Bulgaria and in some regions of Germany and the other eastern countries. Under the Pricing Scenario (TIc), no relevant impacts will be felt on the landscape criterion, but positive impacts are revealed on external visitors and regional integration; the general outcome on the territory is a widespread positive impact, especially visible in New Member countries and in northern and central Old Member countries.

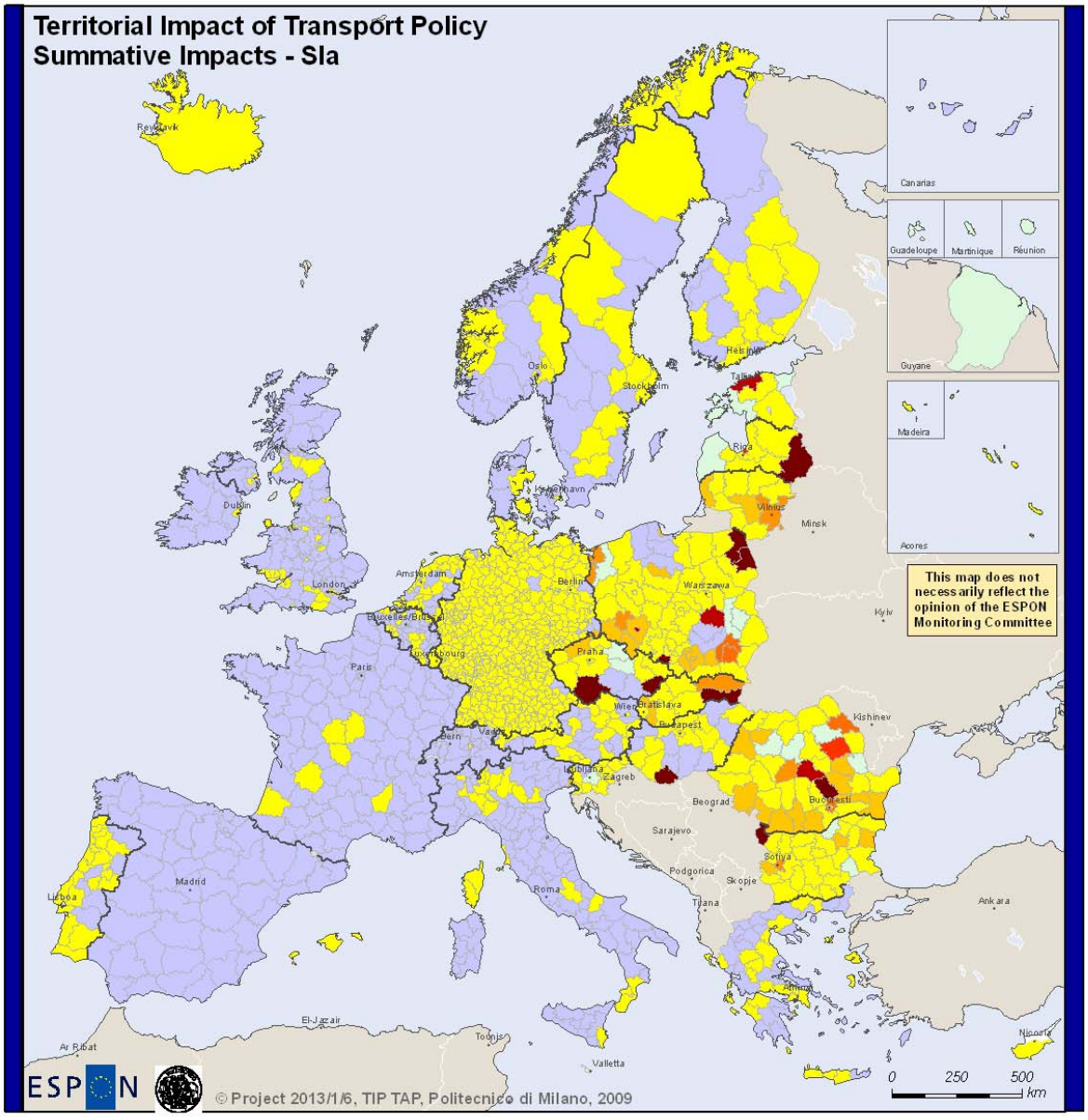
Table 5.2.2.1. Transport policy: Synthetic impacts on all regions by criterion and scenario

(Macro)-Criterion	Transport-Baseline	Transport-Infrastructure	Transport-Pricing
E1 – Productivity of inland transport infrastructure	0,0496	0,0252	-0,0412
E2 – Productivity of airports	0,0462	-0,0127	-0,0083
E3 – Economic growth	0,0277	0,0000	-0,0001
E4 – Congestion costs	-0,2191	0,0089	0,1744
Q1 – Traffic passing through	-0,0146	-0,0051	0,0019
Q2 – Emissions	-0,0308	0,0002	0,0005
Q3 – Safety	0,1372	0,2530	-0,0219
Q4 – Market opportunities	0,0114	0,0034	0,0002
I1 – Landscape fragmentation	-0,0563	-0,0154	0,0000
I2 – Exposure to external visitors	-0,0060	-0,0008	0,0241
I3 – Regional integration	-0,0123	0,0550	0,0272
TE – Territorial Efficiency	-0,0109	0,0049	0,0231
TQ – Territorial Quality	0,0407	0,0886	-0,0072
TI – Territorial identity	-0,0297	0,0021	0,0138
SI – Summative impact	-0,0005	0,0293	0,0115

Summative Impact, considering all the macro-criteria, shows a very weak negative sign in the Baseline Scenario, but the sign becomes visibly positive in the Pricing and more so in the Infrastructure Enhancement scenario. Looking at maps, the Baseline scenario (SIa) looks generally positive for eastern countries, northern Sweden and southern Italy, and for many northern and southern regions in Spain. In the other cases, the result is slightly negative (Map 5.2.2.2.). The Infrastructure scenario (SIb) adds robust positive impacts to almost all regions in eastern countries, plus the almost entire Germany, parts of Portugal and Denmark. The Pricing Scenario (SIc) enlarges further these positive impacts westward, particularly towards southern Sweden, Holland, England, northern and eastern France, the Po valley in Italy.

A different weighting system was prepared using the questionnaire delivered to attendants of the ESPON Prague seminar (49 responses).

Map 5.2.2.2.



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NA	
	-0.05 - 0.00
	0.01 - 0.09
	0.10 - 0.18
	0.19 - 0.27
	0.28 - 0.36
	0.37 - 0.45
	0.46 - 0.54
	0.55 - 0.63

Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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The table below provides the weighting system of different professional groups (e.g. policy makers, civil servants, academics and practitioners). Interviewees were asked to provide us with their policy priorities by taking both a European and a national approach.

Table 5.2.2.2. Preferences concerning relevance of policy goals - TRANSPORT policies

	EXPERTS	Policy makers		Publi Officials		Academics		Practitioners	
		EU View	National View	EU	National View	EU	National View	EU	National View
TE[44]	47	45,00	42,50	49,16	46,66	39,75	36,50	39,00	39,00
TQ	30	30,00	33,75	31,31	33,81	36,75	38,00	34,00	34,00
TI	23	25,00	23,75	19,52	19,52	23,50	25,50	26,86	26,86
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
E1	18	27,50	31,25	28,08	28,57	27,50	28,50	26,67	30,83
E2	10	22,50	21,25	23,46	21,79	20,75	21,25	18,33	14,17
E3	54	28,75	28,75	32,69	30,36	31,75	31,75	35,00	35,00
E4	18	21,25	18,75	15,77	19,29	20,00	18,50	16,67	18,33
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
Q1	16	23,75	22,50	23,46	27,86	22,75	25,50	20,83	23,33
Q2	25	23,75	26,25	29,23	24,29	32,00	28,75	35,00	33,33
Q3	35	27,50	25,00	20,77	22,50	20,75	19,75	18,33	20,00
Q4	24	25,00	26,25	26,54	26,07	24,00	25,50	25,83	23,33
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
I1	45	33,75	35,00	27,69	30,71	38,17	42,42	45,00	40,00
I2	38	28,75	27,50	23,08	23,93	24,92	25,42	24,17	27,50
I3	17	37,50	37,50	49,23	43,21	36,42	32,17	30,83	32,50
	100	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

Concerning the weights of the macro-criteria, the preferences of policy makers (with a European point of view) are very similar and consistent with the experts view; they are also very similar across the different positions of the respondents. On the other hand, inside Territorial Efficiency the (transport) experts gave a much higher preference to impact on GDP (E3: 54%) than policy makers and other respondents (who indicated the interval 28%-32%); similarly they gave higher weights to safety (Q3) and to landscape fragmentation (I1), but the differences are lower in these cases.

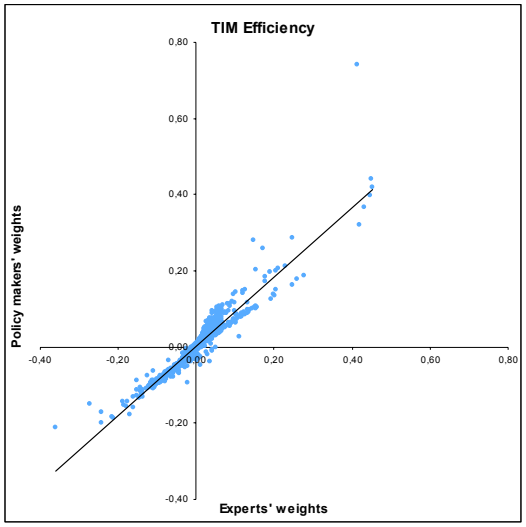
Table 5.2.2.3 shows and compares the average summative impacts in the three scenarios obtained by adopting the policy makers' weighting system and those using the expert's weighting system. The results are quite similar, and this similarity is confirmed comparing previous Map 5.2.2.2 with Map 5.2.2.3 (Summative Impacts using policy makers weights), and looking at correlation between single scores (Fig. 5.2.2.4, 5.2.2.5 and 5.2.2.6 for the Baseline, infrastructure and Pricing scenarios respectively).

Table 5.2.2.3. Average summative impacts according to policy makers' and experts' weights

	EXPERTS' WEIGHTS			POLICY MAKERS' WEIGHTS		
	BASELINE	INFRASTRUCTURE	PRICING	BASELINE	INFRASTRUCTURE	PRICING
TE	-0,0109	0,0049	0,0231	-0,0146	0,0060	0,0238
TQ	0,0407	0,0886	-0,0072	0,0298	0,0693	-0,0054
TI	-0,0297	0,0021	0,0138	-0,0254	0,0152	0,0172
SI	-0,0005	0,0293	0,0115	-0,0039	0,0273	0,0134

[44] The structure of the questionnaire was such that the interviewees were asked to assess the relative importance of TE, TQ and TI only once; the weight for the macro criteria are thus necessarily the same for Transport policies and CAP policies.

Figure 5.2.2.4. Correlation between impacts on Territorial efficiency in two weighting systems (experts' and policy makers') – Baseline Scenario



Figures 5.2.2.4 to 5.2.2.6 capture synthetically the differences between the impacts on Territorial Efficiency in each NUTS3 region according to Experts' weights (Y axis) and Policy makers' weights (X axis) respectively, in three different policy scenarios. The degree of correlation is pretty high, and Experts evaluate Territorial Efficiency very closely to Policy makers (the intercept is in the origin of the axes); this is consistent with the similar weight they attribute to Territorial Efficiency impact indicators.

Figure 5.2.2.5. Correlation between impacts on Territorial efficiency in two weighting systems (experts' and policy makers') – Infrastructure Scenario

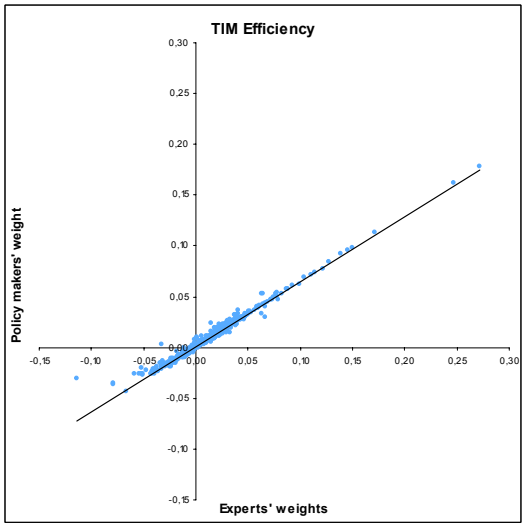
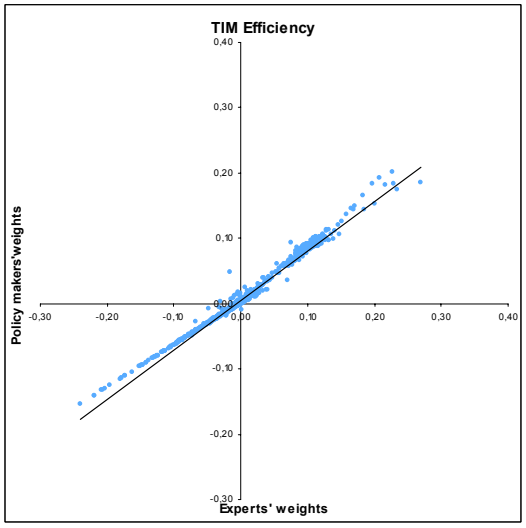
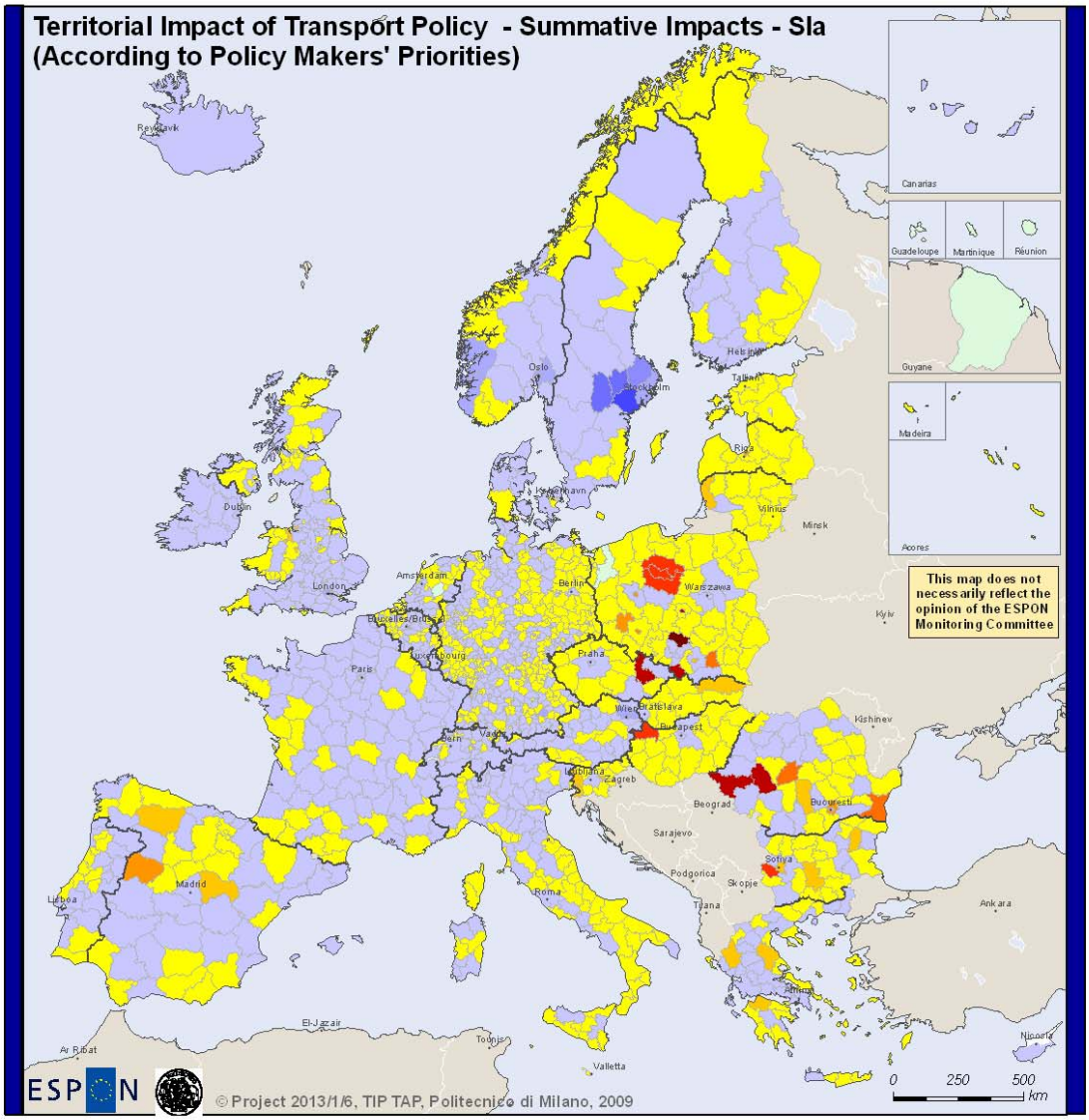


Figure 5.2.2.6. Correlation between impacts on Territorial efficiency in two weighting systems (experts' and policy makers') – Pricing Scenario



Map 5.2.2.3.



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Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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Legend

NA	-0.37 - -0.36
	-0.35 - -0.27
	-0.26 - -0.18
	-0.17 - -0.09
	-0.08 - 0.00
	0.01 - 0.09
	0.10 - 0.18
	0.19 - 0.27
	0.28 - 0.36
	0.37 - 0.45
	0.46 - 0.54
	0.55 - 0.63

5.2.3. Calculating single dimension and summative impacts at national and European level

Following the 3-level approach proposed by ESPON, the TEQUILA 2 model also enables to compute single dimension and summative impacts both at the national and European level, as averages of regional impacts. Table 5.2.3.1 provides these figures, in the case of the Baseline Scenario and the experts weighting pattern.

Within Territorial efficiency, single dimension impacts E1, E2 and E3 (productivity of infrastructure and economic growth) are positive in all countries (with just a few minor exceptions) and, thus, also at the EU level. Differently, E4 (congestion) is negative and in general takes on values of rather high magnitude, somehow counter-balancing the effect of the others: in fact, summative TE shows positive values only in a few countries, mainly New Members, but negative in all western countries. As already said, the impact on TE in the EU is negative.

Within Territorial quality, single dimension impacts Q1 and Q2 (through traffic and emissions) are generally negative in all countries while Q3 and Q4 (safety and market opportunities) are positive in all countries, and the respective EU impact values behave accordingly. As a consequence of this, TQ shows positive values in several countries as well as at the EU level.

Within Territorial identity, single dimension impacts I3 and I2 (internal integration and exposure to external visitors) are negative in several countries and at the EU level; I1 (landscape fragmentation) is negative in all countries and the EU levels. As a consequence, TI shows negative values in almost all countries as well as at the EU level.

Finally, as of SI, all Old Member countries are negatively affected by the policy scenario considered, while all New Member countries are positively affected mainly thanks to both a positive impact on Territorial Efficiency and on Territorial Quality. Given the different demographic and economic weight of the two types of countries, the SI shows a negative sign at the EU level.

5.2.4. Calculating single dimension and summative impacts of urban and rural areas

Different types of regions are differently affected by the policy scenario considered in this study. Considering as usual the Rural/Intermediate/Urban typology, in most cases the signs of the single-dimension impacts do not change across the three classes, and impacts on urban and rural regions are pretty similar. On the other hand, impacts on intermediate regions almost invariably show much higher (absolute) values of the impacts.

As far as Summative impacts are concerned, rural areas are the sole category with a positive impact on Territorial Efficiency in the Baseline scenario; intermediate regions show a strong positive impact on both the Baseline and Infrastructure scenario on Territorial Quality, in contrast with the other classes; and urban areas are the only category with a negative Summative impact in the Baseline scenario.

These results ultimately suggest that no remarkable differences in impacts can be detected between different types of regions (Table 5.2.3.1).

Table 5.2.3.1. Transport policy: Average impacts by country (Baseline scenario)

	E1	E2	E3	E4	Q1	Q2	Q3	Q4	I1	I2	I3	TE	TQ	TI	SI
EU	0,049	0,046	0,027	-0,218	-0,014	-0,031	0,134	0,012	-0,056	-0,006	-0,013	-0,011	0,040	-0,030	-0,001
AT	0,037	0,008	0,008	-0,214	-0,026	-0,003	0,012	0,007	-0,191	-0,053	-0,006	-0,027	0,001	-0,107	-0,040
BE	0,078	0,051	0,008	-0,289	-0,029	-0,001	0,012	0,016	0,000	-0,065	-0,003	-0,028	0,003	-0,025	-0,018
BG	0,053	0,010	0,058	-0,012	0,108	-0,067	0,309	0,030	-0,122	0,036	-0,066	0,040	0,116	-0,053	0,038
CH	0,016	0,091	0,004	-0,279	-0,011	-0,001	0,004	0,007	-0,044	-0,001	-0,003	-0,036	0,001	-0,021	-0,021
CY	0,000	0,048	0,003	-0,377	0,000	0,000	0,000	0,000	0,000	0,000	0,000	-0,062	0,000	0,000	-0,026
CZ	0,044	0,021	0,093	-0,323	-0,004	-0,059	0,465	0,044	-0,024	0,024	-0,019	0,002	0,158	-0,005	0,047
DE	0,058	0,022	0,010	-0,213	-0,005	0,000	0,023	0,009	-0,077	-0,017	-0,004	-0,020	0,009	-0,042	-0,017
DK	0,005	0,015	0,006	-0,464	-0,001	0,000	0,000	0,026	-0,005	-0,003	0,003	-0,078	0,006	-0,003	-0,032
EE	0,167	-0,038	0,270	-0,060	-0,001	-0,044	0,000	0,013	0,000	0,007	-0,067	0,161	-0,008	-0,009	0,065
ES	0,007	0,033	0,008	-0,099	-0,002	-0,086	0,144	0,004	-0,057	-0,044	0,009	-0,009	0,030	-0,041	-0,006
FI	0,003	0,188	0,011	-0,416	-0,007	-0,008	0,024	0,003	-0,033	-0,002	0,000	-0,049	0,006	-0,015	-0,024
FR	0,010	0,120	0,002	-0,264	-0,001	-0,003	0,008	0,004	-0,019	-0,020	-0,003	-0,032	0,003	-0,017	-0,018
GR	0,009	0,010	0,012	-0,126	-0,017	-0,007	0,157	0,002	-0,137	-0,017	0,004	-0,014	0,051	-0,068	-0,009
HU	0,038	0,001	0,072	-0,227	-0,015	-0,033	0,328	0,023	-0,084	0,105	-0,031	0,005	0,109	-0,003	0,034
IE	0,018	0,019	0,003	-0,164	-0,001	-0,013	0,009	0,003	-0,021	-0,008	-0,014	-0,023	0,000	-0,015	-0,014
IS	0,012	0,021	0,009	-0,088	-0,001	-0,004	0,026	0,006	-0,016	-0,004	0,000	-0,007	0,009	-0,009	-0,002
IT	0,000	0,014	0,002	-0,046	0,000	0,000	0,000	0,001	0,000	-0,002	0,000	-0,006	0,000	-0,001	-0,003
LI	0,002	0,107	0,016	-0,345	0,000	0,000	0,000	0,001	0,000	0,000	0,000	-0,043	0,000	0,000	-0,018
LT	0,162	-0,004	0,172	-0,006	-0,018	-0,125	0,256	0,016	-0,012	0,034	0,005	0,120	0,059	0,008	0,072
LU	0,011	0,099	0,004	-0,468	0,000	-0,028	-0,001	0,006	-0,031	-0,004	0,000	-0,070	-0,006	-0,015	-0,036
LV	0,452	-0,024	0,206	-0,013	-0,005	-0,041	-0,009	0,051	0,000	0,011	-0,055	0,188	-0,002	-0,005	0,079
MT	0,000	0,003	0,023	-0,018	0,000	0,000	0,000	0,005	0,000	-0,005	0,000	0,009	0,001	-0,002	0,004
NL	0,025	0,068	0,004	-0,303	-0,003	0,000	0,001	0,014	-0,027	-0,020	0,001	-0,041	0,003	-0,020	-0,022
NO	0,002	-0,199	0,066	-0,379	0,001	-0,047	0,002	0,005	-0,050	-0,052	-0,033	-0,052	-0,010	-0,048	-0,038
PL	0,174	0,025	0,104	-0,114	-0,024	-0,166	0,707	0,041	-0,072	0,048	-0,048	0,070	0,212	-0,022	0,088
PT	0,024	0,009	0,017	-0,071	-0,006	-0,004	0,052	0,004	-0,124	-0,046	0,014	0,002	0,017	-0,071	-0,013
RO	0,072	0,039	0,079	-0,050	-0,005	-0,069	0,621	0,012	-0,110	0,052	-0,094	0,050	0,202	-0,046	0,070
SE	0,001	0,052	0,035	-0,198	-0,656	-0,023	0,022	0,009	-0,067	-0,047	0,012	-0,011	-0,101	-0,046	-0,047
SI	0,147	0,164	0,160	-0,173	-0,058	-0,019	0,045	0,048	-0,109	0,071	-0,052	0,098	0,014	-0,031	0,038
SK	0,081	0,035	0,100	-0,123	-0,007	-0,062	0,243	0,025	-0,042	0,068	-0,014	0,050	0,074	0,004	0,045
UK	0,064	0,089	0,007	-0,485	-0,001	-0,008	0,017	0,005	-0,059	-0,014	-0,015	-0,063	0,005	-0,034	-0,035

Table 5.2.4.1. Transport policy: Average impacts by type of regions and scenario

	Urban			Intermediate			Rural		
	Scenario a	Scenario b	Scenario c	Scenario a	Scenario b	Scenario c	Scenario a	Scenario b	Scenario c
TIM_E1	0,0670	0,0282	-0,0686	0,3133	0,1788	-0,2086	0,0293	0,0219	-0,0125
TIM_E2	0,0409	-0,0058	0,0028	0,5896	-0,2086	-0,1911	0,0068	-0,0016	-0,0026
TIM_E3	0,0136	0,0000	0,0000	0,3106	0,0006	-0,0010	0,0337	0,0000	-0,0001
TIM_E4	-0,3295	0,0198	0,2729	-1,6825	0,0071	1,2420	-0,0116	0,0014	0,0098
TIM_Q1	-0,0012	-0,0003	-0,0001	-0,0038	-0,0127	-0,0021	-0,0642	-0,0214	0,0100
TIM_Q2	-0,0165	0,0001	0,0002	-0,3220	0,0020	0,0039	-0,0425	0,0004	0,0009
TIM_Q3	0,0376	0,0628	-0,0148	2,1687	4,2259	-0,2945	0,0773	0,1277	-0,0054
TIM_Q4	0,0103	0,0004	-0,0007	0,0495	0,0175	0,0028	0,0238	0,0117	0,0016
TIM_I1	-0,0704	-0,0110	0,0000	-0,3007	-0,1014	0,0000	-0,0629	-0,0276	0,0000
TIM_I2	-0,0107	0,0002	0,0026	-0,0562	-0,0037	0,0734	0,0038	-0,0028	0,0949
TIM_I3	-0,0074	0,0154	0,0181	-0,0574	0,3905	0,1821	-0,0330	0,1521	0,0540
TE	-0,0358	0,0081	0,0370	-0,0198	0,0129	0,1664	0,0220	0,0040	-0,0008
TQ	0,0113	0,0220	-0,0053	0,6898	1,4817	-0,1018	0,0119	0,0442	0,0003
TI	-0,0370	-0,0022	0,0041	-0,1664	0,0193	0,0588	-0,0325	0,0124	0,0453
SI	-0,0220	0,0095	0,0154	0,1535	0,4553	0,0569	0,0043	0,0183	0,0120

5.2.5. The FLAG model

The main purpose of the Flag Model, developed by Nijkamp, Ouwersloot and Vreeker (Nijkamp and Ouwersloot, 1997; Nijkamp and Vreeker, 2000), is to analyse whether one or more policy alternatives can be classified as acceptable/sustainable or not, in terms of their regional impact. Its use inside the Tequila 2 model concerns the possibility of computing "summative" impacts of some policy, allowing a weighted averaging and consequently compensation among impacts on different criteria. If (negative) impact on one criterion exceeds a certain threshold, compensation with a more favourable impact on another criterion should be excluded. The Flag Model does so by comparing impact values with a set of reference values (labelled as Critical Threshold Values in the model).

The FLAG model is applied to the Transport policy for a subset of indicators, namely concerning impacts on Congestion, Safety and Emissions. For each indicator a critical threshold value (benchmark value) was established[45] through experts' consultation. Thresholds are determined as follows:

a. Congestion: when the number of hours driving under congestion conditions is greater than 3,5 hours per day, this is not considered acceptable. Regions exceeding this threshold are accordingly 'flagged';
b. Safety: when it worsens as a consequence of policy interventions, this is not considered tolerable. The threshold value is thus stability at the present level (0% decrease); regions exceeding this threshold are accordingly 'flagged';
c. Emissions: the limit to emissions is defined once again in the absence of increases compared with the present condition. This limit is strict (but looser with respect to the Kyoto engagement on reductions), and partly unfair with respect to regions with low present emissions (as a consequence of virtuous behaviour or low car ownership rate). Therefore it was decided to establish three levels of "flagging": yellow flag, withincreases between 0 and 50%, orange flag with increases between 50% and 100%, and red flag with increases beyond 100%.

In the case of congestion, as the threshold is defined in physical terms (hours), the impact values that were used are the PIMs – potential impacts – translated into "levels" (while in the model they are expressed as "icreases"). Also in the other two cases, the PIMs were used, with no consideration of desirability or vulnerability elements, in order to keep the analysis more neutral and based only on forecasts of physical elements.

Map 5.2.5.1 shows the 'flagged' regions in the case of congestion indicator in the baseline scenario. Alert situations are primarily clustered in a few regions: inside the Greater London area, in some areas in Wales (Bristol and Cardiff), in Greater Manchester, Liverpool and Merseyside in UK; in the Stuttgart and Tübingen areas in the Baden-Württemberg Land in Germany; in the Bergamo, Treviso and Venice provinces along the main transportation axis in Northern Italy plus in the Bologna-Florence link; in the wider Budapest metro area, and in the Goriska-Koper area in Slovenia.

[45] An important problem faced in practice is the fact that a benchmark value is not always unambiguous; in different areas and under certain circumstances different experts and decision-makers may have different perspectives on the precise level of a CTV.

Map 5.2.5.2 shows the 'flagged' regions in the case of the Safety indicator in the baseline scenario. The main alert situations concern a large part of central England, from London along the main western and northern corridors, and southern Scotland; many regions in Holland and Germany (Munich, Frankfurt, Bremen, many cities in Nordrhein-Westfalen like Köln and Bonn); the Paris rings and Le Havre; Stockholm and some other regions in Sweden; many regions in Switzerland (Bern, Neuchâtel and Zürich); the Porto area in Portugal; some scattered regions in the Eastern European Countries.

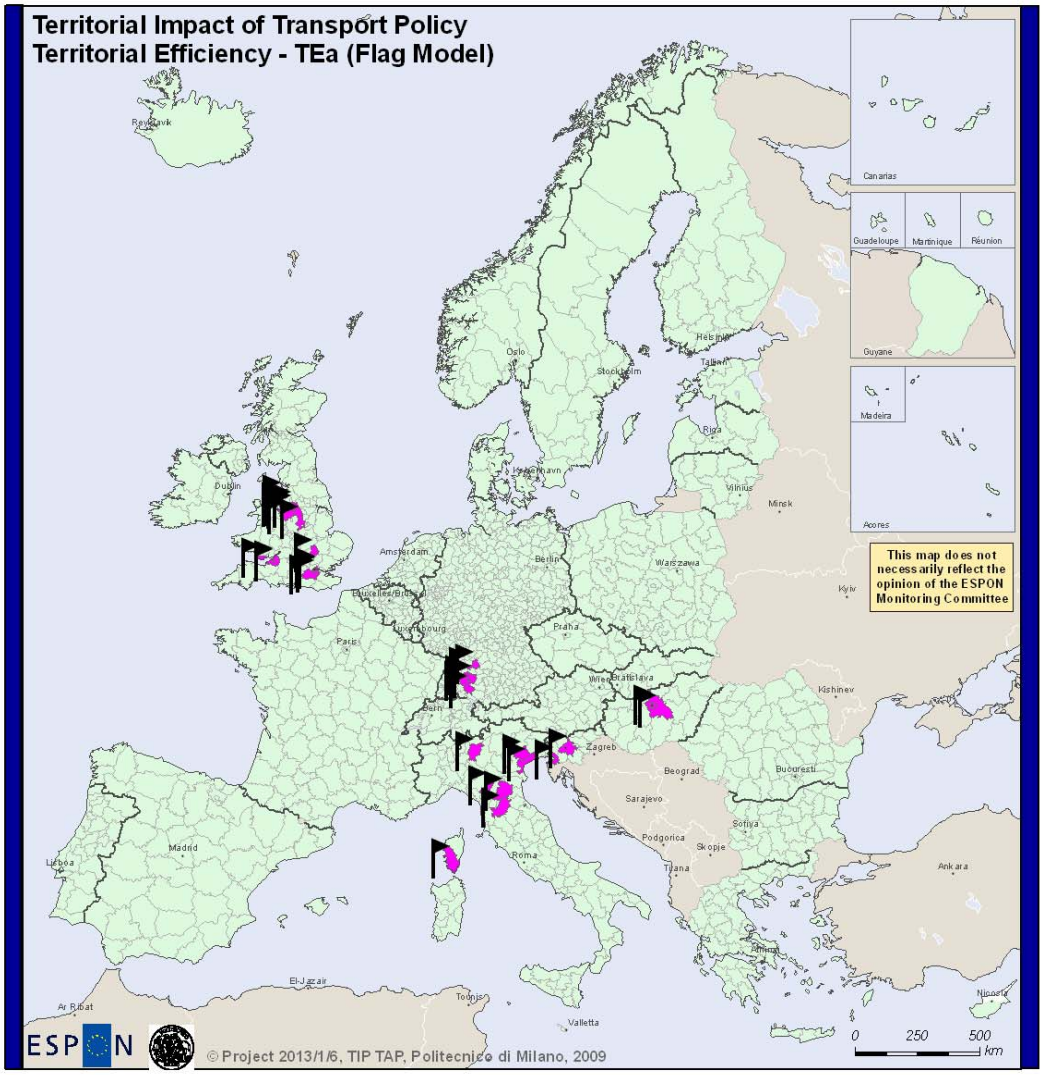
In all these cases, a summative territorial impact allowing compensations among different impacts should not be allowed.

We kept the emissions case separated, due to the peculiar situation which is showing up. In fact, almost all European regions – with just a few exception in central Germany and southern Italy – will overcome the threshold assumed, namely the present condition, in the baseline scenario (Map. 5.2.5.3). Main western countries, together with Czechia, Slovakia, Slovenia and Hungary, will remain inside the limit of +50%, but Poland and the Baltic Republics will go beyond this limit and especially Romanian and Bulgarian regions will overcome the 100% increase. Critical conditions are also apparent in Dublin and southern Ireland, in South-western Sweden from Malmö to Gothenburg, and in northern Greece.

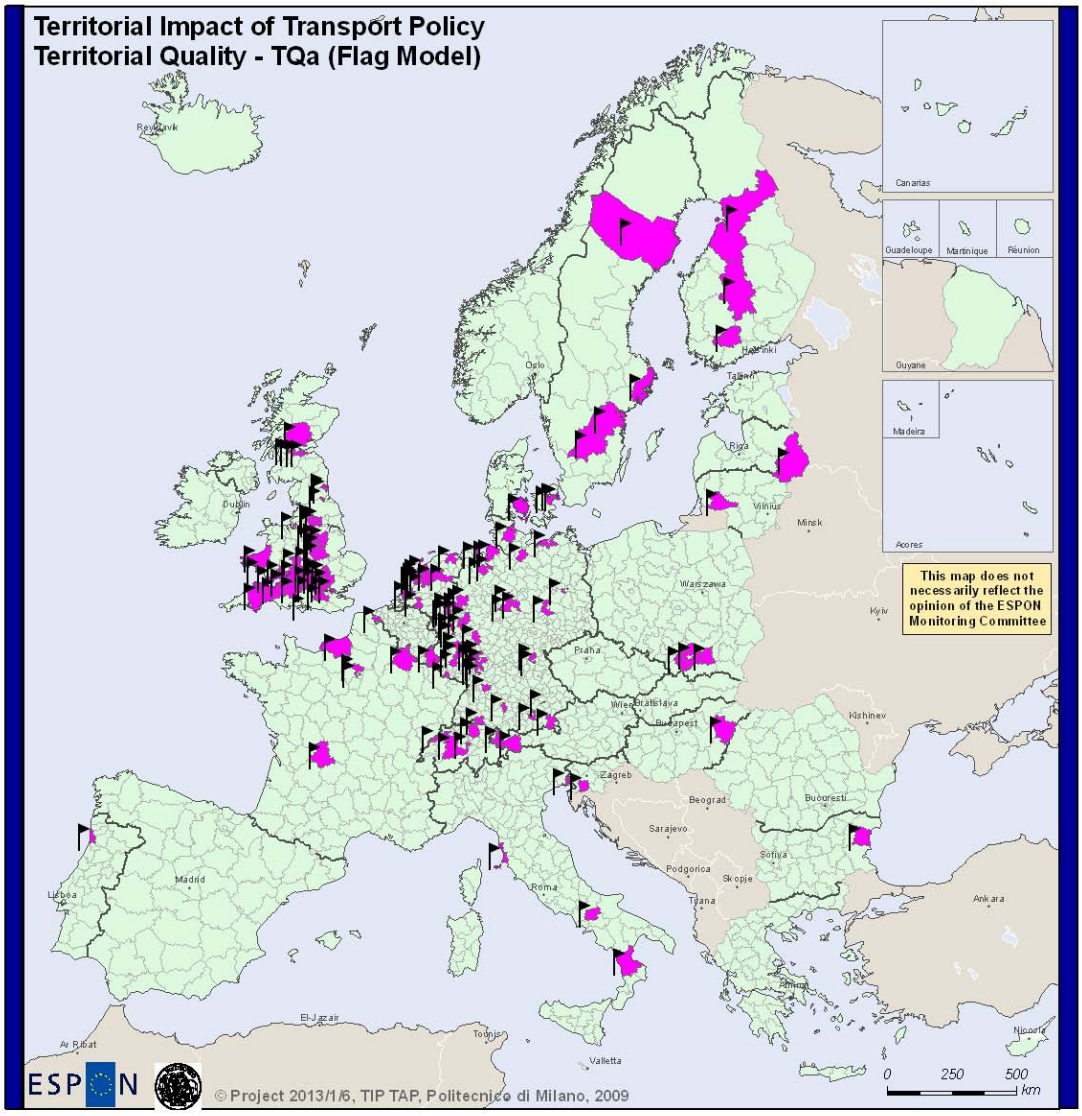
It is important to underline the fact that only trend improvements in engine technologies is considered in the statistical modelling exercise, but no breakthrough discontinuities that could come from hybrid or hydrogen technologies. Furthermore, no policy intervention is included in the scenario, beyond what already decided by the EU or national Governments.

Taking up pro-active policies and regulatory countermeasures, the picture is due to change. In the "infrastructure" scenario in fact (Map 5.2.5.4), the number of "flagged" regions decreases and main problems would concern Eastern European countries (Poland, Romania and Bulgaria in particular), Spain, Ireland, northern Greece and some specific areas like the central north-Italian axis from Brescia to Trieste. In the third, "pricing" scenario (Map 5.2.5.5), the number of "flagged" regions reduces even more, the flags being visible only in Romania and Bulgaria (countries with a relatively low present level of emissions), northern Greece and some other scattered regions.

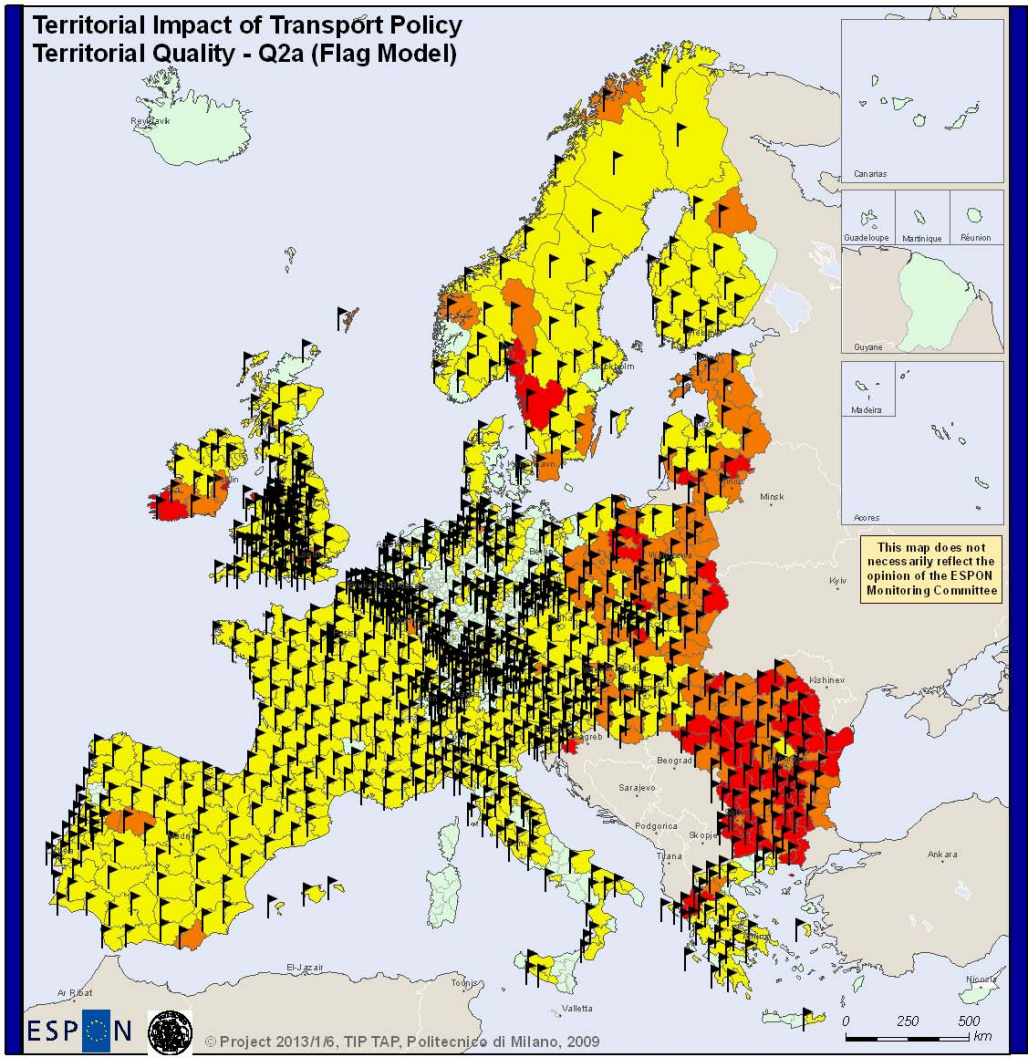
Map 5.2.5.1
The Flag model: warnings about overcoming of congestion thresholds



Map 5.2.5.2.
The Flag model: warnings about overcoming of safety thresholds



Map 5.2.5.3
The Flag model: warnings about emissions in the baseline scenario (a)



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Regional level: NUTS3 (2006)
Source: EUROSTAT, ESPON database
Origin of data: own calculation
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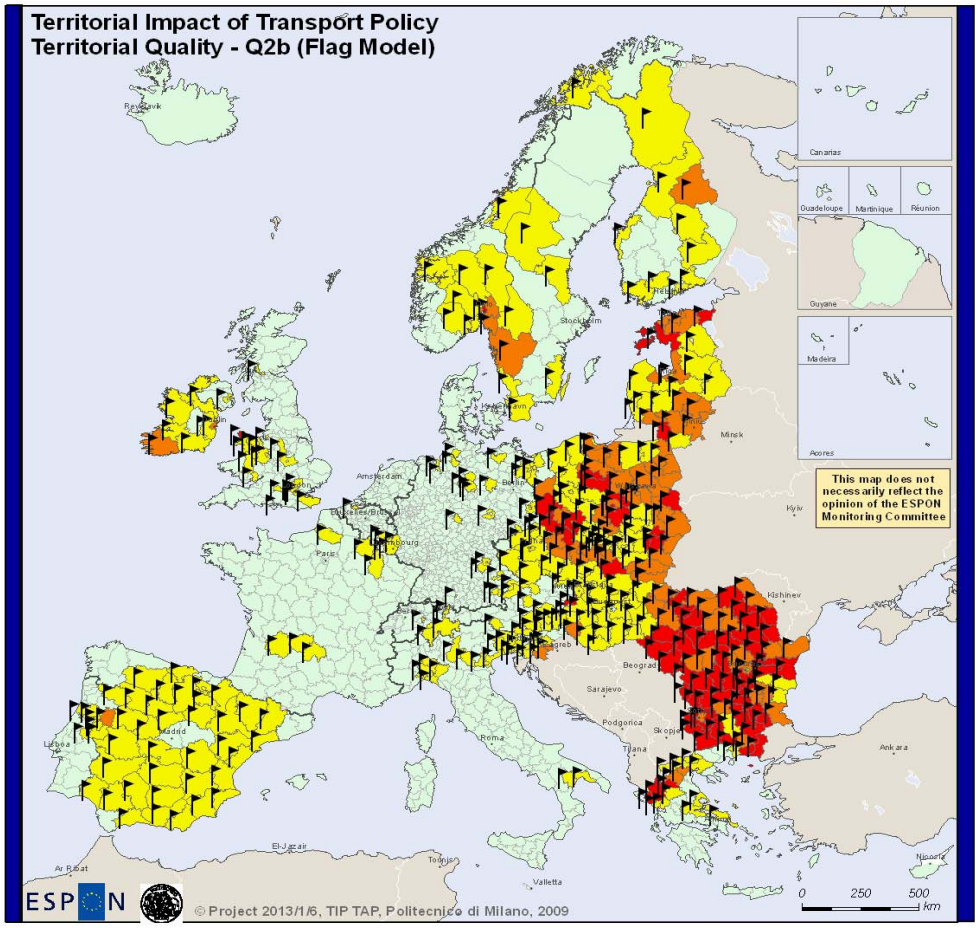
Legend

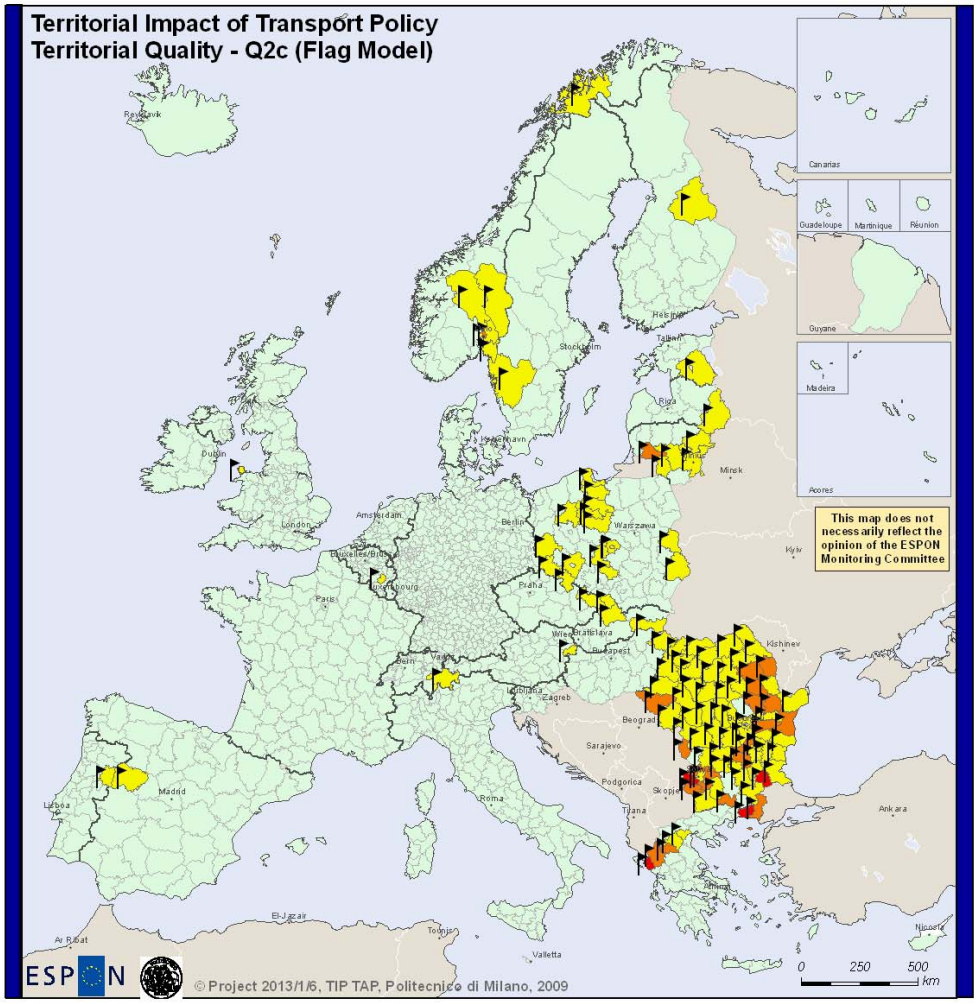
Not Flagged

Flagged Regions
Over the Threshold
More than 50%
More than 100%

Map 5.2.5.4
The Flag model: warnings about emissions in the infrastructure scenario (b)



Map 5.2.5.5
The Flag model: warnings about emissions in the pricing scenario (c)



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Origin of data: own calculation
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Legend

Not Flagged

Flagged Regions
Over the Threshold
More than 50%
More than 100%

Therefore, the conclusion on traffic emissions is straightforward: in a trend scenario, the conditions of emissions are clearly non-sustainable. A mix of policy measures are therefore urgently needed: strong support to technological change and innovation in energy efficiency of engines and emission control; important efforts in modal choice, favouring the rail, mass transit in cities and environment-friendly modes, through regulations, taxations and road pricing and cultural campaigns; new infrastructure investments in order to increase accessibility and energy saving in remote and least accessible areas and solve the most acute congestion problems

5.2.5. Key findings

The analytical calculation of impacts of EU transport policy has produced a high number of maps. In fact 11 impact criteria were defined, on which 3 scenarios were elaborated (33 maps, with one case in which no impact was found, referring to the landscape impact in the pricing scenario I1c). Beyond that, 3+1 summative impacts were mapped, still for the three scenarios (12 maps) and possibly other summative impacts using alternative weighting systems (which did not prove to determine really different outcomes). Of course, only a selection of the most important ones was included here, while a wider selection is presented in the Scientific Report, and the full array of 45 maps is put on the Espon website.

Key findings concerning transport policy regard:
a. A generalized economic benefit of ongoing infrastructure provision (baseline scenario) and the particular advantage of eastern countries in the Enhanced Infrastructure scenario. Per capita GDP and market potential will increase, and also productivity of the network will increase, adding to territorial competitiveness.
b. The emergence of a new economic growth area in central Europe, eastward with respect to the "European Pentagon", defined by the "New Quadrangle" between Praha – Krakow – Budapest – Vienna.
c. Increasing intra-regional integration is visible inside countries particularly engaged in ongoing infrastructure construction (Spain, Germany), but is going to spread towards new countries and regions in the Enhanced Infrastructure scenario, particularly towards New Member Countries. This last element looks crucial: increased internal integration is highly relevant in these countries in order to allow development to spread out of the major centres in the direction of cities of second and third rank.
d. In the baseline scenario, increased congestion is pervasive throughout the territory and particularly in large northern metropolitan areas: ongoing infrastructure looks insufficient to accommodate new forecasted mobility. In aggregate terms, the average impact on the EU will show the highest negative sign among all impacts, all countries scoring negatively – from the highest negative impacts in UK and Denmark to the lowest in Romania and Bulgaria. However, congestion is due to reduce itself, especially in eastern countries, according to the second scenario of new infrastructure provision and even more according to the pricing scenario, especially in most congested areas. Second and third rank airports would substitute for increased inland mobility.
e. Similar results with respect to economic impact on GDP and productivity of networks will show up concerning impacts on new market potentials of regions: the emergence of a central-eastern European "quadrangle" is confirmed.
f. Increase in safety will, to a great extent, be secured in the baseline scenario, and enhanced in the Infrastructure one, especially in eastern countries.

g. Traffic emissions, on the other hand, will expand, pervasively in the Baseline and mainly in eastern countries in the Infrastructure scenario: this result has to raise political concern. Hopefully, emissions would be slightly reduced in the Pricing scenario in a pervasive way, underlining the relevance of control and regulatory policies on road traffic.
h. Among impacts on territorial identity, all showing negative signs at the EU level, landscape fragmentation scores first and will particularly hit countries and regions where new infrastructure will or is being built.
i. Summative impact on Territorial Efficiency in the baseline scenario show up negative on the average in the EU, in all western countries and in regions where congestion is higher; on the other hend, it scores positive in all eastern countries. The picture changes in the Pricing scenario where many punctual strong positive impacts show up, particularly in UK and in more congested areas like the capitals and big city regions, once again showing the relevance of regulatory policies.
j. Impacts on territorial quality are generally positive in the baseline scenario throughout the EU regions. This counter-intuitive result is mainly due to the very positive score of the safety indicator and the positive score of the market opportunity indicator, which counterbalance the negative scores generally reached in the through traffic and emissions criteria.
k. Impacts on territorial identity are generally speaking and synthetically negative, as a consequence of the expected negative impacts of network construction on landscape fragmentation in all countries and the limited positive effects on regional integration.
l. Correlation analysis taking into account relevant and rather standard economic indicators such as GDP and transport and environmental indicators such as Accessibility and Congestion indicates that SI is almost unrelated to these indicators but GDP in the pricing scenario. Interestingly, the impact on territorial efficiency hits areas of greater GDP both in the baseline and pricing scenario. The The impact on territorial identity is highly negatively correlated with the impacts on territorial quality and territorial efficiency – in other words these impacts offset one another. Also, TE and TQ are highly and positively related to SI, especially the latter but in the pricing scenario.

m. The use of the FLAG model in order to convey strong warnings when some critical thresholds in physical indicators on congestion, safety and emissions are attained or overcome, supplied very interesting results. Concerning congestion levels alert situations are primarily clustered in a few regions: inside the Greater London area, in some areas in Wales (Bristol and Cardiff) and in Greater Manchester, Liverpool and Merseyside in UK; in the Bergamo, Treviso and Venice provinces along the main transportation axis in Northern Italy plus in the Bologna-Florence link; in the wider Budapest metro area and in some areas inside the Baden-Württemberg Land (Stuttgart and Tübingen).
n. Concerning Safety, the main alert situations concern a large part of central England, from London along the main western and northern corridors, and southern Scotland (Edinburgh and Glasgow); many regions in Holland (mainly Amsterdam and Rotterdam) and Germany (Munich, Frankfurt, Bremen, many areas in Nordrhein-Westfalen like Köln and Bonn); Stockholm and some other regions in Sweden; most regions in Switzerland (Neuchâtel, Zürich and Bern); the Porto area in Portugal; some scattered regions in the Eastern European Countries.
o. The forecasted condition concerning emissions is crucial: almost all European regions will overcome the threshold assumed, namely the present emission condition, in the baseline scenario. Main western countries, together with Czechia, Slovakia, Slovenia and Hungary, will remain inside the limit of +50%, but Poland, the Baltic Republics, Romania, Bulgaria will go abundantly beyond this limit. Critical conditions

are also apparent in Dublin and southern Ireland, in South-western Sweden and in northern Greece. Taking up pro-active policies and regulatory countermeasures, the picture is due to change.

Taking up pro-active policies and regulatory countermeasures, the picture is due to change. In the "infrastructure" scenario in fact the number of "flagged" regions decreases and main problems would concern some Eastern European countries (Poland, Romania and Bulgaria), Spain, Ireland, northern Greece and some specific areas like the central north-Italian axis from Brescia to Trieste. In the third, "pricing" scenario, the number of "flagged" regions reduces even more, the flags being visible only in Romania and Bulgaria (countries with a relatively low present level of emissions), northern Greece and some other scattered regions.

6. OPTIONS FOR POLICY DEVELOPMENT

In the case of this project, options for policy development - which may form the basis for interventions for improving European competitiveness and cohesion - can be articulated in three main groups:
- utilization of territorial impact assessment methodologies and tools,
- suggestions for policies concerning agriculture, coming from this project's results,
- suggestions for policies concerning transports, coming from this project's results.

6.1. Utilization of territorial impact assessment methodologies and tools.

The results of the present "exploratory" application of a renewed TIA methodology look convincing in our opinion. Results as synthesized on single dimension and summative maps look widely reasonable and robust, and often even counter-intuitive results appear interesting and convincing. One of the weakness points of the previous Tequila utilisation, namely the presentation of only summative impacts, is overcome here through the definition of single-dimension impacts on single criteria and explicitly on economy, competitiveness, society, environment, climate change, etc. The summative elaborations can help only in case that compensations among different impacts look acceptable and rightly managed through the weighting system.

In this last case, two improvements look crucial: the use of two weighting systems (addressed to compare impacts on different criteria), one coming from internal experts and one coming from policy makers, and the use of the FLAG model. In the first case, possible doubts concerning the relevance of some single criteria or summative criteria – as the triad of territorial efficiency, quality and identity- are easily overcome, as some of them could have received a zero weight. This was not the case, and especially policy makers indicated a precise interest not just on traditional economic or environmental impacts but on more innovative, territorial impacts like the ones on landscape, community viability and identity, intra-regional integration. In the second case, the use of the FLAG model gave relevant warnings when certain impact thresholds were overcome, forbidding the process of inter-impact compensation (and therefore, the computation of summative impacts).

Besides this, another interesting feature of the TEQUILA models might be useful, namely the possibility of recalculating summative impacts during a meeting or a public

presentation, considering new, proposed weighting systems and comparing the results with the internal ones.

Given the sensitivity of single-dimension impacts to the desirability element and of summative results to the weighting system, some more thorough reflection on what we call the "territorial utility functions" will be useful, enlarging the scope of the analysis towards national and regional preferences.

Consistency with the analytical tools and suggestions of the Commission concerning Impact Assessment procedures was also inspected, and the result looks positive. The general philosophy is very similar and the spectrum of impacts even wider in our case. The advantage or our methodology consists in the fact that impacts are defined by region, in a transparent and easily comparable way, showing where excessive or "outlier" impacts locate – provided that also the policy measures are sufficiently detailed by region.

This last consideration looks crucial for any impact assessment exercise, and not just for the utilisation of the present model. In fact, a sound TIA exercise on any policy requires that:
- *policy measures* to be inspected are *clearly* and carefully defined,
- *policy intensity in each EU region* is also defined, as it constitutes the logical starting point of any elaboration,
- data concerning the expected impacts are available,
- possibly some quantitative tools (econometric models, simulation models, impact models) concerning the specific field are already available, at least for some typologies of impacts (environmental, economic, social, …).

The availability of a modelling tool in order to forecast and simulate impacts generates an important trade-off, highly visible in the present Project. This availability in fact, as it is the case for transport policies, allows a more precise definition of impacts and, most importantly, allows to take care of the multiple interactions among the different impact dimensions; but on the other hand, the results are less transparent in terms of easy justification for particular results. The opposite condition happened concerning CAP impact assessment: the definition of impacts was less solid, but the resulting maps were more easily interpretable on the basis of the proposed logical chains.

For all these reasons, we think that assessment of territorial impacts of EU policy measures, directives and regulations is both crucial and attainable on solid scientific grounds and that the tool provided in this Research Project looks appropriate for utilisation in the analysis of territorial impacts other policy measures.

6.2. Suggestions for agricultural policies, coming from this project's results.

Policy suggestions concerning CAP refer to the following points:

6.2.a. even if cuts in resources deterministically produce a reduction in incomes and consequently in GDPs, total impacts on territorial efficiency may not be negative, if farmers are indirectly pushed towards alternative production strategies, both inside the sector (product diversification, quality upgrading, product marketing, new philosophies in distribution as "zero km" one) and outside it (agri-tourism, local networking with operators in the tourism sector).

6.2.b. there are clear implications for discussions of modulation in the CAP reform debates, though, and these support the findings of earlier ESPON studies. One of the recommendations made by the previous study of the Territorial Impact of the CAP was that that "the Pillar 2 budget should be *increased progressively*, as anticipated in the Agenda 2000 and MTR agreements and in the Commission's proposals for the RDR 2007-13. This might be achieved either through continuing increases in the rate of compulsory modulation or preferably through the more substantial realignment of EAGGF towards Pillar 2". The TIPTAP study has shown that substantial rates of modulation would have a broadly neutral impact on rural areas where only 25% of the funds cut from Pillar 1 are added to the Pillar 2 budget. Even without sensitivity analysis having been undertaken, it would be expected that the impacts would be positive in most rural areas if all of the funding cut from Pillar 1 were diverted to Pillar 2 through modulation, and this therefore supports the recommendation made in the earlier study. This is highly relevant to the policy debates surrounding CAP reform.
Also, the advantages of a modulation strategy are quite evident in terms of impacts on environmental quality;
6.2.c. on the other hand, reductions in public resource distribution may end up not only in income reductions and land abandonment by weaker farms, but also in homologation of landscapes and reduction of their diversification, risks of soil erosions, reduction of community viability if alternative job opportunities are not available in the regions. All these elements are quantitatively defined and mapped in this Project.

6.3. Suggestions for transport policies, coming from this project's results.

Main results in this case concern:

6.3.a. the positive overall impact of new network construction, especially for eastern countries;
6.3.b. the condition of congestion of the entire EU network at 2030 in the baseline scenario, i.e. also in case all the already decided infrastructure is built; improvements would come as a consequence of the implementation of new infrastructure, especially for eastern countries;
6.3.c. the necessary attention to be paid to improvements in *internal* accessibility in New Member Countries - a goal that does not appear as a priority one in the ongoing policy (baseline scenario), as confirmed by our results. In fact, improved internal accessibility looks as a precondition for diffusing development outside the present concentration areas (capital cities and their surroundings, western border) and proves to be reached and very effective in the Enhanced Infrastructure scenario;
6.3.d. the critical condition of emissions revealed in the baseline scenario and by the Flag model calls for a mix of countermeasures and renewed engagement by policy makers: incentives to technological change and to alternative modes out of road mobility; new regulations and road pricing policies, cultural campaigns and selected new infrastructure provision;
6.3.e. a regulation and pricing strategy can bring relevant results: reducing emissions, but also reducing congestion in presently most congested metro areas;
3.3.f. safety looks as an important goal achieved already in the present (baseline) strategy, and further improved in the Infrastructure scenario: it represents a second, but not secondary, outcome of EU transport policy, beyond the natural one of increasing accessibility.

7. FURTHER EXTENSIONS OF ANALYTICAL WORK AND RESEARCH

Extension of analytical work that look indispensable for any systematic application of any TIA tool refers to the following items:

- the necessity of a specific project concerning territorial values and priorities of regional and urban communities, expanding the regional part of the existing European Value Survey. Alternatively, each new study on territorial assessment of policies should be accompanied by a pervasive inspection of these values and priorities through expert judgement.
- The Tequila model provides a methodology particularly fit for *territorial comparisons* of impacts: the *relative* value of impacts with respect to other regions or surrounding territories is the main added value of the model, rather than the absolute value of the single impact on single regions. Therefore, it should be utilised always with a comparative goal, and applied to policy alternatives.
- The definition of European thresholds and benchmarks for impacts (e.g. in the environmental sphere) has to be made at the institutional level. Once the decision taken, this could be easily included in the FLAG model and operationalized as said before. But this is mainly a task for policy makers.
- The availability of data for impact assessment is crucial; in the absence of it, only abstract reflections on logical chains and very general qualitative judgements are possible. Data should be available at NUTS 3 level (or a mix of NUTS3 and 2 level, for Germany and Belgium), the most appropriate for a really "territorial" inspection.
- Data should refer to the typology of impacts that the Commission looks willing to monitor, as for example, the ones listed in the recent Guidelines for Impact Assessment (SEC(2009)92). In these cases in fact a sound knowledge of the present condition in European regions looks propaedeutical for any trend inspection, foresight and possibly forecast. Particular attention should be devoted to a translation at NUTS-2 and -3 of data on farming, crops, productivities and incomes which are collected on different spatial breakdowns.
- A suggestion coming from the TEQUILA models that looks relevant concerns a new attention to be devoted to information concerning regional social and identity aspects, ranging from poverty to gender, from landscape to cultural heritage, from cultural attitudes (e.g. concerning the private/public relationships) to citizens participation and governance styles. These elements may concern policy goals in themselves or supply conditions for a differentiated territorial receptivity and local response capability to EU directives and policy measures.
- More attention should be paid, perhaps inside ESPON, to the construction of - even simplified - econometric models allowing the empirical estimation of specific, measurable impacts of specific, measurable policy actions. The availability of a vast array of impact coefficients (like the ones used in transport simulations, concerning emissions, congestion etc.) could highly support the improvement of more general territorial impact assessment tools.
- By the same token, more scientific reflections are needed concerning future expected and unexpected outcomes of specific policy measures, specified in territorial terms. In this case, a good cooperation could come between scientific works acting at the aggregate, national or EU, level and works acting on territorial specificities.

- Most interesting fields in which TIA tools, of the kind of Tequila Model, could be used are: specific measures in regional development policies, specific excellence policies (R&D, innovation), some possible regulatory policies concerning spatial policies (housing, anti-sprawl measures, taxation of greenfield developments), alternative measures in CAP policies (always at the condition of a clear definition of policy characteristics and policy intensity in regions).

Further extensions of the TIA project line could envisage:

a. The exploration of the possibility of modelling interregional spillover effects.
The TRANSTOOL model partly embeds in its methodology spillovers treatment (for instance the GDP impact of transport policies), but, unfortunately, broader examination of spillover effects was not possible in this Project due to time and resource limitations.
Other interregional specific and ad-hoc types of models could be exploited to take them account:

- economic spillovers (for instance, through macroeconomic regional models like the MASST model – developed inside ESPON 3.2. Project, and now under exploratory reshaping towards a NUTS-3 utilisation;,
- demographic spillovers (for instance, through demographic migration models),
- environmental spillovers, through the appropriate territorial models for each type of emissions (air and water principally).

This ultimately requires to build an interregional spillover model for each kind of impact, according to EU priorities.
b. The identification of further typologies of regions which are similarly affected by the policies under examination. This typology exercise could complement the assessment of average impacts on specific geographical typologies of regions, such as the one on rural and urban areas that was developed here.
c. Data extensions. Data constraint was a major challenge of the Project, especially as far as the CAP case is concerned, mainly because of the lack of consisted data at NUTS-3 level with adequate coverage of all EU27 and the ESPON countries network. It would be extremely valuable to access data on:
- share of ex-post P1 and P2 expenditures (and their sub-division among different priority axes) on a time series basis;
- indicators on competitiveness for instance on knowledge transfer, innovation, modernization in the food chain, as well as on entrepreneurship,
- indicators on environmental quality and preservation such as on biodiversity available at NUTS2 level and consistently across countries,
- indicators of governance, as proxy of endogenous development capabilities of rural regions.