ET2050
Territorial Scenarios and Visions for Europe

Project 2013/1/19

Second Interim Report | 30/04/2013

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This report presents a more detailed overview of the analytical approach to be applied by the ET2050 ESPON project. This Applied Research Project is conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

The approach presented in the report has been presented and discussed with the ESPON Monitoring Committee, and the indications made by the ESPON Monitoring Committee have been integrated, but still it may not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

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

This basic report exists only in an electronic version.

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1. Presentation

1.1 Content of the Second Interim Report

This Second Interim Report follows the Project Specifications requirements[1] as well as the orientations given in the First Interim Report by ESPON CU the Sounding Board in March 2012.

It contains the results produced after the delivery of the First Interim Report:

- Final results for the 2030 Baseline and Exploratory scenarios produced by MULTIPOLES, MASST3 and MOSAIC forecast models.
- Final results for the 2050 Baseline and policy-oriented variant scenarios produced by SASI.
- Firsts results by METRONAMIC land-use forecast model
- Analysis of results, at European and regional level.
- Draft of policy-recommendations to be further developed

The report also contains the progress achieved in the following directions:

- Discussions related to the Vision 2050 definition carried out in the frame of the ESPON MC workshops, particularly in the workshop celebrated in Paphos.
- Definition of the Territorial Impact Assessment methodology to be applied based on workshop discussions with the ESPON MC.
- Consultations and face-to-face interviews carried out in European institutions (e.g. European Parliament, different General Directorates of the European Commission)
- Multimedia resources: Youtube/Vimeo channel with selection of interviews by relevant thinkers, and movies to present key features of baseline and exploratory scenarios.

The report has to be read as a continuation of the First Interim Report, since it is focused on presenting just the new modelling results and the activities carried out with ESPON MC concerning the Vision and the criteria for the Territorial Impact Assessment. It is also true that the results from models have required to update previous outcomes of the project, such the Baseline scenario as presented in the First Interim Report.

[1] According to Project Specifications, the Second Interim report should include the following elements:

- Overview on concepts and methodology on creating a territorial vision, midterm targets and policy recommendations
- Final results on defining and modelling scenarios.
- Overview of involvement of stakeholders up to now and planned for the next phase up to the Draft Final Report.
- Slideshows explaining the assumptions, the methodology and the results of the project so far.
- A selection of maps suitable for the communication of project progress and results at the different stages on the ESPON website, but as well suitable to be used for creation of posters, postcards, exhibition materials, etc.
- Input (text, maps, images) for the updating of a specific section of the ESPON 2013 Website dedicated to the project.
- Written contribution for the elaboration of at least 4 leaflets/brochures to inform policy makers on the assumptions, the methodology and the results of the project so far (focusing on the baseline scenario and the three prospective scenario);
- Concrete plan for the applied research and stakeholder involvement to finalise Step 4 and Step 5 towards the draft Final Report as well as the Table of Content envisaged for the Final report.

In the project website (www.et2050.eu) a repository of all activities and works carried out can be found.

1.2 Ongoing Works Modelling Scenarios

The modelling process adopted was sequential, each model providing inputs to the next one, by following this order: MULTIPOLES, MASST3, MOSAIC, and METRONAMICA. SASI run in parallel because it was focused in the 2050 horizon and required an specific implementation of exogenous assumptions and policies. Because of the sequential modelling process adopted, needed to assure the overall consistency of the exercise, the latest model to be applied, METRONAMICA, just delivered results shortly before the deadline for this report and their full analysis will be carried out in the coming days and weeks.

Ongoing modelling works:

- Analysis of METRONOMICA results, and adjustment if needed.
- Running more extreme scenario variants, or wild cards, by the integrated SASI model for 2050.
- Consistency check of the 2030-2050 exploratory scenarios by TV+ Meta-model, and enhancing the tool to be used for the analysis of political pathways.
- Integration of indicators into the Territorial Impact Assessment tool, and computing the missing indicators by TV+ Meta-model and/or qualitative expert judgment.

These modelling works will be carried out together with the definition of the Vision and the political pathways.

1.3 Next Steps Towards the European Territorial Vision

A Roadmap to define the European Territorial Vision has been defined to guide the participatory process, together with ESPON CU. An advanced draft, still open to discussion, is annexed to this report.

Next planed activities are the following:

- Fifth policy Workshop with ESPON MC (Dublin, June 2013)
- Presentation of main results achieved in the ESPON Open Seminar Scientific Session (Dublin, June 2013)
- First presentation and discussion at DGREGIO (Brussels, June 2013)
- Third presentation and discussion at the European Parliament (Brussels, June 2013)
- Sixth policy Workshop with ESPON MC (Brussels, October 2013)

2. Introduction

This section contains synthetic information concerning the ET2050 project objectives and methodology, according to the Project Specifications.

2.1 Objective of ET2050

ET2050 (Territorial Scenarios and Visions for Europe) aims at *supporting policy makers in formulating a long-term integrated and coherent Vision for the development of the EU territory*.

2.2 ET2050 Transnational Project Group (TPG)

The Transnational Project Group (TPG) includes 12 European applied research institutions from 9 countries: 6 universities and research institutes, 5 companies specialised in spatial planning and 1 non-profit foundation, from 10 different cities covering to a large extend the urban and regional diversity of the European Union and ESPON Space:

The TPG for the ESPON project ET2050 consists of the following Project Partners:

- MCRIT LTD, Barcelona (Lead Partner, LP)
- Free university of Brussels, IGEAT, Brussels (PP3)
- Centre for Regional Studies of the Hungarian Academy of Sciences, Pécs (PP4)
- Politecnico di Milano, Milano (PP5)
- Central European Forum for Migration and Population Research, Warsaw (PP6)
- Spiekermann & Wegener (S&W), Dortmund (PP7)
- Research Institute for Knowledge Systems (RIKS), Maastricht (PP8)
- Warsaw School of Economics, Warsaw (PP9)
- Nordregio - Nordic Centre for Spatial Development, Stockholm (PP10)
- University of Thessaly, Volos (PP11)
- Institute of Studies for Integration of Systems (ISIS), Rome (PP12)
- Ersilia Fundation, Barcelona (PP13)

The company TERSYN (PP2) is not longer active in the project.

2.3 Methodology

The work is organised according to the 5 steps indicated in the Project Specifications, as follows:

1. **Present State of Europe**: What is the current state of the European territorial structure?
2. **Baseline Scenarios for 2030 and 2050**: What will be the future state of the European territorial structure based on the hypothesis that development trends and policies remain stable?
3. **Exploratory Scenarios for 2030 and 2050**: What could be feasible future state of the European territorial structure in three territorially extreme/exploratory scenarios?

4. **European Territorial Vision 2050**: What is the room for manoeuvre to politically steer (the development of) the future state of the European territorial structure and what is the range in which a realistic territorial vision can be formulated?
5. **Midterm targets and pathways**: Is the Vision feasible?, which political pathway will be sufficient and/or more convenient to achieve end and midterm targets?

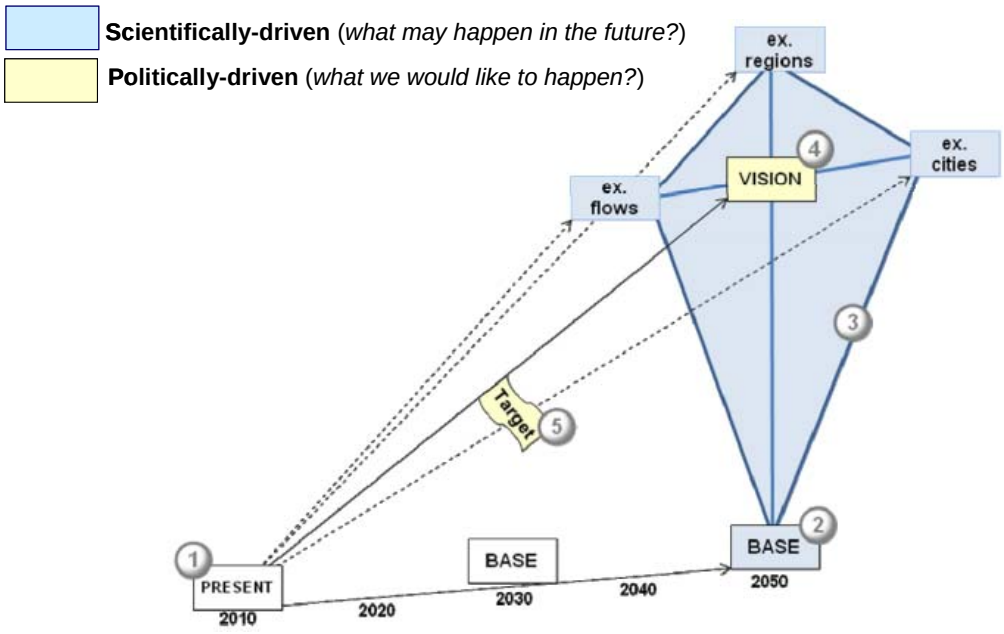


Figure 2-1 Approach to construction of scenarios and the Vision (Project Specifications)

At this point, the project has covered to a large extend the three first steps, as has advanced in the other two (see the details in Fig. 2.3, in the next section).

The methodology applied by the project combines a quantitative and qualitative approach. The qualitative work is based on partner's expertise, expert surveys and workshops (surveys during internal and open ESPON seminars, workshops with the ESPON MC, presentations to the European Parliament and consultations with the European Commission). The First Interim Report was mostly focused on presenting results from the qualitative approach[2], while the Second Interim Report is focused in the quantitative results, based on modelling.

The quantitative approach was developed following the next steps:

[2] *Qualitatively approach:*

1. Review of existing studies on scenarios for Europe and the rest of the World
2. Synthesis of trends by sectors and territories, and elaboration of SWOT tables.
3. Definition of critical bifurcations
4. Definition of key directions for each scenario from the bifurcation points
5. Design of logic relationships between the different key directions and trends
6. Elaboration of qualitative narratives for scenarios
7. Adjustment of the qualitative narratives once quantitative results are available

1. Quantitative hypothesis and expectations were defined at global level for key indicators based on foresight meta-models (PASH+)
2. Quantitative hypothesis and expectations were defined at European level for key indicators based on foresight meta-models (TV+)
3. Adjustment and execution of advanced forecast models for 2030 (MULTIPOLES, MASST, MOSAIC, METRONAMICA)
4. Adjustment and execution of advanced forecast models for 2050 (SASI)
5. Meta analysis of results and integration into TV+ Meta-model
6. Backcast analysis of political pathways
7. Application of TIA

2.4 Work Structure

ET2050 has 3 Work Packages: Coordination, Management and Quality Control (WP1), Research Activities (WP2), and Communication and Dissemination of Results (WP3).

WP2 includes 8 main research tasks:

- **5 content-based tasks (Tasks 2.3 to 2.7)** matching the five steps detailed in the project specifications (Present State, Baseline Scenarios 2030 & 2050, European Territorial Scenarios for 2050, Territorial Vision 2050, Midterm Targets and Pathways towards 2030).
- **3 support-oriented tasks (Tasks 2.1, 2.2 and 2.8)**: Resources for interactive participation (Task 2.1), Database management, forecast and foresight modelling resources (Task 2.2), and Innovative visualisation (Task 2.8).

The content-based tasks is being performed sequentially. The whole project is carried out in close consultation with the ESPON MC and CU. Participatory events and workshops will be linked to ESPON CU activities.

3. Modelling Framework

This chapter presents the forecast models applied in the exercise of modelling the scenarios defined qualitatively in the First Interim Report. A more detailed and systematic description, according to the so-called SPQR form, is included as Annex.

3.1 Approach

The purpose of the ET2050 scenarios is not to guess with accuracy how a certain indicator will actually be in few months or years ahead (in line with the IMF and ECOFIN forecasts for economic growth at national level, e.g.), but providing useful insights for a better understanding of dominant long-term terms to support strategic political decisions, particularly in relation to alternative reforms of Cohesion policies[3]. The main focus of the modelling exercise is therefore investigating the possible evolution of Social, Economic and Territorial Cohesion under different scenarios and policy-assumptions from 2010 to 2030 and 2050.

Needless to say, a word of caution is always needed when interpreting modelling results[4]. Data at European level is often incomplete or not homogenous[5], and the indicators finally used are not the ideal ones but the ones available that can also be integrated by the formulations of state-of-the-practice models[6].

The way to present and explain model's results is never completely free from personal subjectivity, moreover, but it is precisely in order to highlight and contrast one's prejudices and expectations, away from wishful thinking, that it is indispensable to use quantitative data and apply sound forecast models[7].

[3] The models used in ET2050 were not created (and therefore not able) to produce accurate values for specific variables in the future, on the basis of extrapolations of a system of past relations, but depict the tendencies and relative behavioural paths. In the case of the MASST model, relations are related to regional GDP growth (and regional employment growth) in each individual region under certain conditions, i.e. probable states of the system that may become real under certain conditions that are exogenously assumed. In a scenario-building of this kind, the existence of the MASST model guarantees that the results are neutral vis-à-vis the assumptions, since they are based on the structural relationships that hold together the economic system in an objective way (estimates). Used with such a purpose, it is not a short-term forecasting tool, but a long-term quantitative foresight model.

[4] Selected indicators are the ones most often used as reference, those that have data available, and forecast models can produce. Neighbouring countries and the rest of the world was no modelled, but reference assumptions on their possible evolutions were considered as inputs to the models.

[5] For instance data available on migration flows is not enough disaggregated by purposes (e.g. labour, retirement...) and temporary migration (e.g. for education purposes) is missing.

[6] GDP is the standard measure of the value of the production activity (goods and services) of resident producer units. Regional GDP is measured according to the definition of the System of National Accounts (SNA), and therefore "hidden economy", that may represent up to 22% of GDP in some countries, is not considered. On the other hand, it has many inconsistencies (e.g. while investments to improve environmental conditions is counted, environmental impacts are not discounted). As the economy tends to become globalised, and further integrated, regions and national economies dependency to outside corporative decisions, GDP would need to be complemented by the GNP (Gross National Product), a measure that is hardly available. The prevalence of the use of GDP per head as a region indicator by EU policy-makers can be attributed to the availability of data at the sub-national level across the Union. Indeed, GDP per head has become so widely used as a basic indicator that little attention has been paid to its shortcomings as a measure of equality. Many of these arise from the problems associated with measuring GDP at the regional level. A basic point is that there are practical difficulties involved in deciding how to assign output where activities span regional boundaries and national statistical offices differ in their approaches to this. The extent to which regional GDP expresses the prosperity of a region is also modified by the transfers that result from government taxation, spending and social security systems. Excluded from GDP estimates are the goods that people produce for their own consumption, as important as the black or hidden economy already mentioned

[7] The HERMIN model framework can illustrate this fact. HERMIN was applied to assess regional disparities and Structural and Cohesion funds impacts has been continuously improved in late 1980s. According to John Bradley, it was developed in Ireland the late 1980s to evaluate the macro impacts of SFs, and drew on many aspects of the above revision and renewal of macro economic modelling. HERMIN was initially designed to take account of the very limited data availability in the poorer, less-developed EU member states and regions on the Western and Southern periphery (i.e., Ireland, Northern Ireland, Portugal, Spain, the Italian Mezzogiorno, and Greece). A consequence of the lack of detailed macro-sectoral data and of sufficiently long time-series that had no structural breaks was that the HERMIN modelling framework

The forecast models used in the ET2050 exercise are next introduced.

3.2 MULTIPOLES

MULTIPOLES is a cohort-component, multistate, hierarchical population projection model, capable to model population and labour force (by sex and 5-year age group) for multi-country, multiregional systems or for multi-ethnic systems. It can be used to produce projections, simulations and forecasts of complex hierarchical population systems and to analyse the impact of various scenarios concerning migration, fertility, mortality and economic activity on population and labour force size and structure. MULTIPOLES was specifically designed to model the impact of three categories of migration: internal, international within the system (e.g. within EU) and from outside of the modelled system.

MULTIPOLES corresponds to the family of standard population projection models based on cohort-components. The main feature that makes MULTIPOLES different to other available models is a system approach to modelling hierarchical systems (such as Europe, composed of countries and regions) based on the ideas of the multiregional models developed by A. Rogers, F. Willekens and P. Rees. MULTIPOLES specifically uses Rees' concept of multiregional hierarchical population dynamics models. This system approach guarantees consistency of modelling results. Another relevant feature of MULTIPOLES is the approach to migration, a component which was either neglected in the past or modelled through net migration only. In MULTIPOLES, the migration assumptions may be made separately for each category of migration: internal, international within the system and international from the Rest of the World.

The model is built in Fortran. Depending on the number of regions and projection periods, running effort to compute a complete scenario is around 1 hour time, producing 6 to 12 MB raw data text files (tsv, csv, txt) plus 400-800 MB for auxiliary libraries.

In the frame of ET2050, the MUTIPOLES database was updated to 2010 and refined with benchmark statistical data concerning population and demographic events, and improved fertility estimates. Revised benchmark data for ET2050 are now based on MIMOSA (Eurostat) and IMEM (University of Southampton. Recent estimates of migration flows between 31 European countries using Bayesian statistics methods).

needed to be based on a fairly simple theoretical framework that permitted intercountry and inter-region comparisons and that facilitated the selection of key behavioural parameters in situations where sophisticated econometric analysis was impossible. The HERMIN model was designed in order to analyse medium-term policy impacts involving large-scale public investments in physical infrastructure and in human resources.

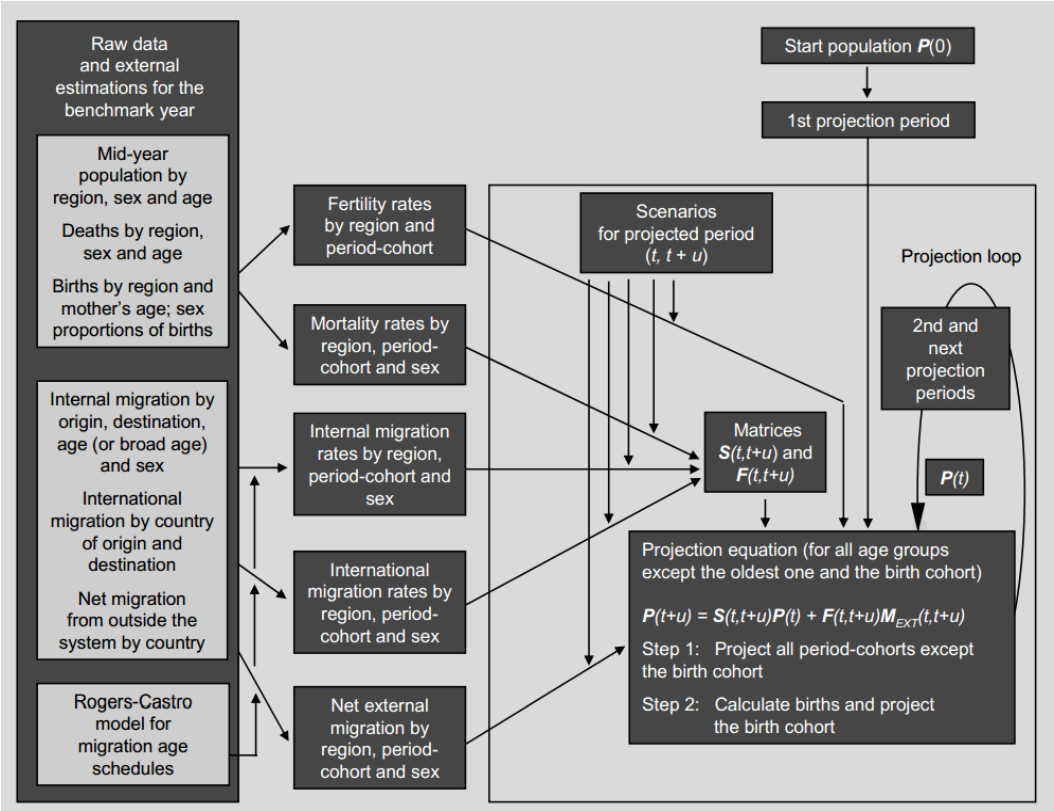


Figure 3-1 Structure of MULTIPOLES multiregional multinational population projection model (IOM CEFRM 2005)

3.3 MASST3

MASST (developed by Politecnico di Milano) is an econometric and macroeconomic partial equilibrium model. It is aimed for creating quantitative foresights rather than point forecast estimates, of regional economic growth under different scenarial assumptions. It works at European scale at regional level. MASST provides as outputs growth rates of GDP and employment total, manufacturing and services).

In MASST national economic factors and regional socio-economic factors are considered simultaneously, and national growth influences regional growth while regional endogenous factors at the same time influence national growth. Regional growth is defined as a function of National Growth (dependent on macroeconomics, e.g interest rates, tax rates, interest on bonds, inflation, FDI, BRICs US and Japan economical dynamism…) and the differential growth rate of the region with respect to the nation. This differential depends on the characteristics of the region, e.g. its capacity to innovate, the abatement of economic sectors or the allocation of cohesion policy funds.

In the frame of ET2050, MASST model has been upgraded in-depth. Version 3 of the model has now endogenised public expenditure growth rates (based on the relative difference between deficit/GDP ratio and stability pact targets), innovation rates (function of human capital and R&D intensity), urban growth (function of traditional and unconventional urban benefits and urban costs, e.g. quality of life, social conflicts…), and regional unemployment growth (dependant among others on labour market, structural funds policies, FDI). The MASST upgrade allows also to explicitly take into account fiscal policies and the impact of the current economic crisis.

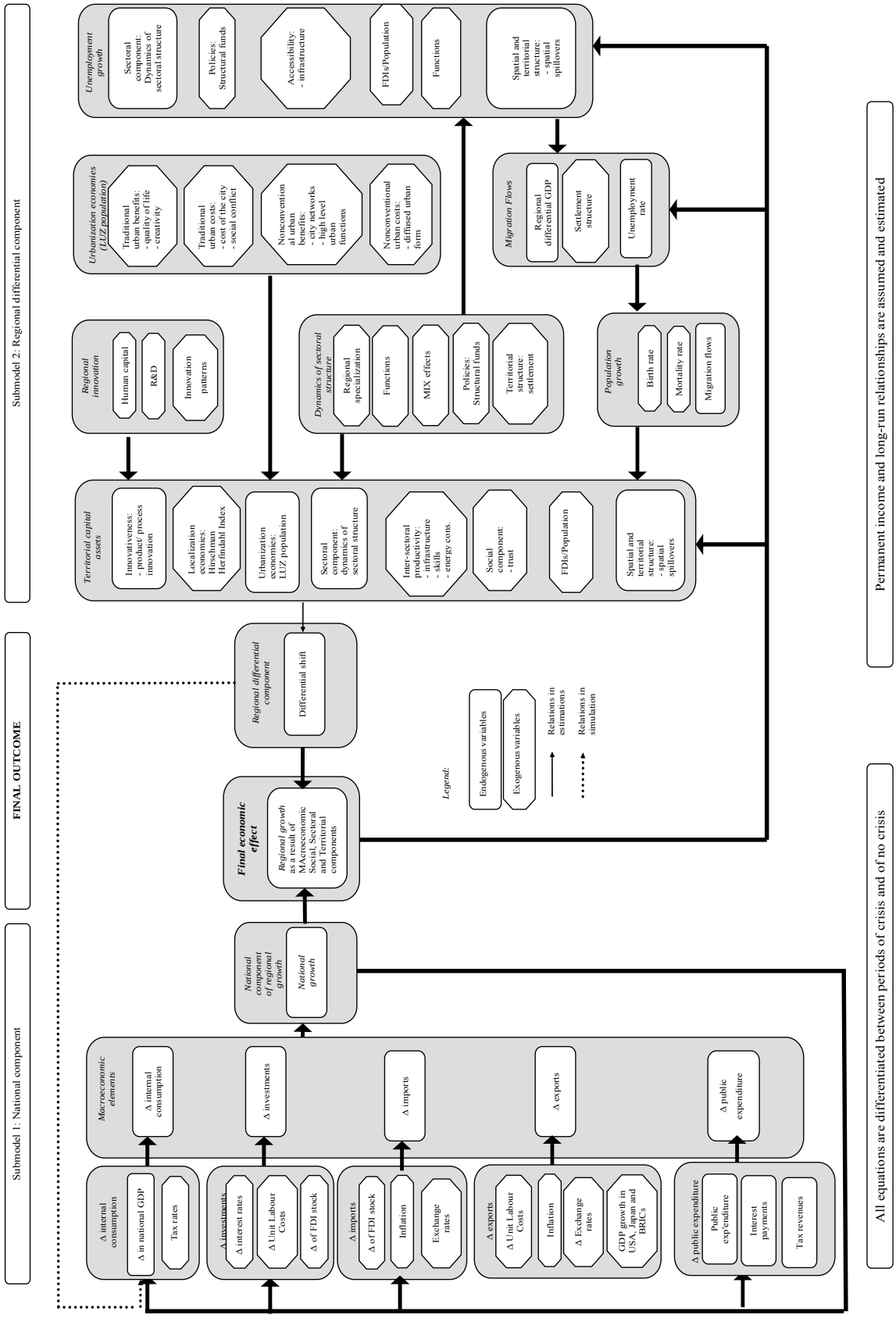


Figure 3-2 Structure of MASST3 model (POLIMI 2013)

3.4 MOSAIC

MOSAIC (developed by MCRIT, Barcelona) is an integrated modal split and assignment model originally applied to TRANS-TOOLS trip distribution matrices. MOSAIC has been upgraded to generate future transport demand based on regional increases of GDP and population. Traditional transportation modelling approaches are generally based on the segmentation between private and public transport modes and are not able to model correctly mode combinations within a trip. Nevertheless, in recent years growing attention has been given to the modelling of multi-modal trips, but mostly at regional scale.

MOSAIC is designed to analyse the impact of alternative transport policy-scenarios (pricing, taxation, infrastructure, fleets…). MOSAIC integrates modal split and traffic assignment in one so the modes do not compete to carry trips but contribute to form multi-modal chains, and modal split is the end result of the process, not the starting point. MOSAIC is built upon a multimodal transport graph integrating road, rail, air and ferry networks, for Europe and its neighbourhood. In this sense, MOSAIC is based on the super-network approach (Fernandez et al. 1994).

MOSAIC is developed in C++ on top of BridgesNIS platform. BRIDGES/NIS is a suit of C++ routines developed in the Bridges 4th EU Research Framework by MCRIT (1999), and continuously upgraded ever since. The outputs produced by MOSAIC (16Gb, 450 million registers) are processed by ad-hoc meta-model routines programmed to compute specific indicators measuring interconnection, network use and environmental impacts.

MOSAIC is based on a multi-class AON algorithm. The module assigns flows searching the cheapest paths according to generalised cost functions (including costs of operation, travel time costs, costs of interconnection between networks and costs of access/egress to transport networks). A total of 1,441 NUTS3 are considered, generating a total of 8.3 million possible minimum cost itineraries between NUTS3, considering the existence of four different trip purposes with different travel costs.

In ET2050, a new module for MOSAIC has been implemented to estimate future demand matrixes in Europe based on hypothesis of regional economic and demographic growths. Growths are determined at NUTS3 level based on regionalised transport elasticities for different trip purposes (transport generation), then distributed with a Furness Distribution Model.

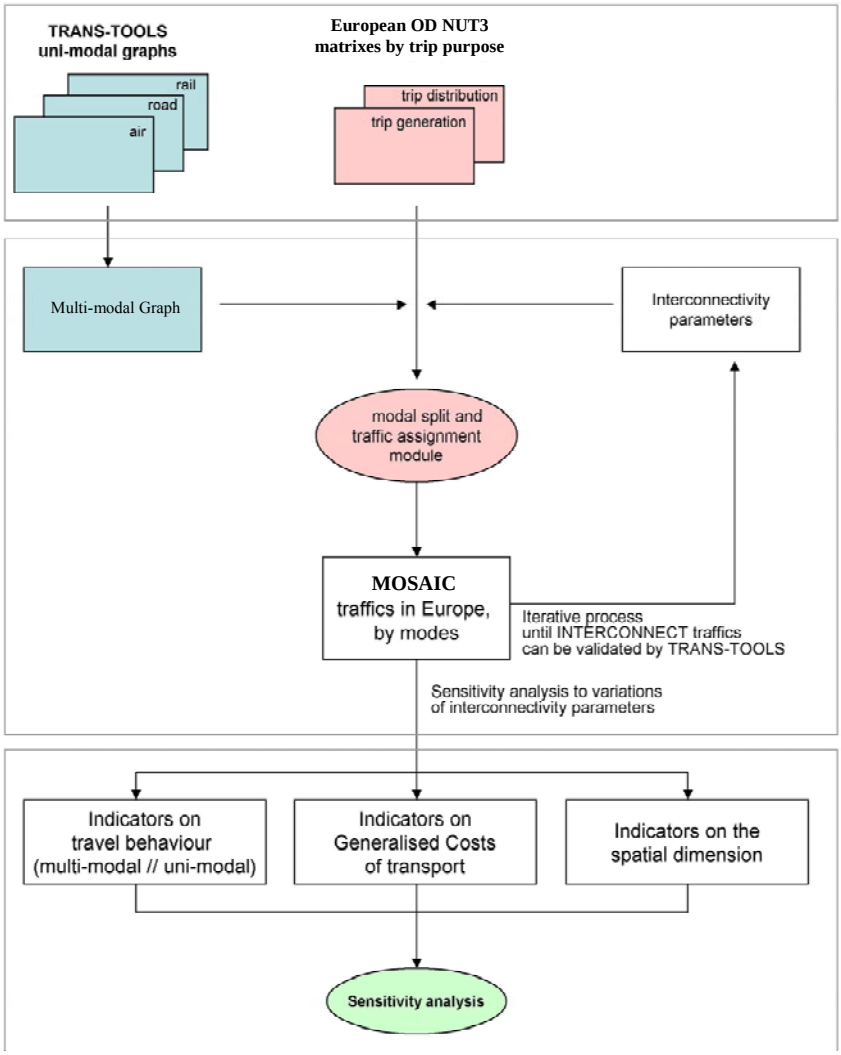


Figure 3-3 Structure of MOSAIC model (MCRIT 2013)

3.5 METRONAMICA

METRONAMICA (developed by RIKS, Maastricht) is a dynamic and spatially explicit cellular automata-based land use model that allocates regional land use demands to local grids. The model is used for scenario studies, policy analysis as well as research projects. It has been applied worldwide. Applications include stand-alone versions as well as integrated systems (such as Xplorah, MedAction and WISE) that include the METRONAMICA land use model.

METRONAMICA incorporates several simulation models that are coupled using the Geonamica software environment. These models start at a certain year in the past for which the required input data is available. Then the models take annual steps to calculate future states up to a certain end time.

The land use model simulates changes in land use caused by human actions and natural processes. Space is represented as a regular grid, in which each cell indicates the dominant land use in that area. Examples of land use classes include forests, agriculture, residential area, industry, commerce, airports and open waters. The model starts with a given land use map and

annually allocates a specified number of cells for each land use. It is in this allocation that the different land uses compete for space to occupy the best locations.

The notion of best location is modelled through total potential as a numerical value for each location —grid cell— and each land use. Total potential is computed as a function of the influence of the land uses that occur within the neighbourhood of a cell, accessibility to infrastructure, physical suitability and zoning regulations. All of these factors need to be calibrated on the basis of historic land use maps and/or expert (local) knowledge.

A major new release of the software has been undertaken in the framework of ET2050. The Model has split Europe in several sections to allow for different social behaviour in those sections, with a number of socioeconomic inputs regionalised for each section independently. Basic parameter values in Metronamica are based on qualitative expertise on regional dynamics.

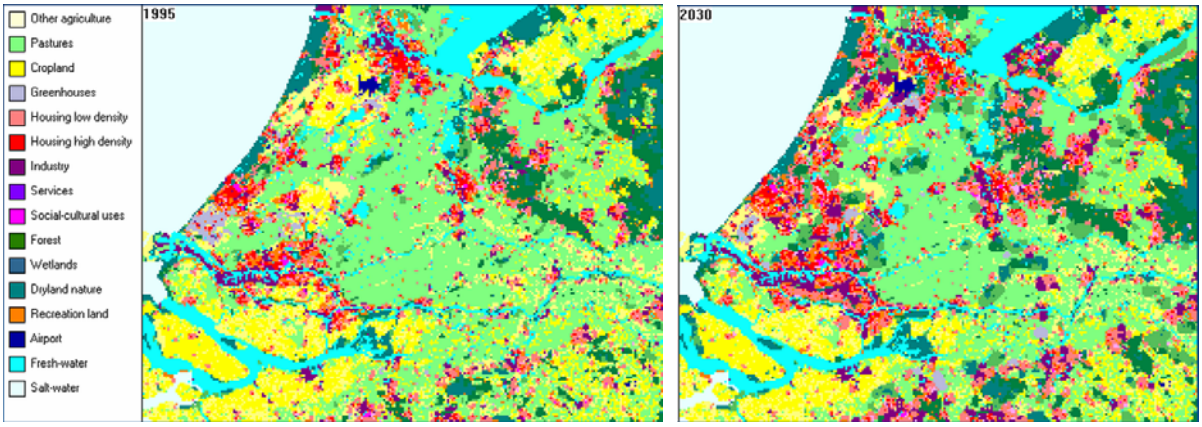


Figure 3-4 METRONAMICA multiscale integrated landuse model (RIKS 2013)

3.6 SASI

The SASI model (developed by S&W, Dortmund) is a recursive simulation model of socio-economic development of regions in Europe subject to exogenous assumptions about the economic and demographic development of the European Union as a whole and transport and other spatial policies. The SASI model differs from other approaches to model regional development by modelling not only production (the demand side of regional labour markets) but also population (the supply side of regional labour markets).

Seven submodels are integrated in SASI to establish cross-sector integrated forecasts for the 2010-2050 period, becoming a comprehensive spatial-development integrated modelling tool.

- The *European Developments* submodel processes exogenous assumptions about the wider economic and policy framework of the simulations (EU economy performance, migrations, economic transfers via SF and CAP, development of TENs);
- the *Regional Accessibility* submodel calculates regional accessibility indicators expressing the locational advantage of each region with respect to other relevant destinations
- The *Regional GDP* submodel calculates regional economic development by production functions for 6 economic sectors (agriculture, manufacturing, construction, trade-transport-tourism, financial services and other services).
- The *Regional Employment* submodel calculates regional employment by industrial sector derived from regional GDP by industrial sector and regional labour productivity.

- The *Regional Population* submodel forecasts regional population by five-year age groups and sex through natural change (fertility, mortality) and migration.
- The *Regional Labour Force* submodel calculates the regional labour force derived from regional population and regional labour force participation partly endogenously affected by changes in job availability or unemployment.
- The *Socio-economic Indicators* submodel calculates equity or cohesion indicators describing the distribution of accessibility and GDP per capita across the regions.

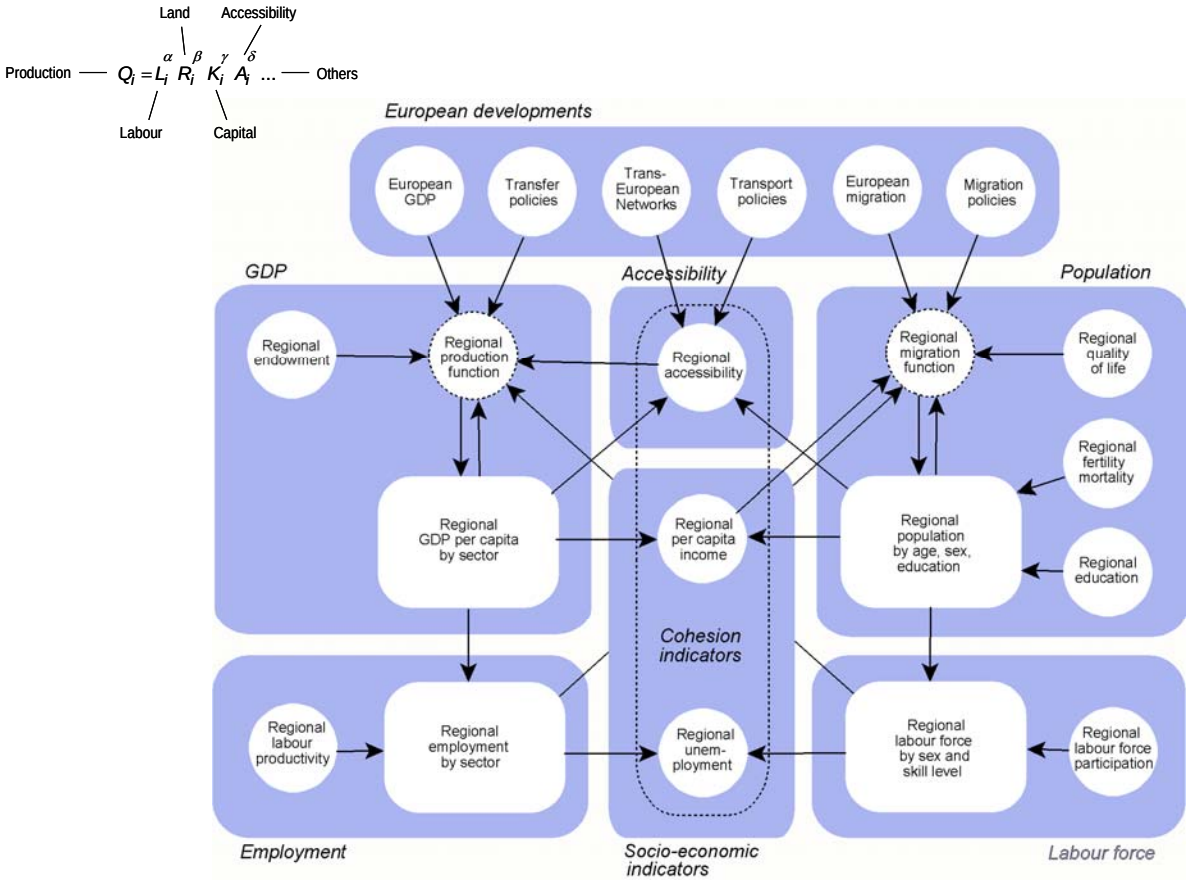


Figure 3-5 SASI model structure (S&W 2013)

For application in the ET2050 project, the SASI model was updated and extended in order to as much as possible meet the scenario specifications in the First Interim Report. The adjustments required many trial-and-error runs. In particular the following adjustments to the model and its database were made:

(1) The model database was updated using the most recent available regional data and converted to the system of NUTS-3 regions of 2006.

(2) The forecasting horizon of the model was extended to 2050 to see how the assumptions made for the period until 2030 would work out in the twenty years thereafter. This extension required the extrapolation of model input parameters.

(3) The study area of the model was extended to the larger study area, EU38 (EU27 plus Iceland, Liechtenstein, Norway, Switzerland and the West Balkan countries Albania, Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro and Serbia.

(4) The exogenous assumptions of the model were adjusted to match as much as possible the exogenous assumptions made in the other models (see Sections 2.2 and 2.3).

(5) The NUTS-2 typology of regions proposed for the exploratory scenarios was translated to NUTS-3 regions (see Section 2.3).

(6) The transport networks were updated to support the three exploratory scenarios (see Section 2.3).

(7) The model was re-calibrated with the updated regional data for the new region system. The new parameters are as follows:

Next table presents the calibration carried out in SASI to better adjust the model to the present situation.

Variable	Regression coefficients					
	Agriculture	**Manufacturing**	**Construction**	**Trade, tourism, transport**	**Financial services**	**Other services**
sgdpn	0.678524	0.893175	0.973386	1.099938	1.177336	0.999325
gdpwn	0.341488	0.612451	0.521618	0.687285	0.531100	0.603967
acctrr				0.092569	0.026030	0.062745
acctrra	0.150137		0.056099			
accfrr		0.081128				
rlmp				0.029001	0.036534	0.035755
pdens	–0.119823		0.077598			
devld	–0.120504			–0.223148		
rdinv		0.145465			0.053178	0.145935
Constant	0.767319	0.213326	0.419835	0.119600	1.157029	0.394670
r^2 log	0.861	0.822	0.735	0.838	0.850	0.842
r^2	0.679	0.694	0.579	0.657	0.714	0.671

where

*sgdp**n***	Share of GDP of sector ***n*** (%)
*gdpw**n***	GDP per worker in sector ***n*** (1,000 Euro of 2010)
acctrr	Accessibility of GDP travel road/rail
acctrra	Accessibility of GDP travel road/rail/air
accfrr	Accessibility of GDP freight road/rail
rlmp	Regional labour market potential (accessibility to labour)
pdens	Population density (pop/ha)
devld	Developed land (%)
rdinv	R&D investment (% of GDP)

Figure 3-6 SASI model: calibration results (for reference year: 2006)

To take account of the slow process of economic structural change, independent variables *sgdp**n*** and *gdpw**n*** are lagged by five years; all other independent variables are lagged by one year, i.e.

the most recent available value is used. Because no data are available for years before 1981, no lags are applied for 1981.

SASI model is especially well prepared to analyse policy impacts in long-term scenarios since it is a dynamic integrated model. Therefore, the modelling exercise carried out by SASI is not just to continue 2030 scenarios further on, but to assess a number of policy-variants and extreme-variants in the 2050 horizon. Once these variants are developed, and the consistency of all modelling results studied, the continuation of 2030 scenarios towards 2050 will be carried out by TV+ Meta-model.

4. Baseline Scenario 2010-2030

4.1 Approach

A Baseline scenario is a projection of current trends in absence of neither new policies nor unexpected events. It may be likely in the near future, but it is very unlikely further away. A Baseline scenario involves a rather pessimistic view in relation to the (lack of) capacity of governments to reform public policies, the (un) willingness of companies and citizens to change their present behaviour, as well in terms of (insignificant) technologic progress.

Exploratory Scenarios, on the other hand, are understood as more or less extreme possibilities for each of the three mentioned drivers (policies and government, social and corporative behaviour, technology). The ET2050 Vision could be understood, in this context, as a "virtuous middle path" – the ideal balance of the best yield by the alternative, and to some extend contradictory, exploratory scenarios.

It is convenient to refer the ET2050 Baseline scenario to pre-existing and more recent Baseline scenarios, for comparability. The ET2050 Scenarios begin in 2010, and therefore they take as starting point the economic crisis that started in late 2008 as a financial crisis in Wall Street and the USA, and its aftermath[8] in the rest of the world and, particularly, in Europe.

In this respect, the ET2050 Baseline Scenario is inspired in the short and medium term, among other recent studies, by the *Regions 2020 Report* (2008, 2011)[9], and assumes as starting point a similar hypothesis that the "Sluggish recovery" scenario, a pathway based on a permanent loss in wealth and stagnation on lower growth path.

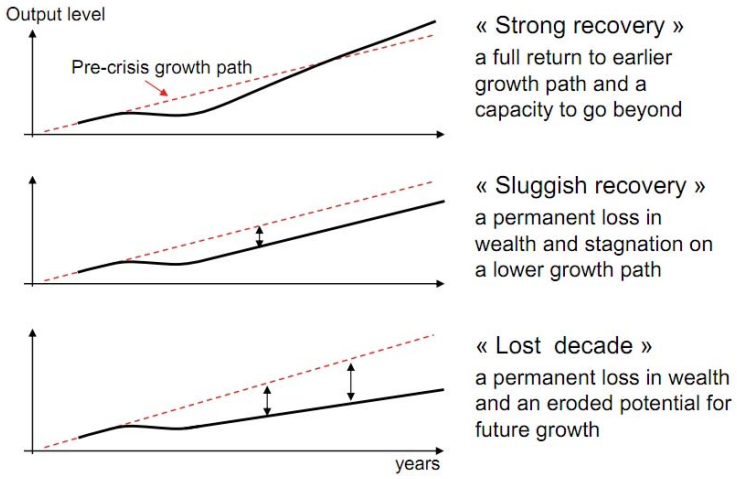


Figure 4-1 EU2020 Scenarios (JM Barroso, Informal European Council, Feb'10)

The actual development of the Baseline Scenario for 2030 and 2050 included the following research activities:

- Analysis of reference trends and scenarios at World and European level
- Drafting of the first qualitative narrative of the Baseline scenario, based on the EU2020 scenarios already mentioned, and other sources

[8] Manuel Castells et alt. "Aftermath: The Cultures of the Economic Crisis", 2012

[9] ÖIR et al (2011), Regional Challenges in the Perspective of 2020 – Phase 2: Deepening and Broadening the Analysis, EC DG Regio.

- Internal expert consultations and debates by ET2050 partners carried out in the Second TPG meeting in Brussels, to discuss a first draft Baseline Scenario (19/20-03-2012)
- Analysis by sectors and macro-regions, carried out in the ET2050 project (see all reports at www.et2050.eu, 20-04-2012 version
- Elaboration of the Present State and Trends analysis
- Analysis of ongoing debates on policy reforms in Europe
- Identification of Critical points of Bifurcation or alternative evolutions in response to major challenges anticipated for key sectors based on the present state of Europe and historical evolutions
- Comparative analysis of existing baseline scenarios developed in European studies as well as at World scale
- Definition of baseline assumptions or Key Directions of the Baseline Scenario based on possible responses to critical bifurcations. Validation through participatory process
- Quantitative analysis made with TV+ and PASH+ meta-models, that provide for a number of hypothesis for relevant indicators aggregated at EU level
- Quantitative modelling of Baseline with forecast models: Multipoles, MASST, MOSAIC and METRONAMICA (2010-2030) and SASI (2030-2050)

Next, the World reference is presented, considered common to the Baseline and all other Exploratory scenarios.

4.2 World Reference: The Aftermath of the Second Globalisation

World figures used as reference for European baseline scenarios are presented for a number of key indicators, since 1950:

WORLD	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
World Population (millions of people)	2.531	3.039	3.708	4.473	5.308	6.125	6.910	7.670	8.323	8.889	9.214
World Urban Population (% over total population)	29%	33%	36%	39%	43%	46%	50%	55%	59%	64%	69%
World illiteracy rate (% of population 15+)	44%	41%	37%	30%	24%	18%	17%	14%	11%	9%	7%
World Gini Coeficient (Income Disparities)	0,63	0,64	0,65	0,66	0,66	0,66	0,64	0,63	0,63	0,62	0,60
World GDP (1000 milions of 2010 €)	4.501	7.422	13.535	19.367	26.411	34.214	43.338	60.565	84.638	106.888	134.986
World total trade (goods % services in 1000 million €)	125	178	479	2.250	5.625	13.027	19.947	36.060	65.189	100.272	154.236
Global seaborne traffic (billion tonne·km)	4.862	7.197	10.654	16.777	16.440	22.927	32.746	48.472	69.707	100.246	144.163
Global air traffic (billion RPKs)	226	368	600	1.100	2.100	3.381	4.621	7.491	12.145	19.688	31.918
World Tourism (million overnight visitors per year)	25	64	109	170	319	560	940	1.281	1.746	2.379	3.241

WORLD	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
World energy consumption (MTOE)	2.900	3.754	4.884	6.469	7.192	8.441	10.182	13.442	17.747	20.758	24.280
World CO2 emissions (million tones)	10.000	11.802	14.908	18.990	21.977	24.224	29.905	38.875	50.537	56.757	63.741
Real crude oil price (€2010 per barrel)	13	12	9	82	33	30	67	108	121	130	138

Figure 4-2 World Framework 1950-2010 and hypothesis 2010-2050 – Table of exogenous variables10. PASH+ foresight model based on various sources.

The indicators on Figure 4-2 above were obtained by PASH+ foresight meta-model based on harmonising an extensive number of sources, as discussed in the First Interim Report.

The Figure 4-2 shows that from 1990s the World has experienced accelerated changes in terms of demographic growth, information and communication technologies and information flows, integration of global financial systems and increase of global trade, and tourism, emergency of Asian economies, and increasing oil prices.

Energy consumption will likely grow in the near future, and CO2 emissions, even if there is a significant market shift towards renewal energy sources and decentralised and distributed grid systems, and electric and hybrid vehicles market share grows significantly worldwide. Oil price may likely grow, even though it seems unlikely a shortage ahead, because of increasing taxation and more expensive extraction.

While economic disparities at world level have been reduced because of the emergency of new economies, and standards of living, knowledge and literacy are spread worldwide, social and regional disparities have mostly grown precisely in China, the Russian Federation, India and even Brazil, countries that displayed the greatest disparity in GDP per capita in 2007. Also in USA and many European countries social disparities have increased largely because salaries have not always followed the growth of the economy, and corporative profits, in the latest decades. Moreover, in the "financial global capitalism system", corporative profits have been increasingly decoupled from productivity and attached to expectations wherever they may be emerging around the world.

The urbanisation process has been accelerated and the number of large metropolis have grown worldwide, not much in Europe. We have seen the fast development of the so-called "Space of Flows", a "Networked Society" that blurs political borders, diminishes the power of Nation-States and, in many aspects, subverts geographic distances: neighbouring places became distant and remote locations much closer if well connected to just-in-time communication networks. The world is not flat, however, and distance still matters: people and corporations become global and still wish to stay local. Therefore, local and global scales become more and more relevant.

4.3 Europe in the world: Diminishing world share

Next graphic displays the expected evolution of European countries world share up to 2050[11]

[10] See ET2050 First Interim Report to consult the different sources and hypothesis used to produce the table.

[11] It is important to note that even if shares may diminish, in absolute terms there is an overall increase

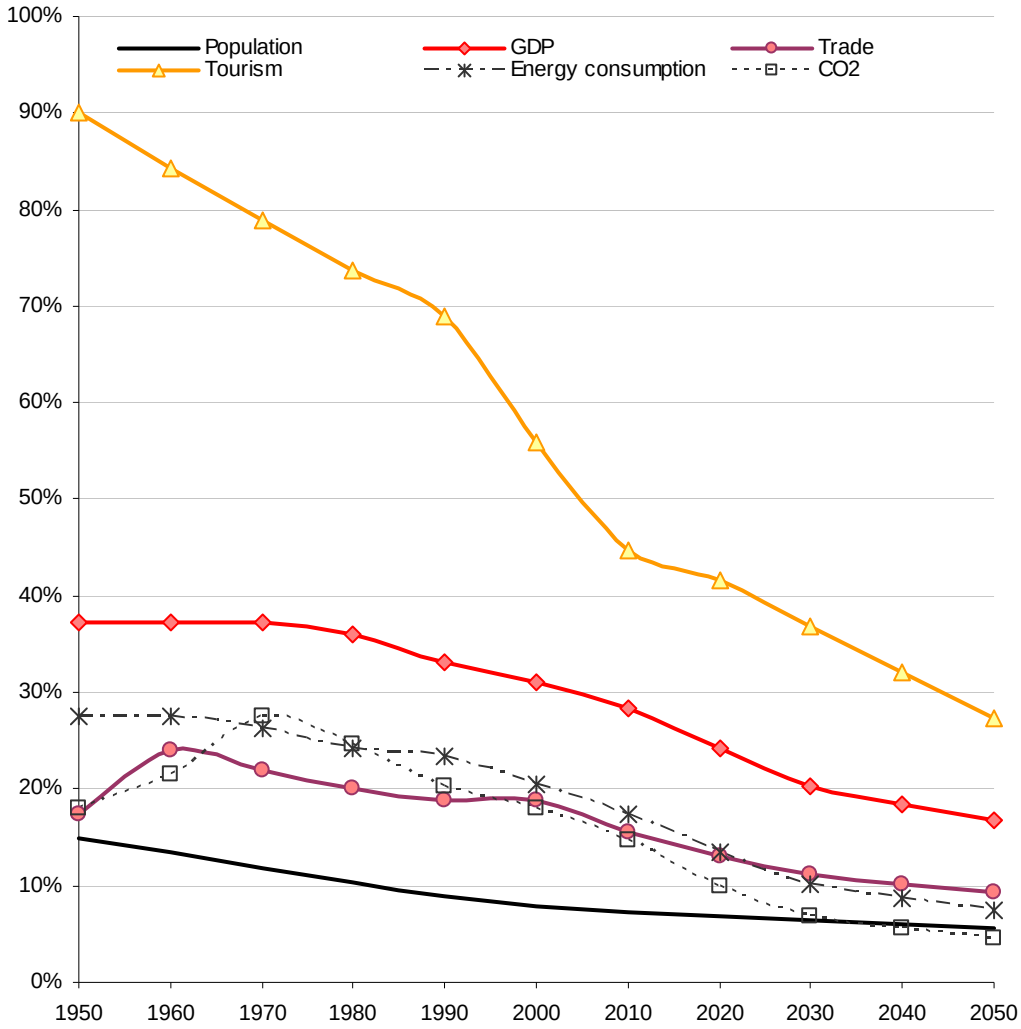


Figure 4-3 World Framework – 1990-2010 evolution of European weight in the World, and hypothesis for 2010-2050. PASH+ foresight model based on various sources

After the Second World War, European Western economies raised in relation to USA, largely because effective social and economic public policies and strong pro-growth social values, in a catching-up process. At the same time, the European political integration progressed step by step according to the post-war vision of Jean Monet, Konrad Adenauer, and other political leaders of that time. The development of Western European economies in late fifties and sixties was qualified later on as the “European model”..

The economic gap between more advanced Western European countries and the rest of the world has been reduced since mid seventies because of the lower economic growth in Europe. During the last decades this process has increased because of the outsourcing of American and European industrial corporations mostly to export-oriented Asian economies still with very low salaries, as well as the introduction of new technologies in manufacture and services (the so-called “robotsourcing”). Both processes have reduced the number of jobs now available in Europe, keeping the salaries of European workers relatively low in relation to corporative profits, and therefore increasing social disparities. Because of the relatively slow economic growth of the recent years, and the crisis initiated in late 2008, public policies face nowadays increasing financial sustainability problems, in many European countries. The “decline” of the so-called “European model” was first announced in the early 2000s, when the “excess” of social and other expenditures by European public sectors, in relation to the likely evolution of their finances, was

first denounced by different analysts. The increasingly old European population, compared to the rest of the world and particularly to Neighbouring Mediterranean countries, and the rigidity of European public institutions and markets, in the eyes of many analysts results in predominant reactive and conservative values leading to a lack of flexibility adopting forthcoming technologic innovations.

The idea of "decline" is not new in Europe. It was already before the First World War, since early 1900s, that the "decline" of Europe and even of the Western civilisation was first announced. At that time, European countries begin to reduce the share of population, economic production, trade and technologic innovation they accumulated during the industrialisation of the 1800s, in the age many historians call "High Imperialism", with the apotheosis of the dominance of European colonialists powers over the rest of the world.

It is clear that in the years to come the political influence of European national governments and the weight of European corporations will naturally tend to diminish (rather than "decline") at Global level[12]. Next graphic displays the long-term evolution since the First Globalisation to present times in terms of world production.

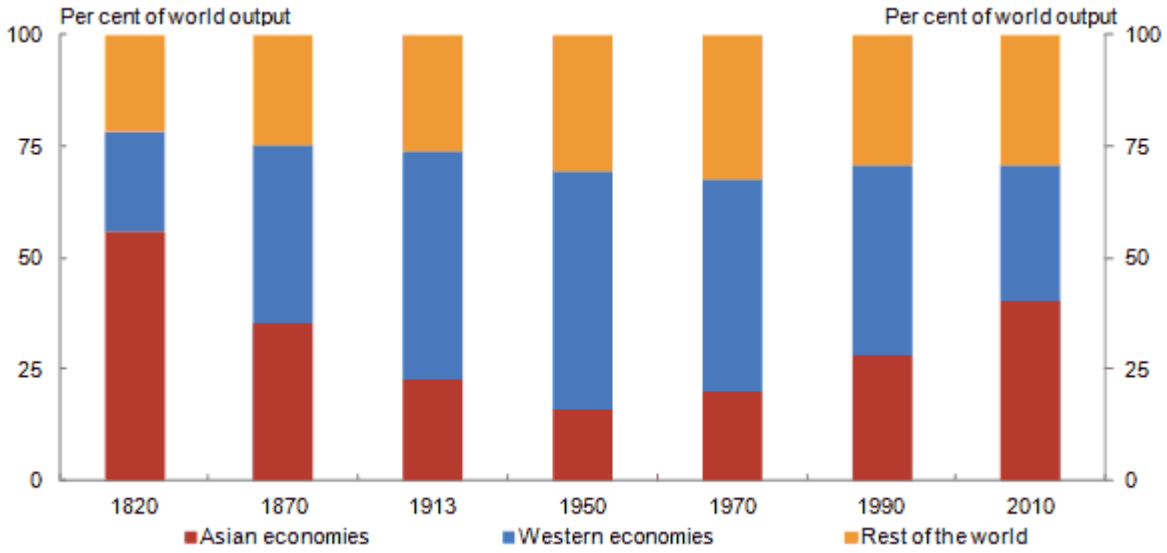
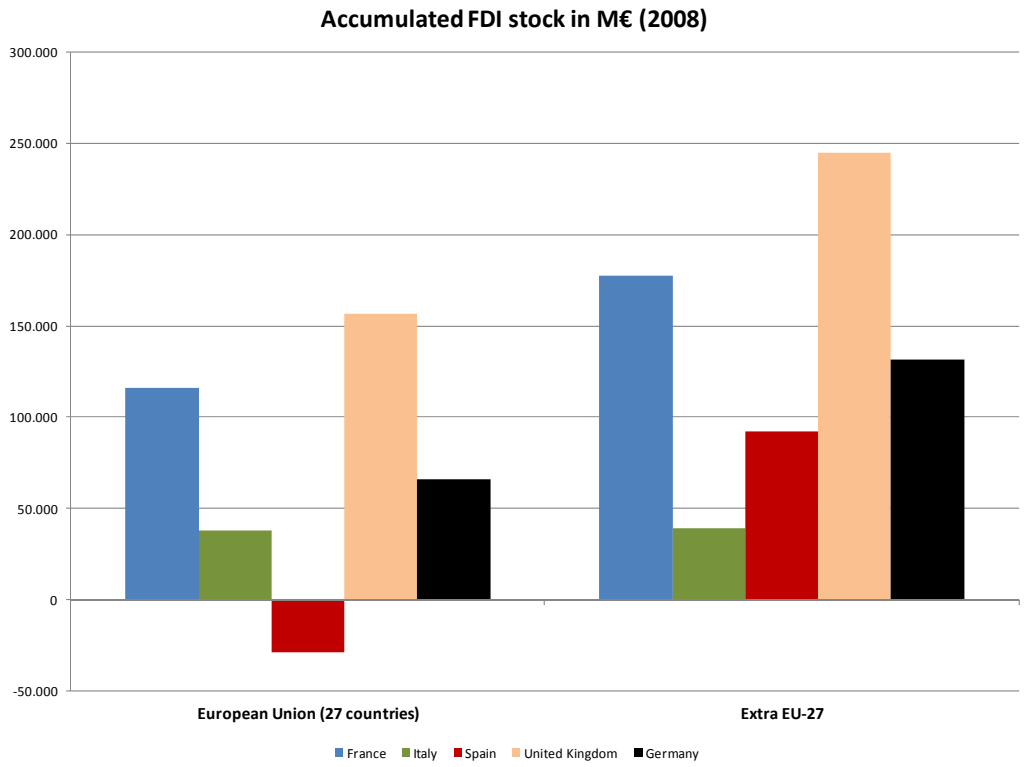


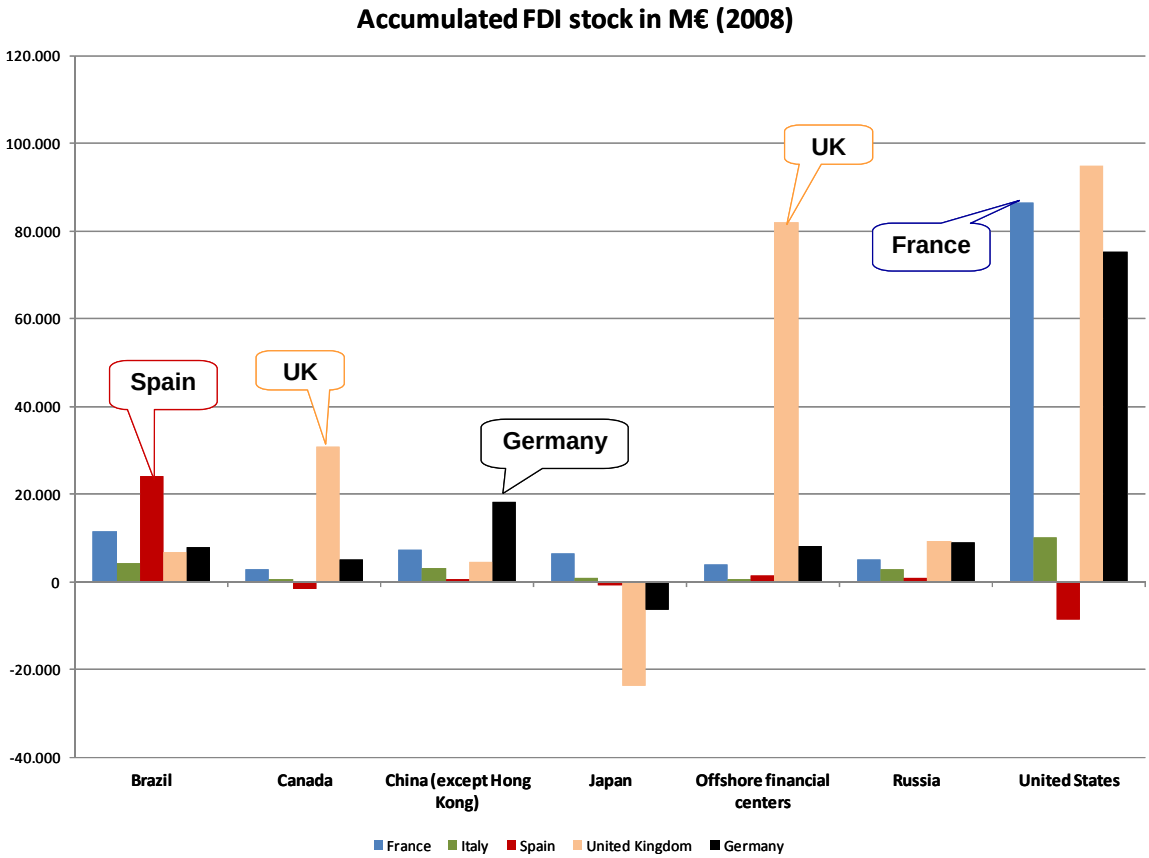
Figure 4-4 Purchasing parity adjusted Total GDP Source: Maddison (2010) and Conference Board (2011)

Western economies are defined as: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, the UK and the US. Asian economies are defined as: Bangladesh, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam

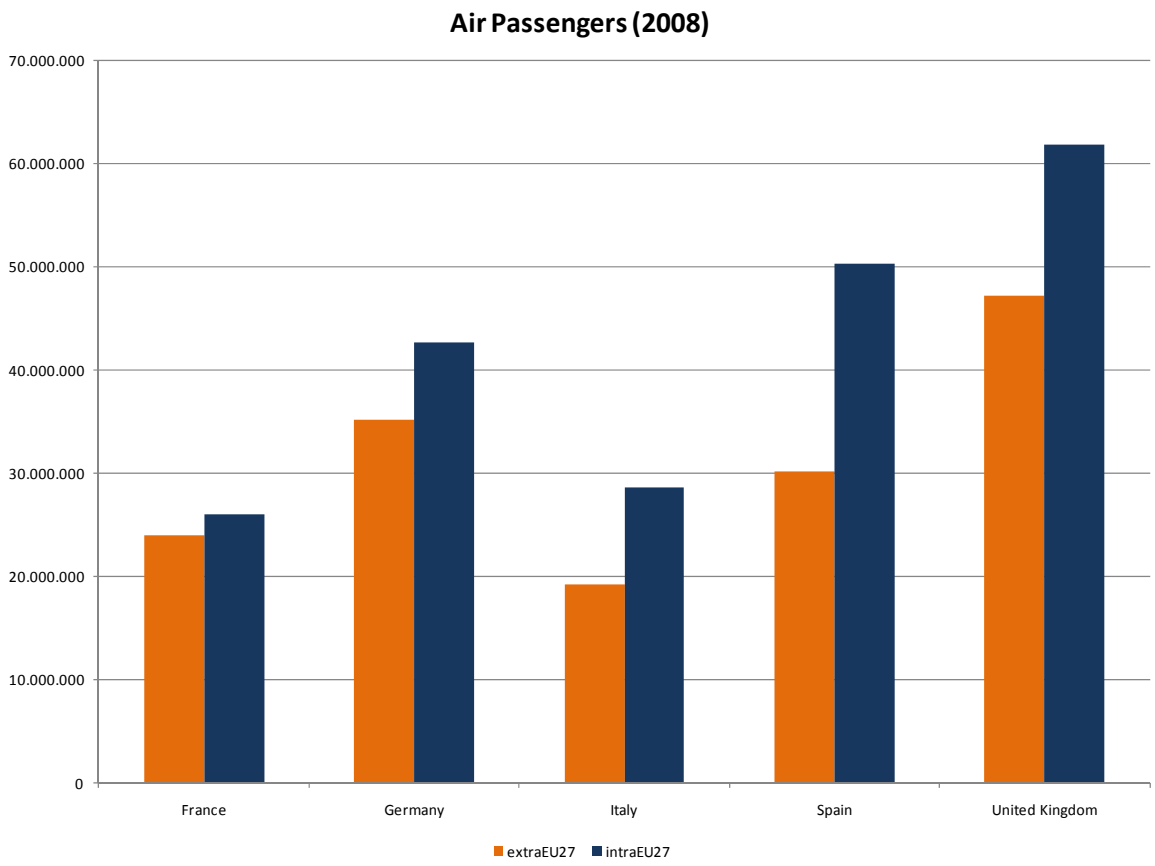
Needless to say, the diminishing share of European countries of the world economy does not mean the absolute growth, even in exponential terms, in many areas. The European economies will become, after the crisis, increasingly more interdependent from the rest of the world economies, and foreign investments, trade, migrants, or tourism, that may grow more than in between European countries. This may have profound social and political implications.

[12] This view, pictured a context for the "Relative Decline", or the "Sweet Decline" of European countries, echoes European thinkers and visionaries from 1900s, when than the USA were rising as an economic and military power.





Next table provides complementary information to further illustrate the increasing globalisation of the European countries (the same Western countries shown as sample), with international air passengers at similar magnitudes between intra-European and Extra-European.



4.4 Europe Present State: Across the Great Recession

The present financial crisis, then economic, social and political, is maybe the worse European economic crisis in half a century. EU Council President Herman Van Rompuy warned that the eurozone and the European Union itself were fighting for survival as a result of the ongoing sovereign debt shocks. Nationalism and populism grow both in Southern countries, with economies in recession and large percent of unemployment especially among young's, as well as in France or in UK, to some extend in Hungary, and some Northern countries like Finland. The way the old successful "European model" is being perceived by citizens of different regions and countries inside the European Union, but also in Neighbouring countries is dramatically changing.

The roots of the actual crisis in Europe, and the Western economies, are often presented as follows:

- The financial, and then economic crisis, lead to dramatic public financial unbalances. Countries running with surpluses and relatively low debts have seen deteriorated their situation in just five years. By some experts, these financial crisis only triggered a much more serious concern of world financial markets on the sustainability of European public expenditures. Or it is just, by other analysts, the last episode of the successive , each one worse than the previous one, inherent to the capitalist global economy.
- The crisis is very having different impacts in different countries and regions, further increasing economic divergence, and different countries have different, even opposite interests, concerning the measures to be taken at European level, and their level of urgency.

- The fundamental weaknesses of European policies have been revealed, mostly in relation to Monetary stabilisation, banking and private debt control, and Fiscal harmonisation. Also in relation to the difficult situation of less developed countries in recession, unable to implement internal devaluation and facing speculative induced tensions in financing their so-called sovereign debt.
- In relation to Cohesion policies, relevant hidden trends in the 1990and 2000s years are becoming more visible, such as the increasing trade gap among European countries, the unsustainable growth of private debt fuelled by easy lending, as well as other well-known unbalances in public finances and the Real Estate Bubble in many Cohesion countries.
- European strong austerity and monetary policies are nowadays almost unique at world level (e.g. compared with Japanese and to some extend American monetary policies), and many analysts blame them to be responsible for worsening the economic situation. However, other analysts alert in relation to the urgency to keep public debts in order avoiding a Public Debt Bubble that will be far more dramatic that any other.
- Economic Disparities among countries and regions have grown 2008-2013, to the point that the relative convergence in the previous decade is maybe lost.
- ECOFIN and IMF forecasts for the few coming years show the difficulties of most European economies to recover to a previous situation, and the lasting impacts of the crisis particularly in Cohesion countries.
- As a result, social welfare has been reduced, both because higher unemployment, lower salaries and public cuts on social expenditure. The growth in the hidden economy (up to 22% in some countries) and social networks, often family based, become more important.

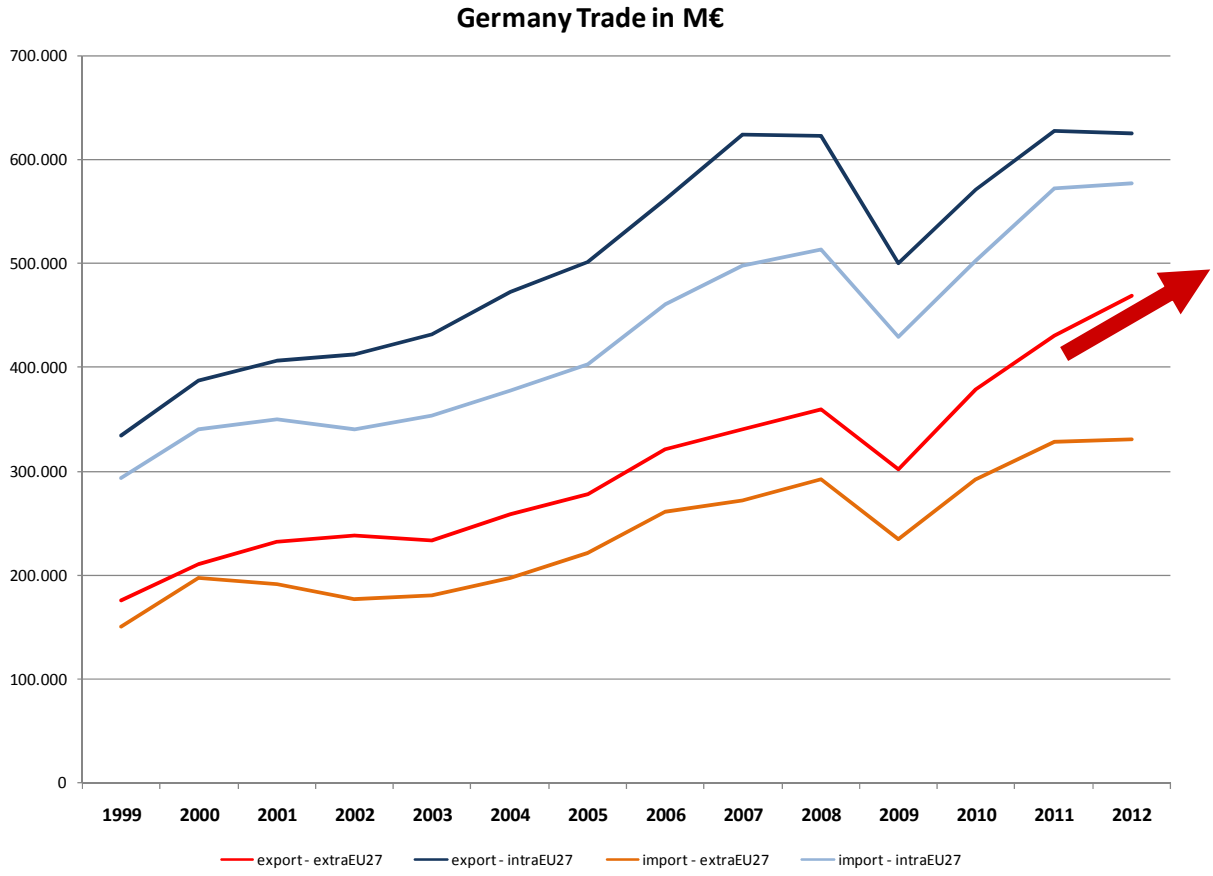
Based on the performance during the crisis of regions and countries considered successful cases of catching-up economic growth, the narrative of the successive Cohesion reports, and probably Cohesion policies, may need to be reviewed[13].

Recent ECOFIN[14] studies affirm that in the euro area the convergence process appears to have stalled a few years after the inception of the euro. This essentially reflects, always according to ECOFIN studies, a poor growth performance of catching countries in productivity. Catching-up processes in the euro area were benefited from large inflows of foreign capital in pre-crisis years. However, the observed capital accumulation pattern does not seem to have been conducive to rapid technological change and productivity growth. More worrying, ECOFIN also affirms that there is also evidence of capital misallocation, with the accumulation process becoming gradually less economically efficient during the first decade of the euro.

Imposed by the strong austerity policies, and therefore the lack of capacity of governments to increase public investments, as well as by the low levels of domestic consumption, European economies are nowadays increasing their exports to the rest of the world. Next graphic, for Germany, shows a pattern that is to some extend common to other European economies: stagnation of intra-European imports and exports, and increase in extra-European exports.

[13] It is true that EU achieved impressive economic and social convergence since 1988. At national level, Greece, Spain, Ireland and Portugal – the largest beneficiaries of Cohesion Policy in recent years – have experienced significant growth. Between 1995 and 2005, Greece reduced the gap with the rest of the EU-27, moving from 74 % to reach 88 % of the EU's average gross domestic product per head. By the same year, Spain had moved from 91 % to 102 %, and Ireland reached 145 % of the Union's average starting from 102 %. It was expected similar results in the new Member States, where Cohesion Policy has just begun to take effect, underpinning the high growth rates. At the level of the regions, relatively strong economic growth of those with a low GDP per head has meant that EU regions have been converging. Between 1995 and 2004, the number of regions with a GDP per head below 75 % of the EU average fell from 78 to 70 and the number of those below 50 % of the EU average declined from 39 to 32.

[14] Quarterly Report on the Euro Area, Catching-up processes in the euro area. DG ECOFIN based on EU KLEIMS


Germany Trade in M€
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0
1999
2000
2001
2002
2003
2004
2005
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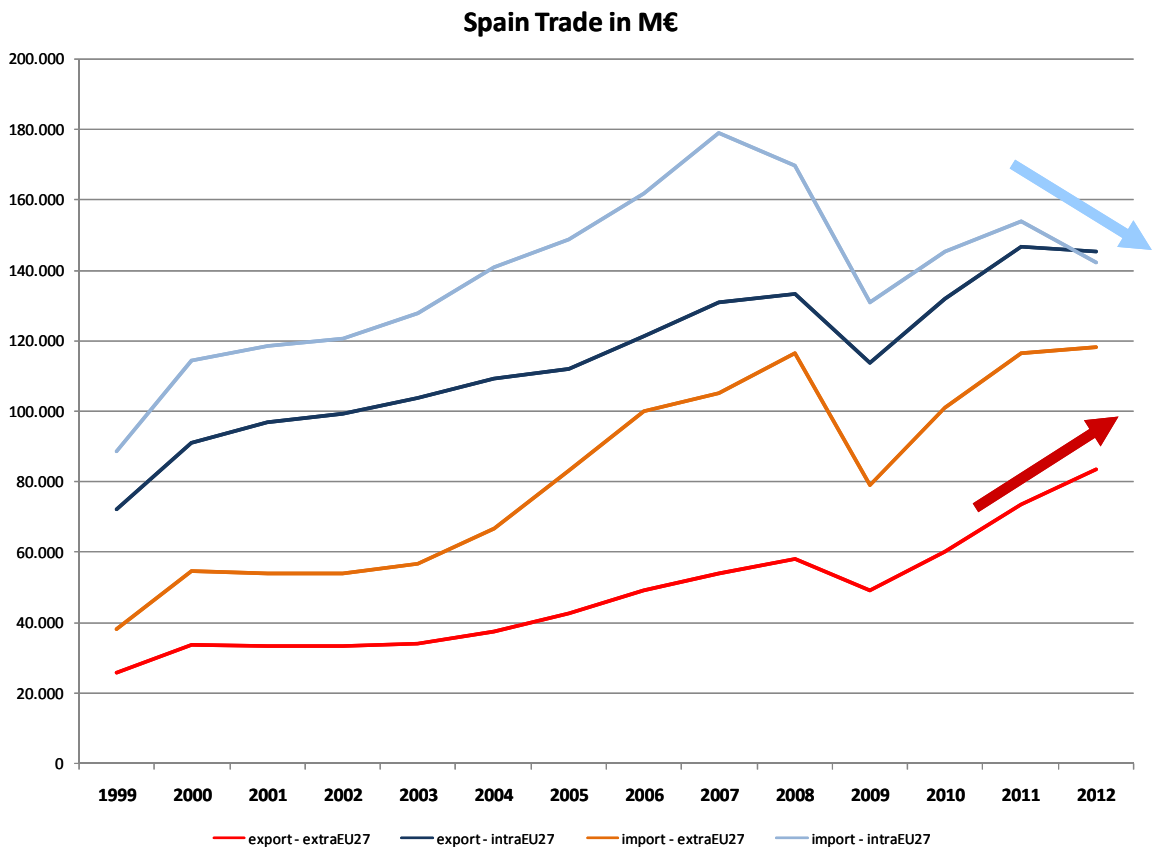
2011
2012
export - extraEU27
export - intraEU27
import - extraEU27
import - intraEU27

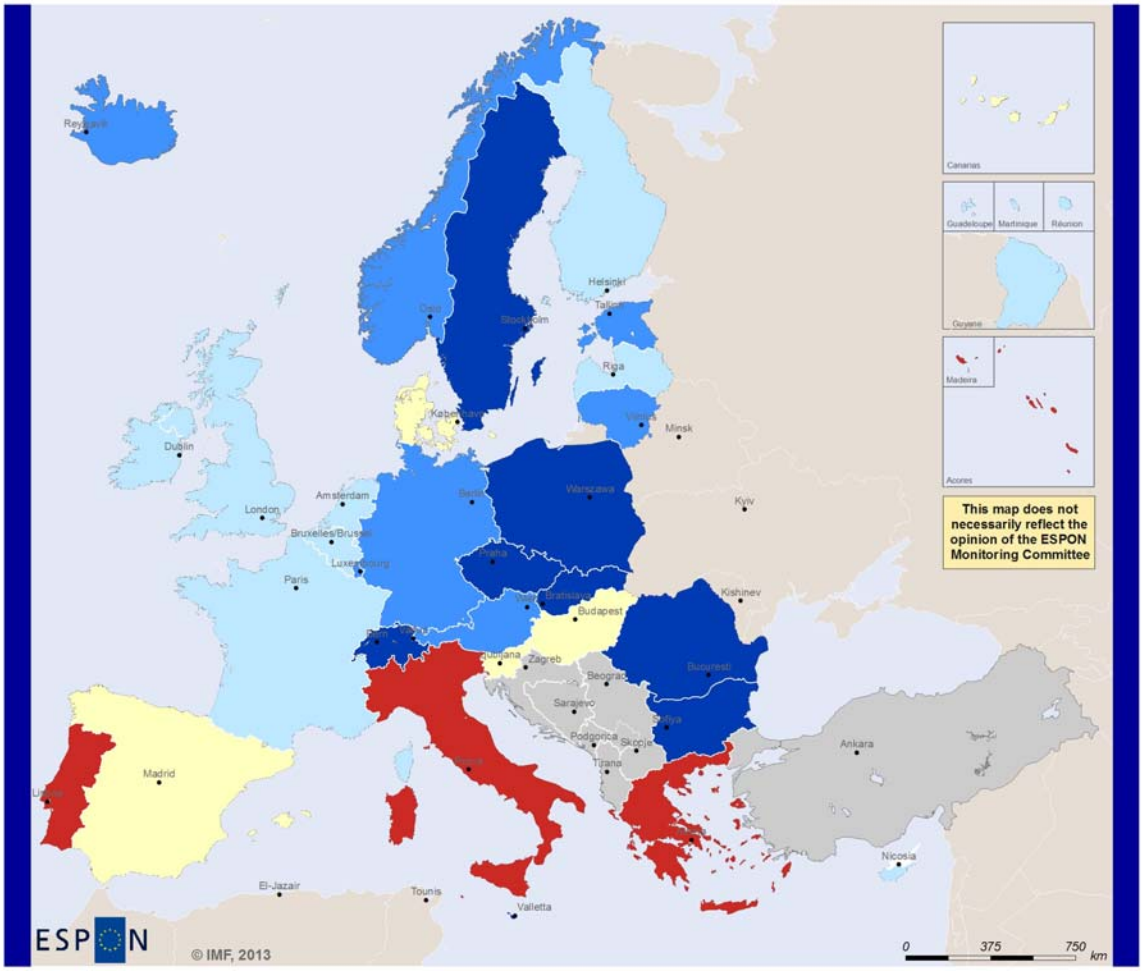


In the case of the corporations located in Spain, together with the increasing exports to the rest of the world, there is also a clear pattern to reduce intra-European imports. The rapid growth of imports from Europe and from outside Europe since 2003 to 2008, was not supported by increasing productivity gains and exports, but by an increase of private debt, in part induced by the Real Estate Bubble, facilitated by easy lending from the international financial system.

Next map presents the most recent forecast produced by IMF for the European economies up to 2017.

GDP Growth 2008 - 2017, 10 years period (Source: IMF 2013)

Measured as annual average GDP growth rate along the period



GDP Growth annual average rate (Units: %)

Results obtained by IMF

- -1,6% - 0%
- 0% - 0,6%
- 0,6% - 1%
- 1% - 1,6%
- 1,6% - 3,6%
- No data (ESPON space)
- No data (No ESPON space)

Needless to say, even if pessimistic views are nowadays overwhelming, there are also analysts, like Marco Buti and Karl Pichelmann[15], pointing out that Europe has a more than fair chance to

[15] European prosperity reloaded: an optimistic glance at EMU@20, By Marco Buti and Karl Pichelmann (19th Brief, February 2013)

leave the crisis behind in a much stronger overall world position than before. Deep reforms at national and European level, they say, including the establishment of a banking union, will allow for significant gains in dynamic allocative efficiency, fostering intra-area convergence and retaining Europe's strong competitive position in the global economy. European well-developed social systems, smartly recalibrated, continue these experts, will be an asset in the post-crisis world, paying-off in terms of more economic stability and sustained growth, and the strengthened medium-term fiscal framework to put public finances back in order will generate fiscal space to tackle new challenges and enable automatic stabilisers to work; a task yet to be addressed in other advanced economies.

In relation to Cohesion policies, it is clear that they will have to somehow be adjusted to the new social and economic conditions created by the crisis, and the increasingly globalised and divergent European economies. Cohesion, rather than only a question of co-financing building missing infrastructure to increase social fixed capital or providing subsidies to local entrepreneurs, seems to require a more comprehensive approach with common monetary and fiscal common policies being able to be sensitive to less developed regions and countries, as well as to promoting in-depth institutional reforms, as well as better territorial planning and governance. On the other hand, future Cohesion Policies will also have to face future challenges such the ageing society and the sustainability of the welfare systems, the capacity to developed or implement technologic innovations, as well as to reduce fossil energy dependency. These well-known challenges will likely have very different positive or negative impacts according to the regions specificities. Local and regional governance issues will likely play a decisive role in regional development.

4.5 European Baseline Assumptions

This section introduces a synthesis of the main assumptions (at European, National and Regional –NUTS2 or NUTS3 scale) adopted by the forecast models. A more detailed description will be included as scientific annexes to the project Final Report.

Demographic Exogenous and Policy Assumptions by MULTIPOLES

The demographic Baseline scenario assumes no major policy changes in demographic policies across Europe. The number of immigrants will be growing slowly to respond to the labour shortage related to aging of Europe.

In MULTIPOLES the assumptions are formulated for each component of population change, i.e. for fertility, mortality and migration. In the case of the first two components, we have reasonably good data about past trends in Europe and based on this information we are trying to make predictions for the future. For migration, the situation is far more difficult as the required data on international migration are not reliable and not available on the regional level. Estimates of net migration to Europe reported in various sources (Eurostat data, MIMOSA project estimate, IMEM project estimate) vary significantly. There are also problems with the availability of recent data on internal migration (matrices of flows between NUTS2 regions by age and sex). Given the lack of reliable data on migration, we have to accept a large degree of uncertainty of any population forecasts.

In order to deal with the problem of data quality and availability, it is important to take into account various existing sources of information on past trends and various existing forecasts for the future. When preparing our demographic scenarios for ET2050, we were guided by five main sources: Eurostat data and projections, data from national statistical institutes, migration estimates from the MIMOSA project funded by Eurostat, migration estimates from the IMEM project conducted within the NORFACE program, and population projections prepared within the ESPON’s DEMIFER project. The latter ones were very useful as they were prepared on a regional level (NUTS2), while

the Eurostat's EUROPOP2010 population projections were prepared on the national level only. In the DEMIFER project, four regional scenarios were prepared, covering the period 2005-2050 (Rees et al., 2010). In ET2050, we used some information from two scenarios: *Growing Social Europe* (GSE) scenario and *Limited Social Europe* (LSE) scenario. These two scenarios assumed regional cohesion but differed in the assumptions about the economic development.

Fertility assumptions

We assume that total fertility rate (TFR) will increase from 1.61 to 1.66 in 2030, then it will be stable. Age specific rates in 2010-15 will be as in the DEMIFER's GSE scenario, then they increase linearly until 2030-35 to values equal to the average of those in the GSE and LSE scenarios and then will remain constant over the period 2035-50. The assumed 2010-2050 values of TFR are very similar to those assumed in the Eurostats's EUROPOP 2010 projection.

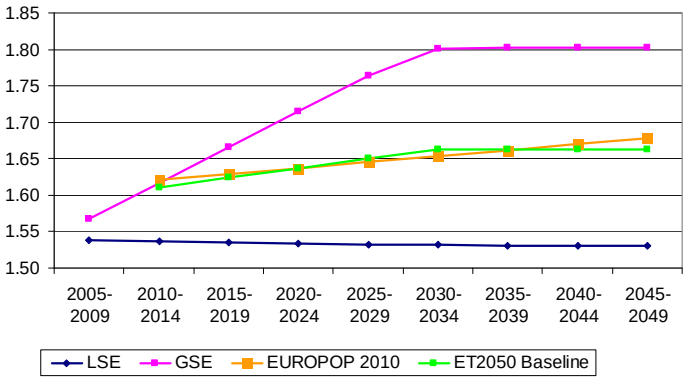


Figure 4-5 Baseline assumptions on total fertility rate (TFR), EUROPOP 2010 and DEMIFER

Life Expentancy assumptions

Two observations were important when formulating the assumptions about mortality: (i) Life expectancy observed in Europe in 2010 (77 for men and 83 for women; Eurostat data) were higher than forecasted in the EUROPOP 2010 Eurostat's projection and in DEMIFER's scenarios; (ii) future life expectancy has been underestimated in most forecasts prepared for European countries in the past.

We assumed that life expectancy will increase to 81 years for men and 86 years for women in 2025-30 and to 85 years for men and 90 years for women in 2045-50. The assumptions about the age and sex specific mortality rates were as follows: 2010-2014 rates will be as in 2015-2020 in the DEMIFER's LSE scenario, and they will decrease linearly to reach 2045-50 rates as in DEMIFER's LSE scenario (Figure 2).

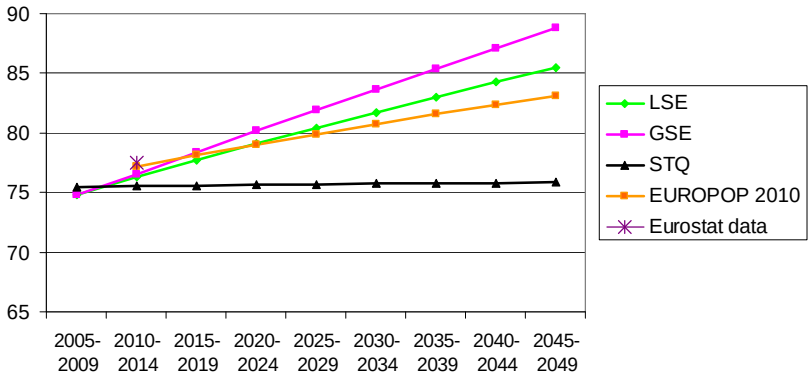


Figure 4-6 Baseline assumptions on life expectancy, EUROPOP 2010 and DEMIFER

Assumptions on migration

We assumed that until 2030-35 extra-Europe immigration will increase by 2 per cent every 5 years, then it will be constant. In the most crisis-hit countries the increase will be delayed by five years. For international intra-Europe migration (age and sex-specific emigration rates) it was assumed that in the least crisis-hit countries the rates will be constant, as estimated for 2010 based on the MIMOSA project, the IMEM project and the most recent Eurostat data. In the most crisis-hit countries (CY, GR, IT, ES, PT, IE,…): the crisis-related increased rates will gradually drop back to the pre-crises values in 2020-25 and then will be constant. For internal migration (inter-regional, within each country) the rates were based on the estimates prepared in the DEMIFER's LSE scenario (which assumed that the average level of mobility will maintained but regional differences will decrease).

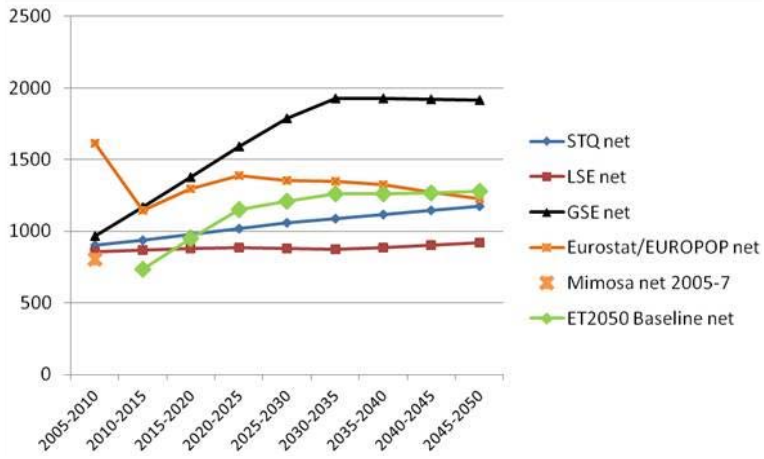


Figure 4-7 Annual net migration 2010-2050, ET2050 Baseline, EUROPOP 2010 and DEMIFER

Policies and Exogenous Assumptions	General Assumption (adjusted regionally and overtime)
Demographic policies	No major policy changes in demographic policies across Europe. The number of immigrants will be growing slowly to respond to the labour shortage related to aging of Europe
Fertility (TRF)	Total fertility rate (TFR) will increase from 1.61 to 1.66 in 2030, then it will be stable.
Life Expentancy	We assumed that life expectancy will increase to 81 years for men and 86 years for women in 2025-30 and to 85 years for men and 90 years for women in 2045-50
Migration	Until 2030-35 extra-Europe immigration will increase by 2 per cent every 5 years, then it will be constant. In the most crisis-hit countries the increase will be delayed by five years. For international intra-Europe migration (age and sex-specific emigration rates) it was assumed that in the least crisis-hit countries the rates will be constant, as estimated for 2010 based on the MIMOSA project, the IMEM project and the most recent Eurostat data

Economic Exogenous and Policy Assumptions by MASST

The specific assumptions applied in MASST3 model for monetary and fiscal policies in Europe are as follow:

- Financial debts will remain as a permanent burden for many European countries, each country standing alone for its own debt, and increasing the costs for all. Austerity policies will remain.

- Structural transformations requiring policy reforms beyond business-as-usual (e.g. fiscal harmonisation) will be carried out to a limited extend only, favouring the renationalisation of policies and establishing mandatory controls at European level.
- Public welfare systems will be reduced especially in Southern and Eastern countries, forced by public financial constraints, and its management more privatised aiming to improve efficiency.
- Public support to lagging regions will be scarcer, and Cohesion policies progressively renationalised.
- Net international extra-European migration will be limited while intra-European migrations will be facilitated as an economic balancing factor.

More specifically MASST3 takes the following main assumptions:

Policies and Exogenous Assumptions	General Assumption (adjusted regionally and overtime)
Macroeconomic situation	In the 2015 the crisis is assumed to be over
Monetary policies	Stability of interest rates, ULC, exchange rates and inflation in Western EU countries, and progressive convergence to these value for Eastern EU countries Decrease of interest on bonds: end of speculation periods
Fiscal policies	Increase of tax rates in the West and East Debt/GDP remains constant

Transport Exogenous and Policy Assumptions by MOSAIC

The following main transport policies and assumptions have been considered in the Baseline scenario:

Policies and Exogenous Assumptions	General Assumption (adjusted regionally and overtime)
Total transport investment	From 1,04% of EU GDP in total transport investment to 0,73%
Infrastructure provision	Maintained in 50% of total transport investment (from 0,72% of EU GDP to 0,38%)
Optimised service management	0,02% of EU GDP yearly in smart ITS infrastructure equipment
Bans and regulations	Car emission factors in 2030 a 30% lower than in 2010, with development of new technologies and driven by Euro Standard regulations
Transport taxation and pricing	Similar 2013

Figure 4-8 Transport and energy assumptions for the Baseline Scenario

The 2013-2030 budget for transport infrastructure was disaggregated in the amount to be invested in the TENs, at National and Regional levels, as well as in transport management and maintenance, as well as in the implementation of smart transport infrastructure. Budgets are then used to build transport infrastructure in Europe in the TENs (core and comprehensive), and the national and regional networks, according to criteria sensitive to the rational of the Baseline scenario.

- European infrastructure budgets are allocated in the TENs network (core and comprehensive) were decided by selecting specific links of the transport network to be upgraded, by applying criteria of efficiency (links with highest levels of traffic) and cohesion (links in different type of regions).
- National and regional infrastructure budgets are allocated at NUTS2 level, according to criteria sensitive to the rational of each scenario.

Between 1995 and 2012, transport investment followed the following pattern:

- The EU spent on average between 0.9% and 1.2% of EU GDP in infrastructure provision
- 1/3 of available funds have been spent on infrastructure maintenance and the rest on construction of new infrastructure.
- More than 85% of investment is financed with Member States national budgets. EU funds represent 5% of investment, and 10% is constituted by EIB loans and private initiative.
- Around 60% of total investment has been devoted to Road mode. 20% to Rail and 10% equally split between Air and Water modes.
- 50% of investment devoted to new infrastructure is targeted at TEN-T networks, and the other half to national networks.
- Almost half of investment on TEN-T has been devoted over the last 10 years to rail, and around 35% to road. In the ISPA and CF beneficiary countries, the proportion of road investments is slightly higher, approaching 40%.

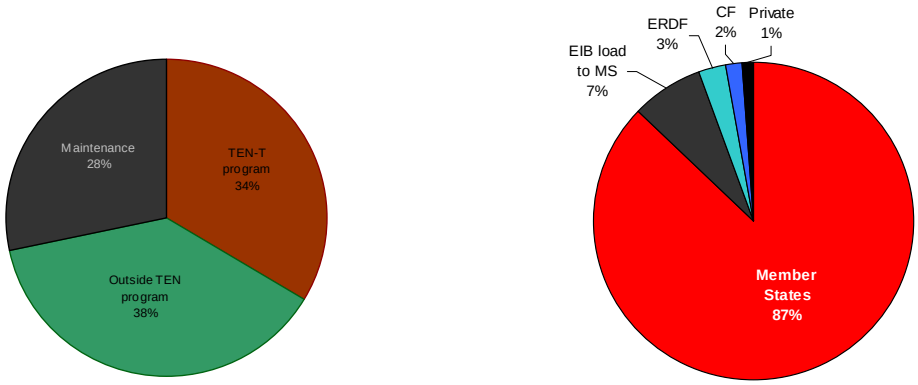


Figure 4-9 Structure of Infrastructure investment and financing 2000-2006 (EEA, TEN-T EA, EC)

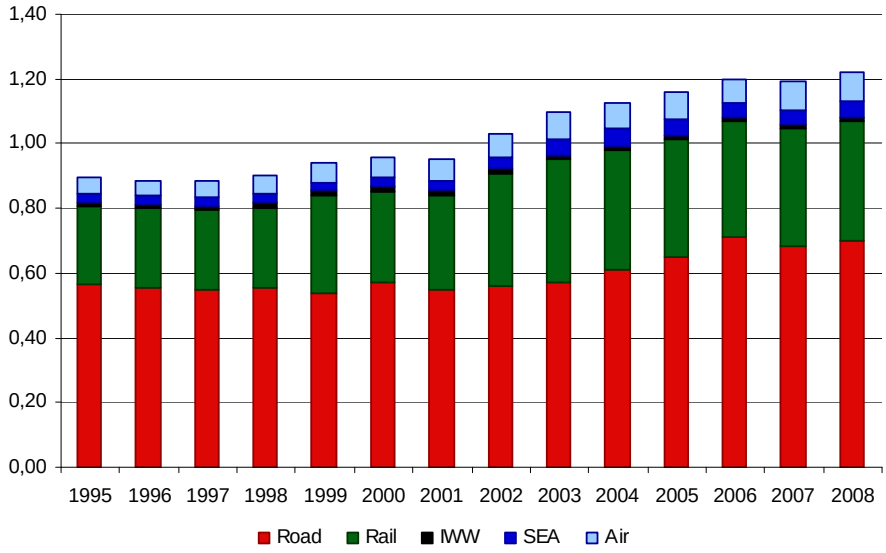


Figure 4-10 Total Infrastructure Investment as a share of GDP (per modes) 1995-2008 (EEA 2010)

The Baseline scenario assumes a continuation of observed trends since 1995, adjusted to the actual crisis. The transport investment drops from 1,2% of EU GDP in 2008 to 0,6% in 2015 (hits the bottom) and increased thereafter until the levels of the early 1990, in around 0,8% of the EU GDP. More specifically, the Baseline considers the following investment abatement:

- € 1.970 billion (2013-2030) in transport investment, 0'73% of cumulated GDP. Infrastructure investment rate in 2030 converging to Western European Countries (WECs) levels (0,8%).
- 2% of budget on ITS implementation
- 1,0% yearly maintenance budget maintained
- € 330 billion in TENs and € 700 billion in National and Regional networks (32% in the TENs)
- 60% of required investments to complete the TENs engaged up to 2030
- € 166 billion in the CORE network and € 161 billion in Comprehensive network. Projects evenly allocated between core and comprehensive networks (50% // 50%).
- Modal allocation of investment in TENs, in line with overall 1995-2012 period.

Additional exogenous assumptions required in MOSAIC were following ones:

- Tendency towards transport demand increase. Elasticity transport to GDP still positive. No decoupling neither for freight no passengers for any trip purpose and long-distance travel.
- Decoupling happening only for urban mobility in more developed regions.
- Decreasing energy intensity (energy consumption elasticity in relation to GDP) due more service oriented economies and increased energy efficiency.
- Decreasing carbon intensity (GHG emissions elasticity in relation to energy consumption) due to improved technology

In the case of SASI, that requires policy inputs for the longer 2010-2050 period, specific assumptions were defined (see next chapter, when introducing 2050 results).

Based on these policy assumptions, and the demographic and economic preliminary results produced by MULTIPOLES and MASST3, MOSAIC model runs produced a number of indicators related to transport investments for long-distance and short-distance networks, mobility for freight and passengers, intra-European and Global accessibility, that were then considered as inputs for MASST3.

Land-Use Exogenous and Policy Assumptions by METRONAMICA

For the baseline scenario general land use behaviour 2010-2030 is assumed to be similar to that of the historic period 1990-2006.

Demographic and economic evolutions from MULTIPOLES and MASST3 models are translated into land-use demands and allocated using assumptions based on historic developments.

Policies and Exogenous Assumptions	General Assumption (adjusted regionally and overtime)
Land-use policies	Based on historical evolutions

Cohesion Policy Assumptions

Cohesion policies are treated both in MASST3 and SASI in terms of the allocations of Structural and Cohesion funds at regional level (NUTS2 in the case of MASST3, and NUTS3 in the case of SASI).

Expenditures in the present funding period 2007-2013 are considered as the point of departure.

Based on the Cohesion policy expenditures by country and the changes in eligibility patterns for Structural Funds for the 2014-2020 period (EC 2011), it was examined whether the allocation of expenditures to countries follows a quantifiable principle that could be used for extend the allocations of funds into the future. The conclusion achieved by SASI modellers was that it is possible to continue the business-as-usual allocation of Cohesion expenditures into the future for the Baseline Scenario based on an inverse relationship with regional income per capita.

Region type	2007-2013	2014-2020
Less developed regions	NUTS-2 regions whose GDP per capita is less than 75% of the EU average	No change
	Transitional support for regions which would have remained eligible for the convergence objective if the threshold remained 75% of the average GDP of EU-5 and not of EU-25	Separate category for transition regions
	Cohesion Fund: member states whose GNI per capita is less than 90% of the average GNI of EU-27	No change
	Transitional support to member states who would have been eligible for the Cohesion Fund if the threshold remained 90% of the average GNI of EU-15 and not of EU-27	Transitional support to member states eligible from the Cohesion Fund in 2013 but whose GNI per capita exceeds 90% of the average GNI per capita of EU-27

Transition regions	Transitional support for NUTS-2 regions which would have remained eligible for the convergence objective if the threshold remained 75% the the average GDP of EU-15 and not EU-25 (phasing-out)	NUTS-2 regions whose GDP per capita is between 75 and 90% of the average GDP of EU-27 with a differentiated treatment for regions which are eligible und the convergence objective in 2007-2013
	Transitional support for NUTS-2 regions which were covered by Objective 1 in 2000-2006 but whose GDP exceeded 75% of EU-15 GDP average (phasing-in)	
More developed regions	All NUTS-2 regions outside the convergence objective and not covered by the phasing-out transitional support	NUTS-2 regions whose GDP per capita is above 90% of the average GDP of EU-27 with a differentiated treatment of regions which are eligible under the convergence objective in 2007-2013.
	Transitional support for NUTS-2 regions which were covered by Objective 1 in 2000-2006 but whose GDP exceeds 75% of EU-15 GDP average (phasing-in)	

Figure 4-11 Changes in eligibility for Structural Funds 2007-2013 to 2014-2020 (EC 2011)

The Baseline scenario assumes as the main hypothesis the maintenance of the Cohesion Policy budget, limited and gradual reforms favouring efficiency with no major political change (as presented in the First Interim Report of ET2050). In particular the Baseline Scenario considers a share of cohesion policy expenditures respect to EU27 GDP constant along time, in 0.4% of EU27 GDP.

In MASST3 all types of structural fund expenditure are not applied, but only all cohesion expenditure in labour market (i.e. axes 21, 22, 23, 24 and 25) by all funds and all cohesion expenditure in SMEs (i.e. axis 16) by all funds. These axis are assumed not to change in relative terms during the 2010-2030 period (in SASI, used more modelling the longer 2010-2050 period, assumptions applied as explained in the next chapter focused just on the 2050 scenario).

These assumptions regarding Structural and Cohesion Funds allocations are consistent with the following overall political framework in relation to the key European sectoral policies[16]:

Overall European Policy Assumptions

Next table presents general assumptions in relation to European policies:

Policy	General Assumption
European policy framework	Budget maintained or slightly reduced in real terms. Shallow reforms to partially renationalise policies (e.g. Cohesion, Agriculture, Transport).
Economic and Financial	Stabilisation. Euro-zone maintained. More strict budgetary controls. Maastricht criteria in deficits and debts reinforced. Increasing fiscal and labour market harmonisation.
Cohesion	Budged slightly reduced. Limited and gradual reforms favouring urban areas and direct support to productive activities
Agriculture	Limited reform of the Agricultural policy favouring rural development and ecological criteria. Budget reduced.
Energy	No effective policies at European level. Each country follows its best interest.
Transport	Transport infrastructure investments in Transeuropean networks reduced, particularly in rail. Some success of opening market policies.

[16] Further analysis of critical challenges to be addressed through European policies is fully reported in ET2050 Interim Report 1 (October 2012 amendment), chapter 4.2 “Critical Bifurcations” and chapter 4.3 “Key Directions”

Policy	General Assumption
Environment	Environmental regulations relaxed for less developed regions
Enlargement	Only Croatia, and Balkan Countries, becomes EU members before 2030. Trade agreements with USA and Neighbouring Countries.

Figure 4-12 Baseline European Policies Overall Directions

4.6 Baseline Results at European Level

MULTIPOLES, MASST3, MOSAIC and METRONAMICA forecast models delivered the following aggregated results for Europe (ESPON Space):

Evolution of Key Indicators	Baseline 2030
Total Population in 2030 (in millions; *514 million in 2010*)	530.2
Total Migrations 2010-2030 (cumulated number of migrants in millions)	37.9
Population Ageing (weighted average of ODR in NUTS2; *25% in 2010*)	40%
Economic Growth (average yearly increase 2010-2030)	+1.89%
Regional Divergence (GINI coefficient in 2030; *26.1 in 2008*)	28.5
Total Employment (average yearly increase 2010-2030)	+1.59%
Manufacturing Employment (average yearly increase 2010-2030)	+1.38%
Service Employment (average yearly increase 2010-2030)	+1.63%
Total transport demand for passengers (total pax·km increase 2010-2030 in %)	+39.0%
Total travel cost (total euros increase 2010-2030 in %)	+39.3%
Total time spent travelling (total hours increase 2010-2030 in %)	+41.0%
Total CO2 due to transport (total tones increase 2010-2030 in %)	-25.2%
Total CO2 (total tones increase 2010-2030 in %)	-28.9%

Figure 4-13 Baseline Results at European level

These results indicate a number trends that can be summarised as follows:

1. More stable population at European level. Depopulation of Eastern European rural regions.
2. Aging is universal across Europe
3. Continuous East-West labor-related migrations.
4. Average economic growth at a moderate, not marginal, level

5. Divergent economies, with higher productivity gaps between the core and peripheral regions
6. More jobs being created everywhere, with lower salaries in less developed regions. Marginal economic growth is not related to productivity gains in Southern and Eastern regions, while higher growth related to productivity in central regions.
7. Reindustrialisation of the economy, with balanced employment growth in manufacture and services. Technological innovation concentrated only in some sectors and regions. Increasing dependency of more expensive energy
8. Growth in long-distance and intercontinental traffic, but more limited territorial integration, with few passenger and freight cross-border flows. Increasing road share in inland transport. Polarised development in transportation nodes well connected globally, usually large metropolis.
9. Expansive land consumption, producing more hybrid urban-rural geographies
10. Reduction on Green-House Emissions in more advanced industrial economies

Next table develops these trends further on, presenting key figures still at an aggregated European level[17].

Baseline Trend	Key Trend	Possible Territorial Implications
More Stable Population. Depopulation in many Eastern rural regions	From 514 million inhabitants in 2010 to 530 in 2030 and 539 in 2050. Fertility rate increases up to 1.66 in 2030.	Many Eastern rural regions suffer population decline while large and capital cities grow because of internal migration, taking advantage of agglomeration economies.
Aging in most regions	Old Dependency Ratio (ODR) grows from 25% on average in 2010, to 40% in 2030 (219 millions of elderly) and 54% in 2050.	Ageing European population is general in Europe, excepts in large cosmopolitan cities and regions attracting young skilled people. Retiring age likely increases (e.g. up to 70 years old)
Increasing Migrations. Labour migrations East-Western (and probably South-North).	Total cumulated migration between NUTS2 up to 40 Million between 2010 and 2030	More mobility because of temporary labour migration and personal visits. More diversified migration purposes, from labour to leisure and tourism, health care and education. Increasing attraction of large cities in front of rural regions.
Average economic growth at a moderate, not marginal, level	1,89% annual growth up to 2030 (MASST3). Economic growth at different speeds. 45 regions grow at less than 1% annual growth.	Increasingly different paths to economic recovery across regions. Marginal economic growth is not related to productivity gains in Southern and Eastern regions, while higher growth related to productivity in central regions.
Divergent economies, with higher productivity gaps between the core and peripheral regions	From GINI coefficient 26.1 in 2008 to 28.5 in 2030	Increasing disparities between core regions of Europe and several peripheries (Southern, Eastern).
More jobs being created everywhere, with lower salaries in less developed regions.	Employment annual growth of 1,59%. It grows at a sustained rate in Europe, meaning that large parts of the recovery for the crisis comes from job creation and lower salaries, instead of productivity gains.	Labour markets are reformed in Southern European countries and more jobs are generated even with low economic growth. Increase in social disparities also because the likely reduction of social public expenditures, that may hit specific zones and neighbourhoods.

[17] These features were first generated as hypothesis by the ET2050 foresight models, and then adjusted by the actual ET2050 forecast models (Multipoles, MASST, MOSIC, METRONAMICA, SASI). An extended version of this table, including the quantitative World framework and the European main drivers and trends is available as an Annex in the Interim Report 1.

Baseline Trend	Key Trend	Possible Territorial Implications
Reindustrialisation of the economy, with balanced employment growth in manufacture and services.	Jobs in manufacture grow at similar rates than service (1,69% services, and 1,49% industry).	Technological innovation concentrated only in some sectors and regions. Increasing dependency of more expensive energy
Growth in long-distance and intercontinental traffic.	Polarisation of global accessibility in regions having intercontinental transport services in airports and ports.	Continuous growth of long-distance and intercontinental traffics, and increasing share of road in inland transport. Polarised development attached to global transport nodes (e.g. intercontinental airports and ports).
Accessibility changes influenced by other factors than new infrastructure.	Population and economic changes, as well as increasing transport costs heavily influence accessibility within Europe. Road and air becoming the dominant modes. Rail modal share below 5% in 2030 (6,6% in 1995, 6,2% in 2009) for passengers, and below 7% for freight (12,6% in 1995, 10% in 2009).	Limited territorial integration, with few passenger and freight cross-border flows. Polarised development in transportation nodes well connected globally, in general located near larger metropolis
Expansive land consumption, producing more hybrid urban-rural geographies	More specialised and segregated uses in large metropolitan areas, especially in Southern and Eastern regions with weakest planning traditions.	Increasing low-dense urbanisation, with different development patterns across territories. Relaxed planning regulations in Southern European countries in coastal and touristic zones.
Reduction on Green-House Emissions in more advanced industrial economies	Transport emissions related emissions reduced 16% because of a combination of lower economic growth and the use of more environmentally friendly vehicles and energy sources.	Decreasing CO2 emissions but targets are not met. Environmental regulations are relaxed in less developed regions.

Figure 4-14 Key features of the Baseline at a European level

4.7 Baseline Results at Regional Level

The paramount question to be investigated in this section is the most likely evolution of social and economic cohesion in Europe, under the Baseline assumptions. Below figures show that GDP per capita growth for the largest macro-regions in Europe will continue to grow, despite the fact that relative regional differences will also become more acute: more developed regions grow faster than less developed regions in the Baseline scenario.

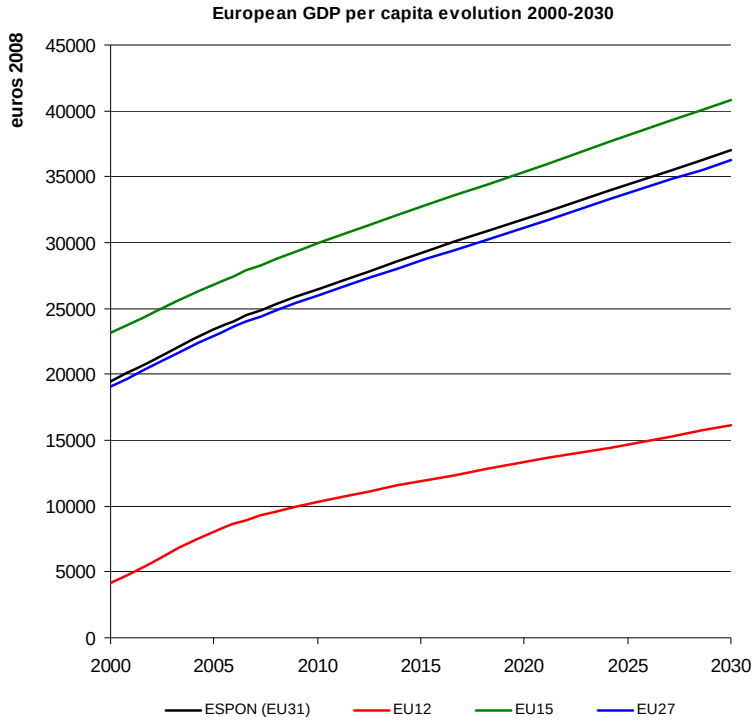


Figure 4-15 European GDP per capita evolution 2000-2030 for mail country groups

Next graphics better illustrate this question just for 4 countries, taken an as example:

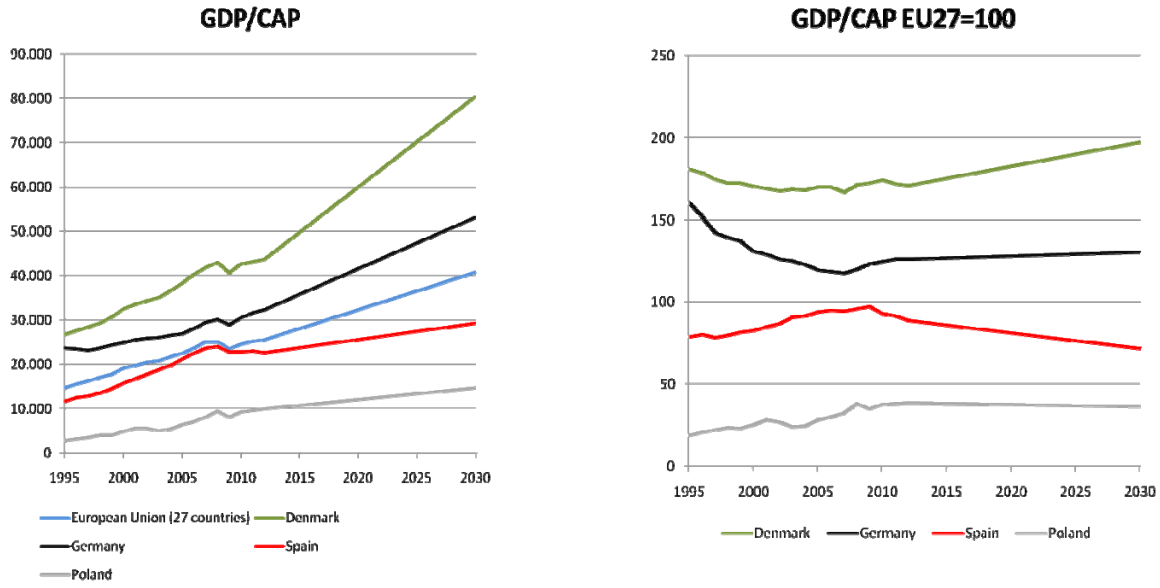


Figure 4-16 GDP per capita 1995-2030 for Denmark, Germany, Spain and Poland, as a sample

For the 2010-2030 period, according to MULTIPOLES and MASST forecasts, out of the 132 regions below GDP per capita average in 2010, 84 are expected to experience further regression and only 54 are expected to progress positively. Total disparities in Europe increase, as the effect of very small decrease of disparities between countries and a significant increase of disparities within countries, although the former remain bigger than the latter in absolute terms. Next Theil graphic illustrate this finding:

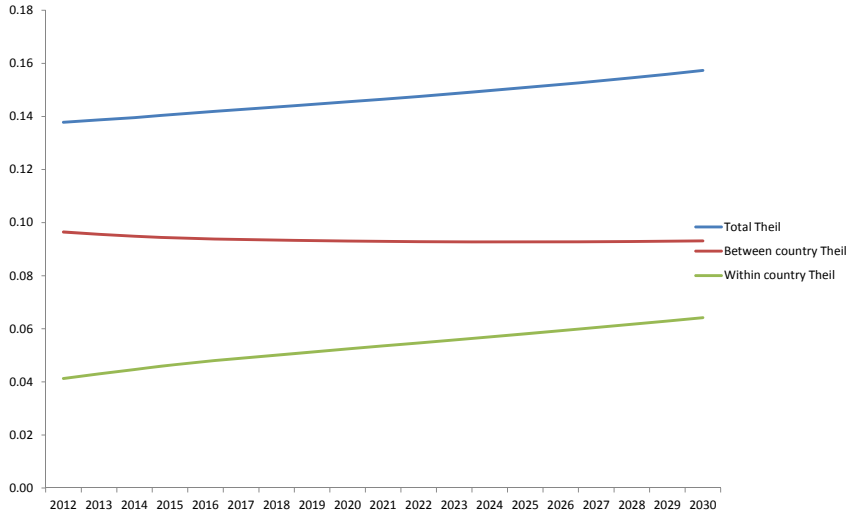


Figure 4-17 Theil index for the Baseline scenario

These economic results deliver a picture not of “Relative Decline” but of “Growing Disparities”. If current policies do not change, and there are no changes in terms of social behaviour and technologic innovation, in a business-as-usual evolution the crisis is likely to have lasting impacts in most regions in the Southern regions, and Eastern European regions will be unable to keep growing fast enough to catch up the development of the core and Northern regions of Europe, except maybe in few national capitals and metropolitan cities. On the other hand, Northern and Central European regions will keep growing at a reasonably high rate and therefore regional disparities may grow twice the current level from now to 2030.

Next maps represent GDP per capita at regional level from 2010 to 2030, as well as from 2000-2008 for comparison (while GDP per capita converged during the 2000-2008 period, GDP diverges from 2010 to 2030 according to the Baseline forecasts by MULTIPOLES and MASST3). These maps illustrate the need to rethinking the cohesion and convergence narrative of the latest decades.

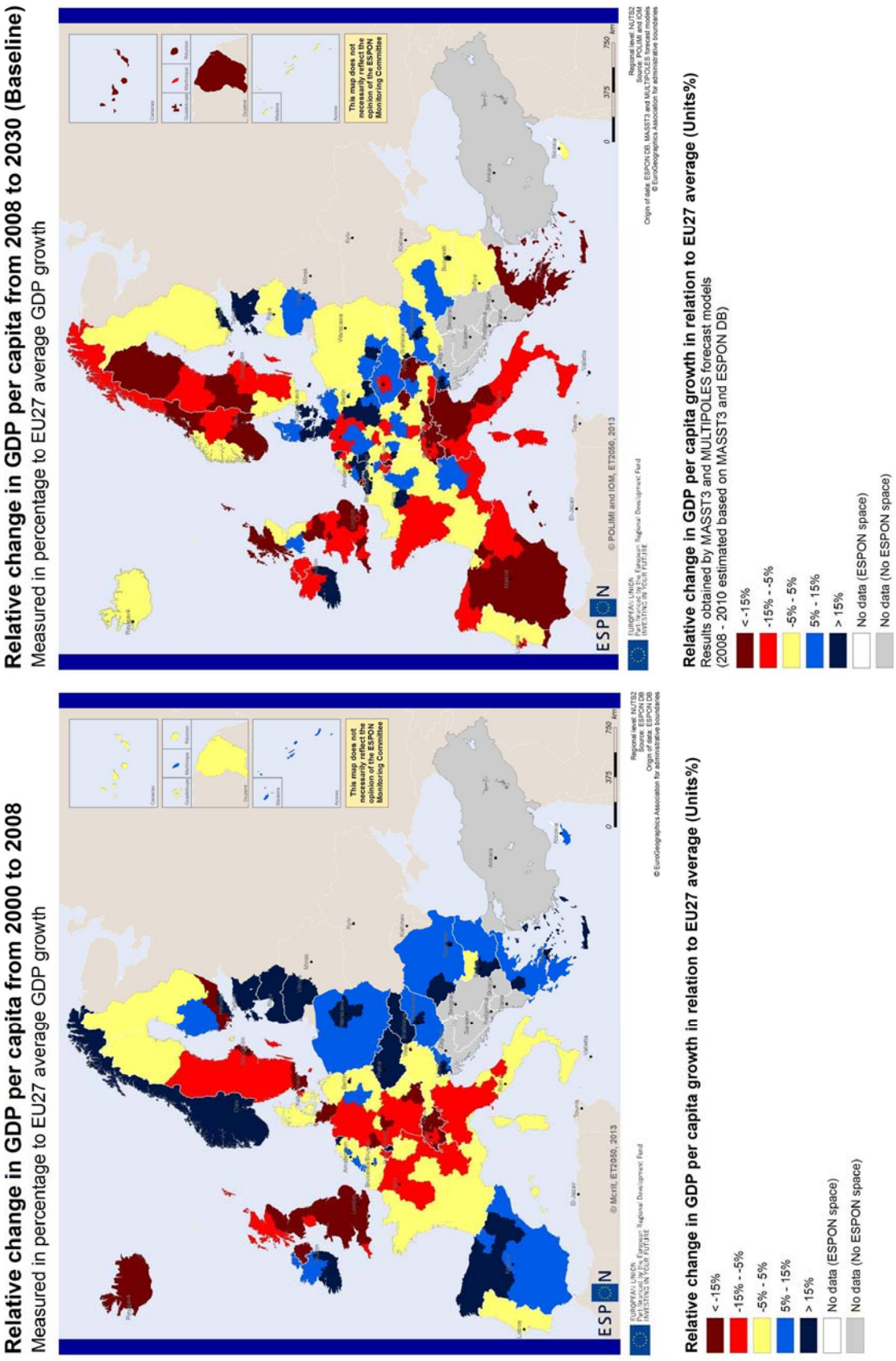


Figure 4-18 Relative change in GDP per capita growth 2000-2008 and 2008-2030

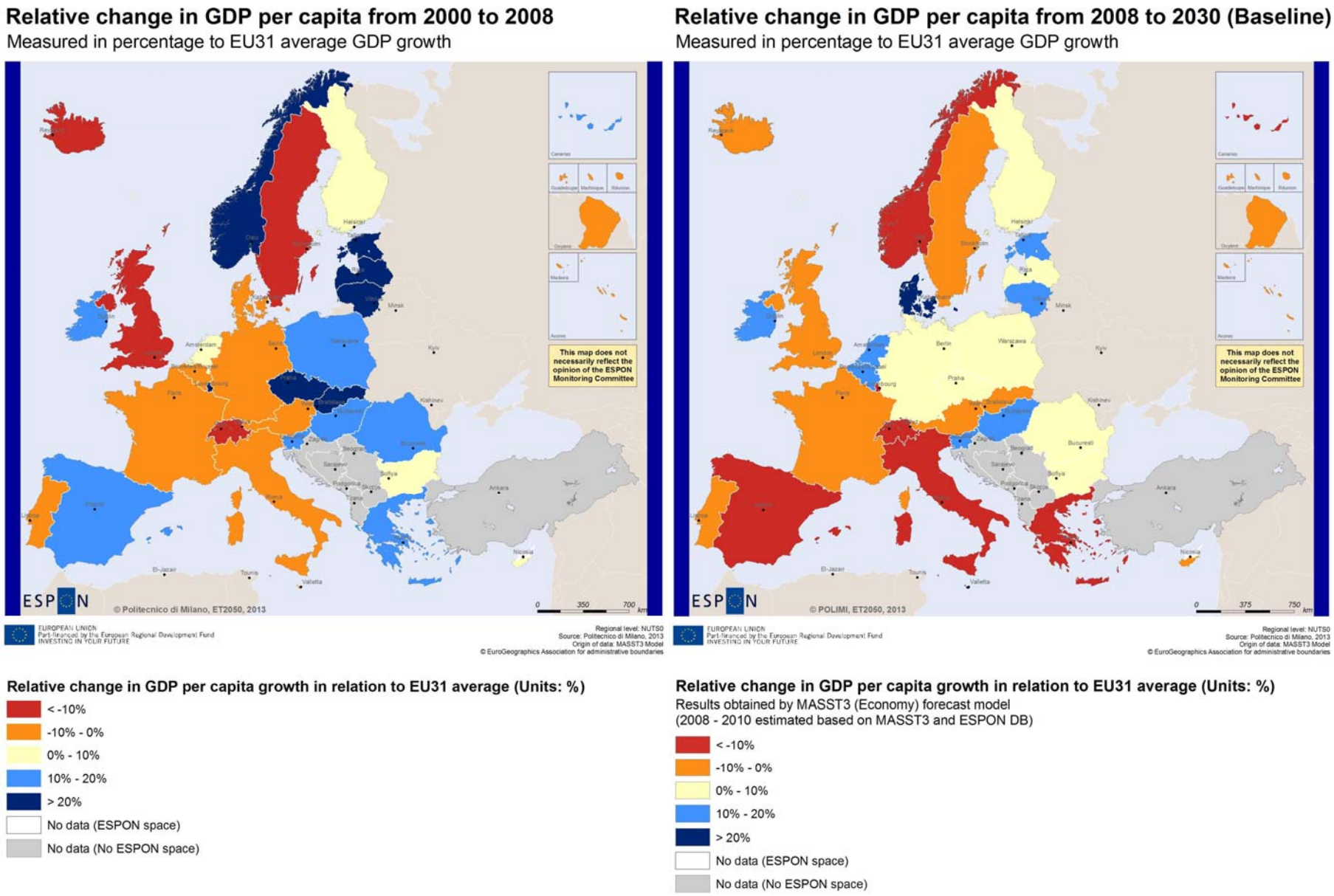
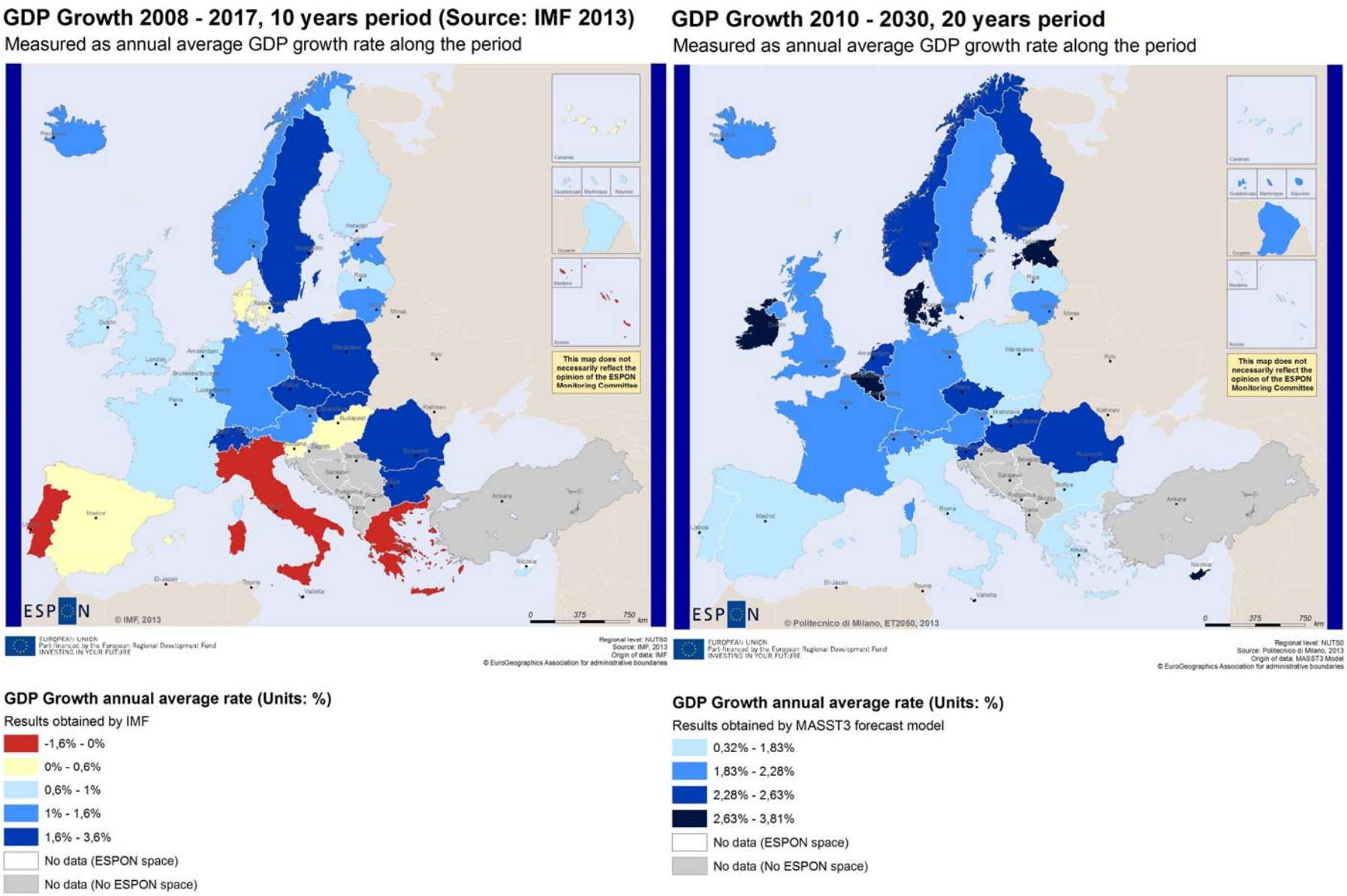


Figure 4-19 Progress or regression towards EU31 GDP per capita average. National Data

Figure 4-20 Average GDP growth per countries. ET2050 results contrasted to IMF forecasts



Next, a more detailed analysis by sectors, and macro-regions, is presented:

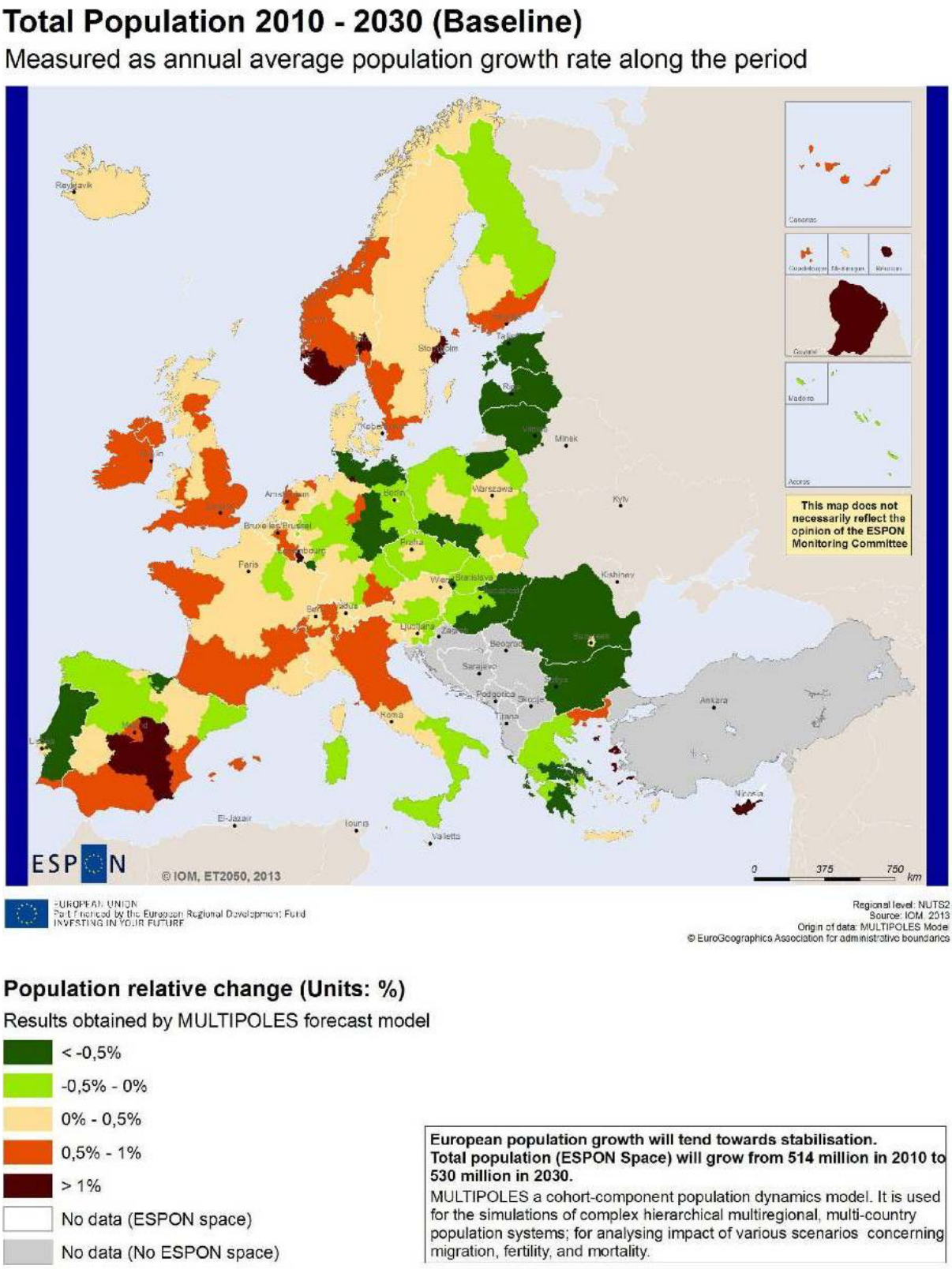


Figure 4-21 Baseline – Total population increase 2010-2030

Population: Eastern Demographic Decline

- European population growth will tend towards stabilisation. No shrinking. Total population of 31 European countries will grow from 514 million in 2010 to 530 million in 2030 (less than predicted by EUROPOP 2010) and 539 million in 2050 (in line with EUROPOP).

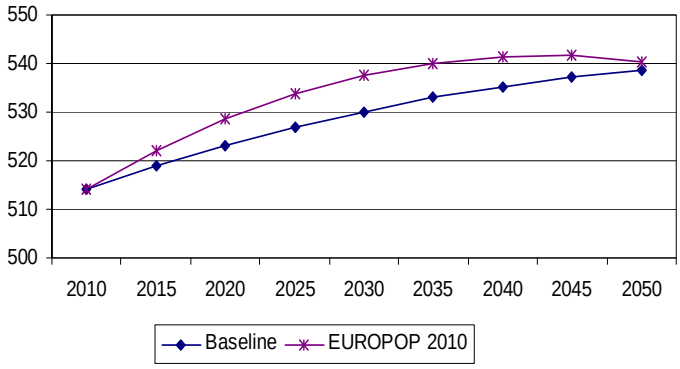


Figure 4-22 ESPON Population 2010-2050. Baseline scenario and EUROPOP 2010

- Despite an overall small increase in population, many regions are declining, especially in Eastern countries and some remote peripheral areas, mainly as a result of the intra-Europe emigration. Rural-urban migration and depopulation of many rural areas is expected.
- Population growth is likely to happen in Western Europe and in regions with large urban agglomerations. Population growth is generated by immigration coupled with relatively high fertility.
- ***Baltic Sea – Artic Region.*** In the Nordic Countries the population increase keeps concentrating on capitals and larger city regions in the southern parts of the countries whereas the more sparsely populated areas in northernmost parts of the countries can expect either stable population development or population decline especially in Eastern Finland. In the Baltic States the recent negative trend of population decline is expected to continue. Together with some other Eastern European countries and regions the Baltic States will have remarkable population losses in the coming decades.
- ***North-west Europe.*** North Western Europe is confronted to a double challenge. On one hand, internal migrations to metropolitan areas reinforce the weight of international migrations in the United Kingdom, the Netherlands and Belgium. This translates in the development of capital cities and their hinterland. On the other hand, in France, internal migrations from Paris towards developing regions in the West and the South counterbalance the flows of international migrations to Paris. This translates in a stabilization of the population of Paris and an increasing population in Western and Southern regions. Ireland remains in a specific situation: a youth population with a high fecundity rate induces a constant increase in population.
- ***Central and Alpine region.*** Baseline reflects the expected population decline in Germany and slow population growth in Austria and Switzerland.
- ***Central European region.*** The Danube Region and Eastern Europe is the only macro-region in the EU where the population is not increasing but decreasing. This 'natural' trend is expected to be continue due to the deteriorating socio-economic conditions as a consequence of the Crisis. The decrease has both natural and migratory reasons. The birth rate is low and the death rate of adult men is expecially high resulting in natural decrease of population in most of the countries (except Poland). The most affected areas of natural decrease are the counties of Hungary, the southern parts of Romania,

Burgenland and Serbia. This is partially the consequence of the deteriorating socio-economic conditions due to side effects of transition and the recent crisis. Indirect demographic consequence of population decline is resulting in the workforce shrinkage. The depopulation is more significant in sparsely populated rural and border regions and in the Eastern part of the macro-regions. MULTIPOLES baseline scenario predicts the strongest decline of population in Romania, Bulgaria, Eastern Hungary and the Baltic States.

- ***Eastern Mediterranean Region.*** South eastern Mediterranean countries are expected to show the same demographic diversity as today including countries –such as Greece- with more stabilized projections related to an already below-replacement fertility as opposed to Cyprus, Albania, Azerbaijan and Turkey, which until recently persisted in showing relatively high fertility. It is unclear, in the modelling results, why the north eastern regions will have a higher population change than –for instance- Crete or that Crete will have the same rate of change as the islands of the south Aegean although they show different dynamics.
- ***South-central Mediterranean Region****.* The baseline scenario foresees a further process of population concentration in rich and industrialised areas in the Northern and North-Eastern areas of Italy. Conversely, areas in the Southern part of the Country present negative growth rates, in line with other peripheral areas in Europe in this scenario.

  In Slovenia, a similar trend marks a difference between Zahodna Slovenija and Vzhodna Slovenija, hosting respectively Maribor and Lubljana. Whilst the latter presents (although mildly so) positive growth rates, the former is characterized by negative expected population growth, arguably for a further (slow) process of urbanization in the Country.
- ***Western Mediterranean Region.*** The low growth on Western Mediterranean is a remarkable change in relation to the booming immigration happening in the 2000-2008, especially in Spain, and confirms the more recent evolution. According to Eurostat, annual net migration to Spain was in the range 600-700 thousand in the 2002-2007 period, but was going down since 2007 and was negative for the first time in 2011 (41.000, and this number is probably underestimated). MULTIPOLES produces negative net migration in Spain in the 2010-2015 period and only later on it changes back to positive values. This negative net migration is related to high emigration and the regions affected must be those which had a lot of immigrants, so those that were developing fast previously.

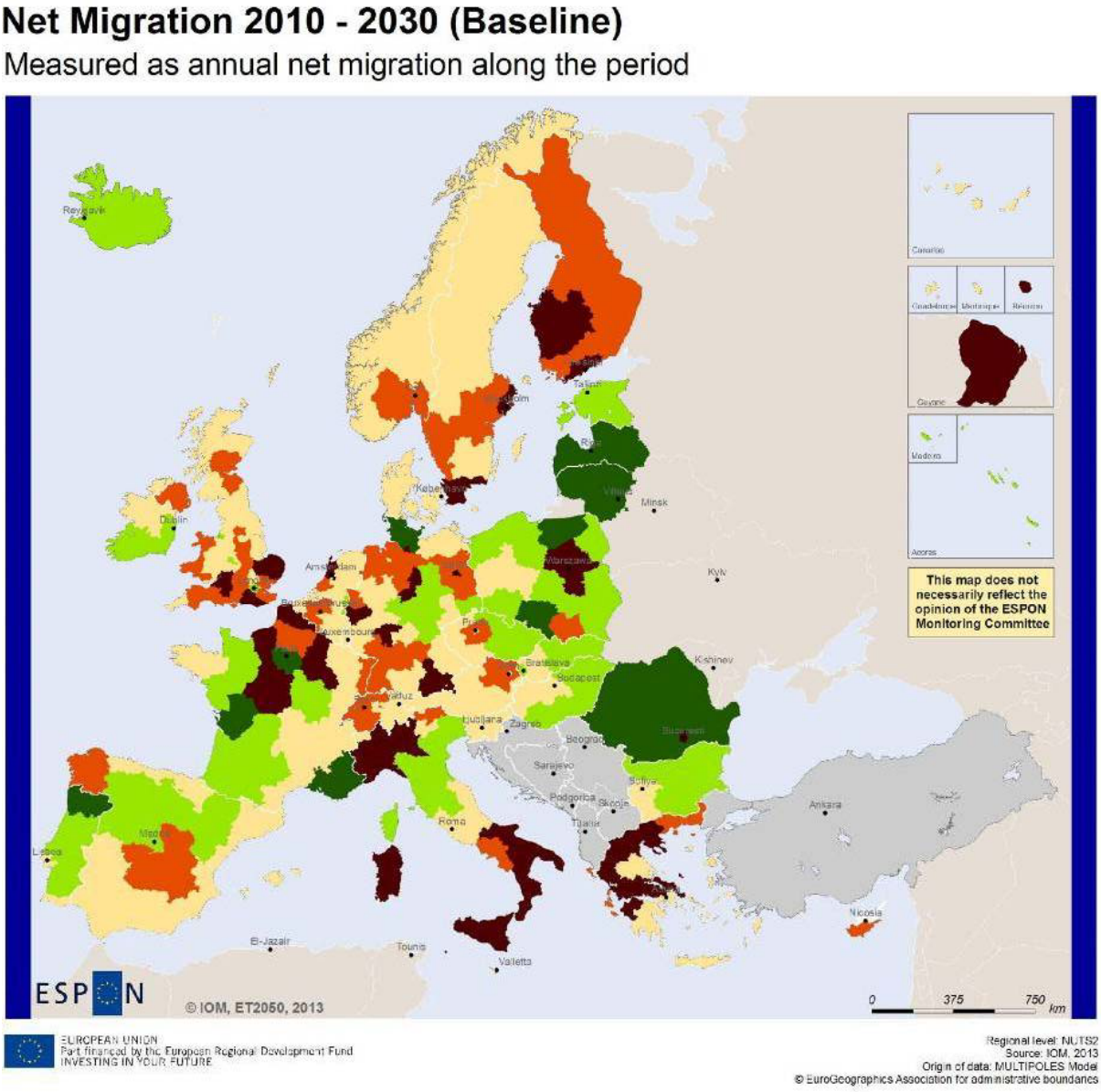


Figure 4-23 Baseline – Net Migrations 2010-2030

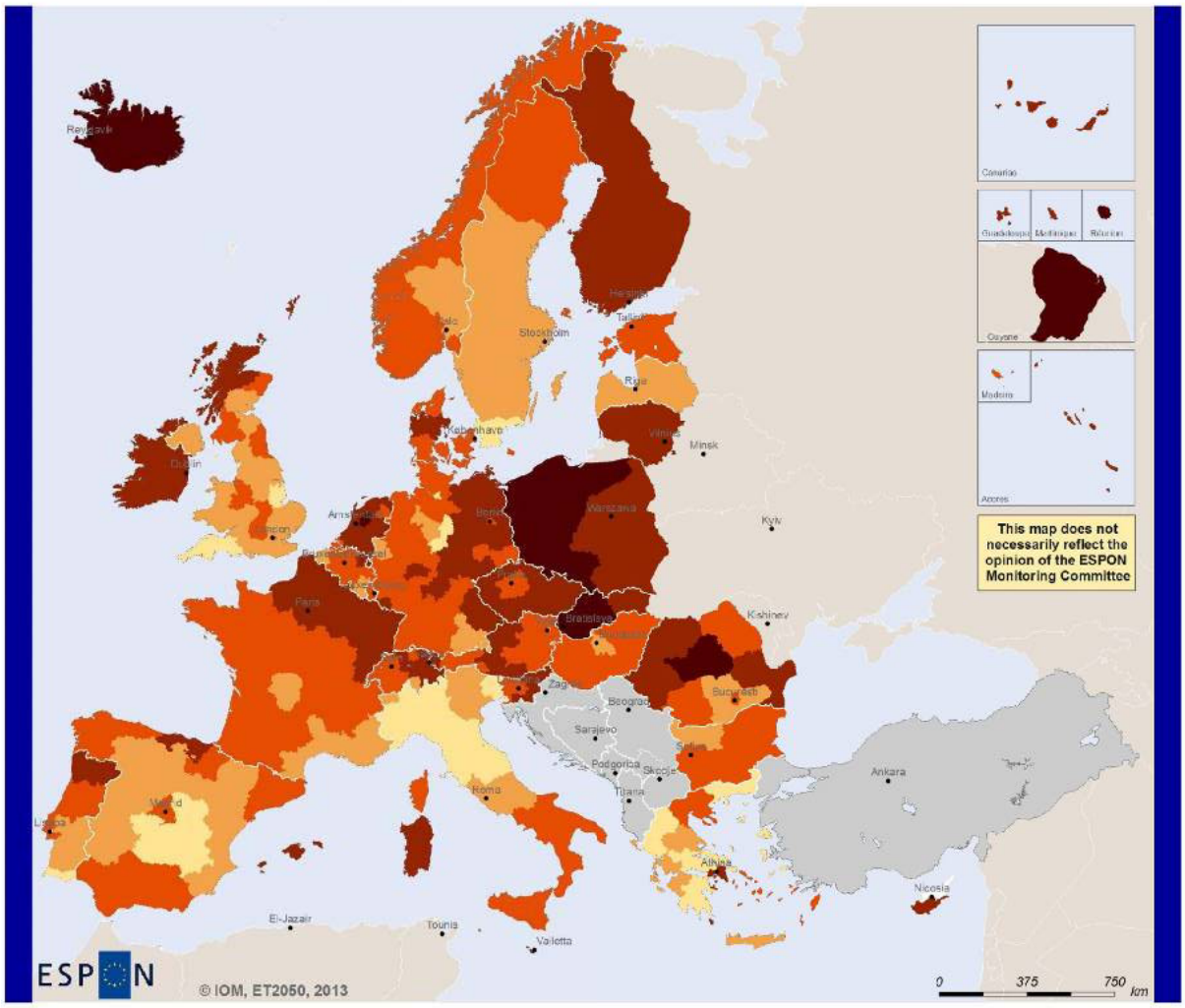
Migration: East-West Migration

- East to West intra-European migrations increases
- Internal migrations within Member States from rural areas to urban areas
- The re-population of rural areas with high life quality standards can be important in attractive areas like the Mediterranean coast or touristy areas of France and Italy.
- ***Baltic Sea – Artic Region.*** After the model Nordic Countries will in general gain on migration in the coming decades in all the regions and the capital regions and other larger agglomerations in special. As opposite, the emigration from all the Baltic States is expected to continue

  The fact that maps uses persons as a unit instead of % change makes the interpretation of the map challenging especially due to varying size of the NUTS2 regions (large sparsely populated regions vs small million city regions) . From a Nordic point of view the fact the migration seems to increase rapidly all over Finland is a bit confusing. It is estimated that the total population in sparsely populated Northern- and Eastern Finland will annually decline between 0-0.5% until 2030 but at the same time the region should receive annual migration surplus from 5 000 – 10 000 persons (= 0.33-0.66%). Between 2000 and 2010 the region had negative net migration every year.
- ***Central European region.*** Natural population decrease is boosted by the deteriorating socio-economic conditions and the intensifying out migration. The international migration to other EU (East to West) countries started immediately after EU accession and it is very selective (Doctors, medical personnel and engineers are overrepresented among the migrants. If emigration continued at the current rate, then – by 2030 – doctors would disappear from the Czech Republic, Slovakia and Hungary). Increased internal mobility leading to concentration of population in urbanised areas and depopulation on the peripheral rural regions. Peripheral border & mountainous regions located on the eastern fringe of the macro-region are the hardest hit by population outflow and depopulation of rural areas. It can be stated that Scenario B is even more likely than the Baseline, showing a great contrast between the economically more active core and peripheral regions characterized by strong internal & international out migration.
- ***Eastern Mediterranean Region.*** It is likely that factors encouraging migration from South eastern Mediterranean countries and the Balkans will remain such as demographic and income differences, economic emergence which encourages the migration of middle classes who risk losing status, political and economic crises.
- ***South-central Mediterranean Region****.* The baseline scenario foresees a mild net migration towards both Slovenian regions. Interestingly, as for Italy the process of net migration to rich and traditionally industrialised areas in the North-West of the Country (Piedmont, Lombardy, and Liguria) is also matched by a remarkable process of in-migration towards most Southern regions, on the Mediterranean coasts, arguably because of the weather and locational amenities. This last result is line with other areas in Europe, such as Greece and France.
- ***Western Mediterranean Region.*** Population growth in Southern European “Sun-belt” regions is underestimated because the MULTIPOLES model does not consider migrations driven by reasons other than those related to the labour market or the GDP evolution. Residential tourism of Northern Europeans retirees, for instance, is not considered (e.g. Sardinia, Liguria…). According to recent estimates, nowadays there are 700.000 inhabitants from the rest of Europe living in coastal regions in Spain. The number of people and the length of time they will spent in the South will likely continue to grow in the future.

Ageing 2010 - 2030 (Baseline)

Measured as annual ageing increase rate



EUROPEAN UNION
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Regional level: NUTS2
Source: IOM, 2013
Origin of data: MULTIPOLES Model
© EuroGeographics Association for administrative boundaries

Old-Age Dependency Rate 2010 - 2030 increase (Units: %)

Results obtained by MULTIPOLES forecast model

- < 1%
- 1% - 2%
- 2% - 2.5%
- 2.5 - 3%
- > 3%
- No data (ESPON space)
- No data (No ESPON space)

Ageing grows fast across Europe. Percentage of population older than 65 years increases in Europe from 25% to 40% (210M of elderly).
MULTIPOLES a cohort-component population dynamics model that considers population age groups in 5 years, also for migrants.
The Old-Age Dependency Rate is measured:
ODR = Population > 64 / population 16 - 64.

Figure 4-24 Baseline - Ageing in Europe 2010 – 2030

Ageing: Ageing Everywhere

- Ageing is universal across Europe. Percentage of population 65+ over population on working age increases in Europe from 25%[18] in 2010 to 40% in 2030. This will require complete rethinking of the spatial planning to adapt it to a large number of people with partial or full disability.

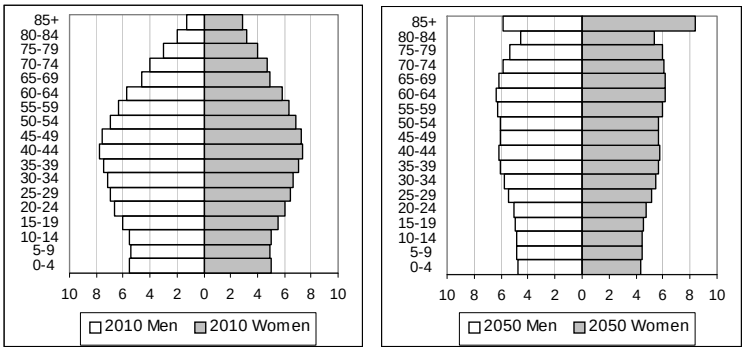


Figure 4-25 Age pyramids 2010 and 2050, ESPON countries, Baseline scenario

- The old-age dependency ratios (ODR) observed in the majority of regions will grow from 20-30 persons aged 65+ per 100 persons in the working age in 2010 to 40-60 in 2050. In 2010, ODR not exceeding 30 was observed in 212 regions in Europe (74% of regions), in 2050 only in 2. ODR above 60 was not noted in 2010, while such level of ODR is expected to be observed in 73 regions in 2050.
- Fast ageing, reinforced by emigration of persons in the working age, is observed in the former socialist countries, Portugal and northern Spain, except in capitals and touristy areas.
- ***Baltic Sea – Artic Region.*** During the latest years ageing has been a common concern across the Nordic Baltic region. The reasons vary. In Finland and partly in Sweden the aging of population will heavily hit the regions in the coming year due to large retiring age cohorts. In Norway and especially Iceland the regions seem to age rapidly but as the countries as such have younger age structure than in EU on average the actual ODR will still be relatively low in 2030. In the Baltic States the ageing is closely related to outmigration of working aged population and low birth rates.
- ***North-west Europe.*** Ireland and Northern France face a phenomenon of demographic catch-up with the ageing of a youngest population than the rest of Europe. The same in the Netherlands where a high fecundity induces a highest ageing rate towards 2030.
- ***Central and Alpine region.*** The stronger increase in old-age dependency rate in eastern Germany conforms to expectation.
- ***Central European region.*** Ageing will be a big problem also in this region. The region's age structure can be characterised recently by a balanced ratio of young and old generations (the ratio of the below 15 year old population shows a slight prevalence over the age group over 65 but this trend is soon going to reverse). A natural decrease of population can be experienced in most countries. Pressures on governments to finance an increasing number of retirees while labour reserves shrink might dominate policymaking to the detriment of European catching-up. Scenario A seems even more probable than the Baseline, portraying the outcome of the strong natural decline of population and out

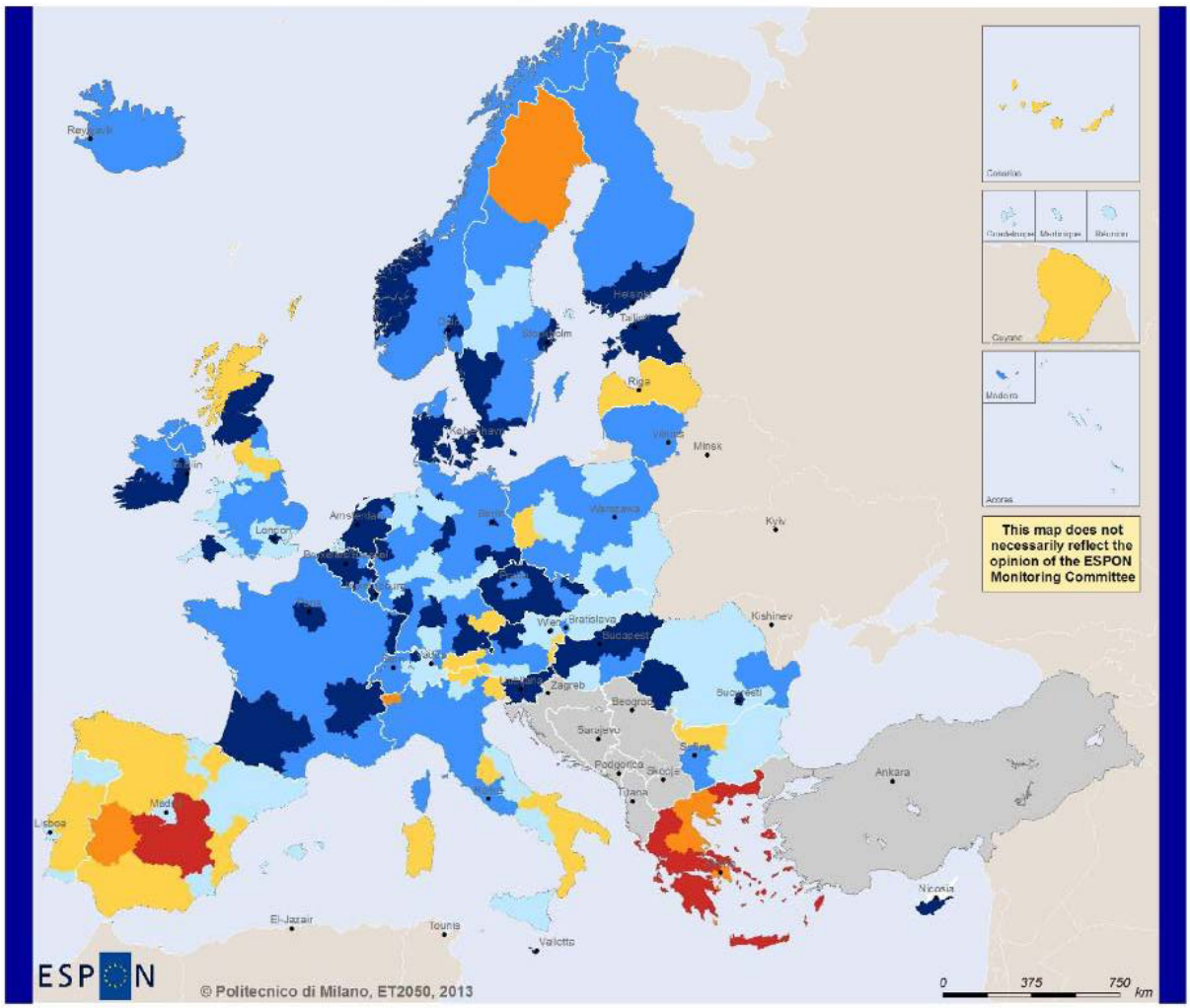
[18] Population weighted average of European NUTS2's old-age dependency ratios ODR

migration. It will be geographically largely uneven process and it mostly affects the rural regions on the Eastern parts of the countries.

- ***South-central Mediterranean Region.*** The baseline scenario foresees a remarkable increase in Slovenia's ODR, in line with other NMS regions; similarly, Southern Italy's regions are also characterised by a process of population ageing, at rates compatible with those of other Western countries such as France or Spain. Conversely, the relevant in-migration foreseen for Northern Italy is expected to more than compensate for the low crude birth rates, thereby allowing only a very mild growth of the ODR.
- ***Western Mediterranean Region.*** Aging will be territorially distributed in a very heterogeneous way in Western Mediterranean areas, because of internal and external migrations. Some coastal areas (e.g. in Algarve, Andalucia, Murcia..) may attract large senior population while large metropolis and suburbs younger populations.

GDP Growth 2010 - 2030 (Baseline)

Measured as annual average GDP growth rate along the period



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Regional level: NUTS2
Source: Politecnico di Milano, 2013
Origin of data: MASST3 Model
© EuroGeographics Association for administrative boundaries

GDP Growth annual average rate (Units: %)

Results obtained by MASST3 forecast model

- < 0%
- 0% - 0,5%
- 0,5% - 1%
- 1% - 1,5%
- 1,5% - 2%
- > 2%
- No data (ESPON space)

Economic growth at very different speeds, leading to an increase in inter-regional economic disparities. Number of regions below to 1% of GDP growth: 45 (16%). ESPON Space annual average GDP growth rate:1.89%

MASST3 is an econometric, macroeconomic, sectoral, social and territorial model. It has been upgraded to explicitly take into account the impact of the current economic crisis.

Figure 4-26 Baseline – GDP Growth 2010 – 2030

Economy: Growth at Very Different Speeds

- The average GDP growth rate is of 1,89%, which is slightly lower than the long run trend for Europe, because of the slow coming out of the crisis
- GDP growth is positive in all European regions, with the exception of a very limited number regions in southern Europe, where the recovery after the crisis is not able to overcome the negative effects of the crisis in the first years of the period 2011-2030. These regions are the rural areas of Greece and Castilla-La-Mancha in Spain;
- in terms of GDP growth rate, there is a *two speed Europe*, since regions belonging to southern peripheral countries grow in general significantly less than northern countries. Southern European countries discount the difficult present conditions on their future evolutionary trajectories and their post-crisis growth is insufficient to recover with respect to other countries where the crisis is felt mildly;
- the *convergence process by New12 countries is incomplete* – since these countries are only slightly outperforming the Western ones – and is uneven, since also within the New12 countries GDP growth rates are differentiated. Eastern European countries still grow more than the others, but this is not enough to catch up with the GDP per capita levels of the Western countries by 2030;
- *intra-national regional disparities increase* in all countries, in New 12 and in Western ones. The regions with the capitals, the regions with the largest cities, and the more central regions at national level generally outperform the regions which are more rural and peripheral at national level. This is especially evident in Bulgaria and Romania, where Sofia, Bucharest and, to a lower extent, Timisoara are winners at the national level; France, where the highest rates are in Paris, Lyon, Toulouse and Bordeaux; Italy, where the differential between the richer North and the poorer Mezzogiorno increases; Greece, where the three regions with positive growth rates are Attiki, Thessalia and Kentriki Makedonia
- ***Baltic Sea* – Artic region.** The main GDP in the Nordic Baltic region can be identified in the main urban regions with high qualified labour force. In the recent years the on-going boom on natural resources extraction, like gas in Northern Norway and various metals an minerals in Northern Finland and Sweden has boosted the regional economic development. In the forecast model this boom doesn´t seem to continue. It is also interesting to highlight that even the total population in Estonia is expected to decrease rapidly in the coming years, the national economy measured as GDP is expected to blossom.
- ***North-west Europe.*** The global trends to 2030 for North Western Europe in the baseline conditions show a reinforcement of metropolitan areas coupled to a national effect on the structure of economy with a reinforced weight of capital cities and their hinterland in the production of wealth. Ireland reinforces its position with an ascent of fields whilst Southern France confirm its position in economies with a high added value: a developing service economy in Lyon and its hinterland and the development of the aeronautic industry in the south-west.
- ***Central and Alpine region.*** The Baseline shows strongest growth in GDP in the most urbanised regions in Germany, Austria and Switzerland, including surprisingly east Germany.
- ***Central European region.*** Catching-up in the region will take place, but with internal disparities on the increase, particularly between metropolitan centres and peripheral regions without competitive economic structures and high European integration. The split between service-based growth in metropolitan and industry-based growth in non-

metropolitan regions will stay relevant. With the continuing dominance of FDI among investments, the role of domestic capital and markets will receive more emphasis than previously, in part due to a less favourable post-crisis investment climate.

- ***Eastern Mediterranean Region.*** The projection for Greece, Cyprus, Bulgaria and Romania is extremely negative. Particularly for Greece, most of the country (including Crete), GDP is not expected to be negative for the future years according also to that latest projections by the task force of IMF, EU and the World Bank that foresee a positive growth rate for 2014-2015 and on. The negative growth of the 2010-2014 period, however, makes the average 2010-2030 negative in the MASST3 simulation.

- ***South-Central Mediterranean Region.*** Whilst Southern presents a mild economic performance, with very low, yet positive growth rates, other areas in the macro region present a higher foreseen growth rate. Northern Italy, and even more so, Vzhodna Slovenija (the area around Lubljana) show positive medium run economic performance, with yearly average GDP growth rate up to more than 2 per cent (in the Slovenian case). These results are in line with the interpretation of a scenario describing Europe with increasing disparities.

- ***Western Mediterranean Region.*** Southern European countries discount the difficult present conditions on their future evolutionary trajectories. In Spain, to some extend also in Portugal, because of a drastic reduction on salaries, there is a relative reindustrialisation and net gain of jobs in manufacture, to a less extend in services, implying a reform of Spanish labour markets; internally, disparities among regions also increase.

  Relative results in Castilla-la-Mancha and Extremadura are due to their weak local economies, large public sectors and relative high public debt, limiting growth opportunities to the attraction of economic activities; the attraction of economic activities is not an unlikely event, however, since they are sparsely populated regions with inexpensive land and low salaries close to Madrid and well communicated by motorways and high-speed rail. Because Madrid would only grow up to 1,5%, it is also understandable that spill-over effects on Castilla-la-Mancha and Extremadura would not be substantial.

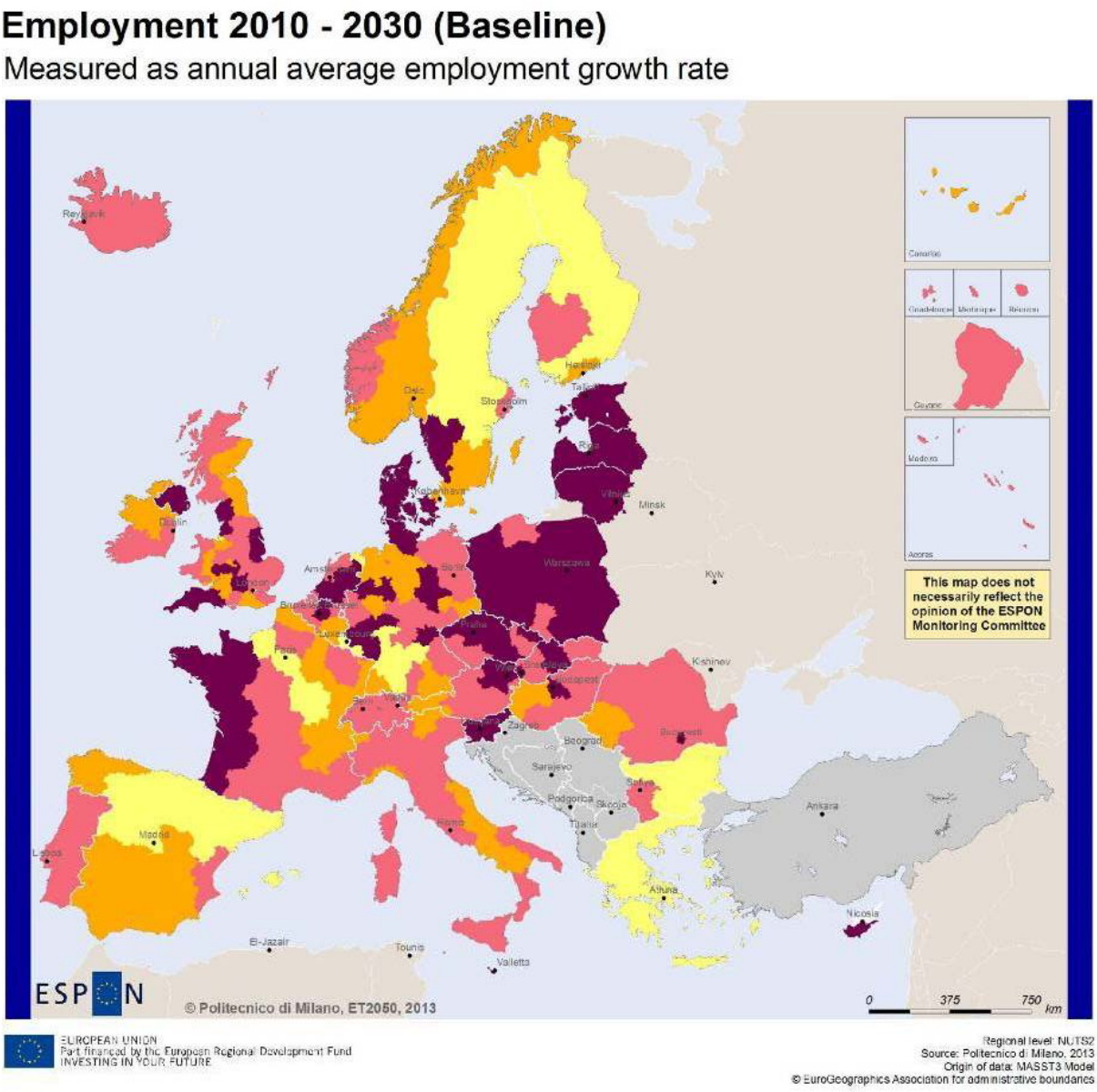


Figure 4-27 Baseline – Employment Growth 2010 – 2030

Employment: More jobs if lower salaries

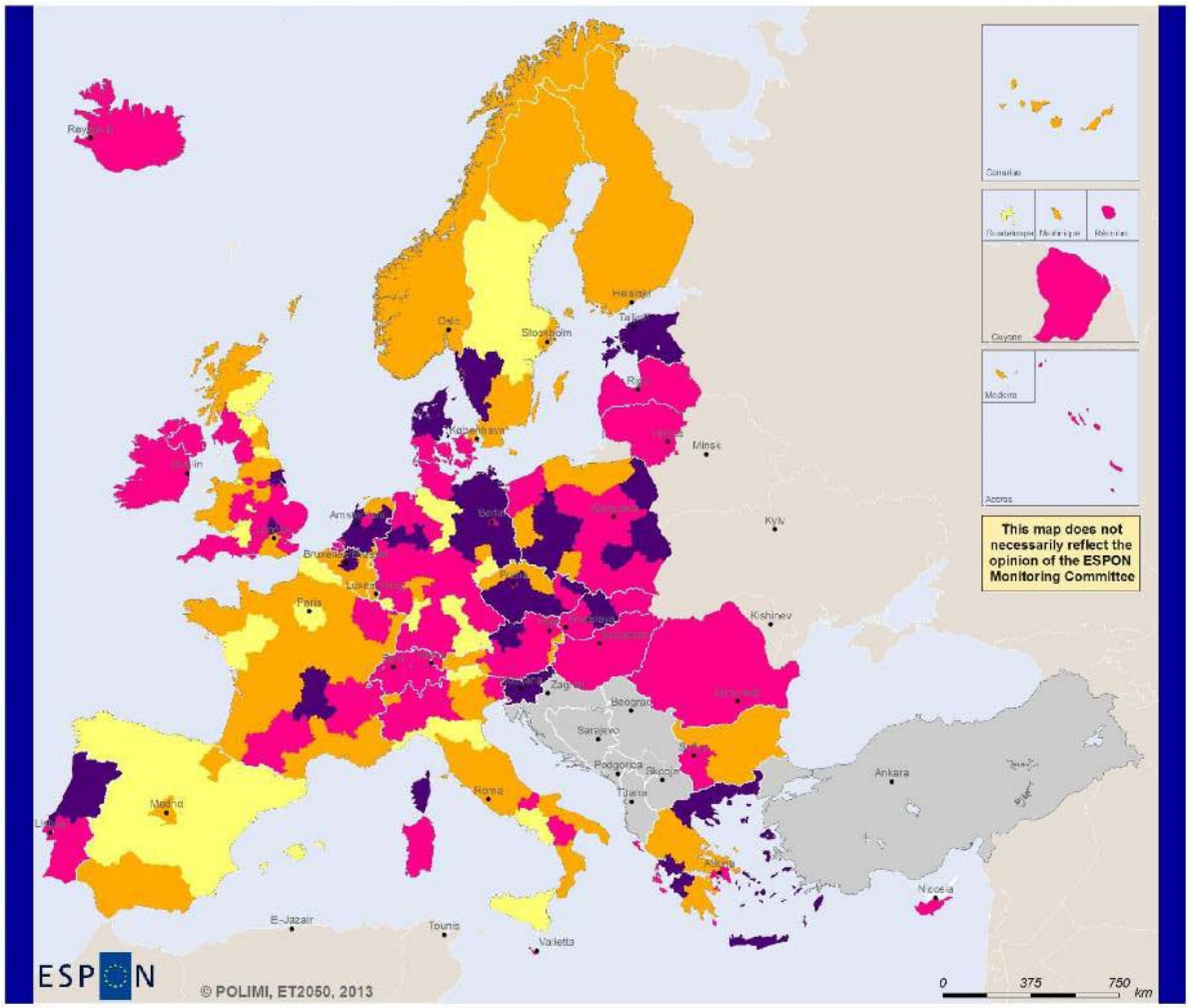
- Total employment growth rate increases across Europe, 1.58% yearly between 2010 and 2030, which partly recovers from present huge unemployment growth rates. Employment grows at a sustained rate in Europe (1.53 in Western Countries, 1.93 in Eastern), meaning that large part of the recovery from the crisis comes from job creation. Part of the recovery, however, also comes from productivity gains, as signalled by the larger increase of GDP with respect to employment.
- Some peripheral regions (Poland, Southern Italy, Spain) show a good employment growth rate, even in the presence of reduced GDP growth rates (employment led growth). Some Northern countries show a low employment growth rate, even in the presence of high GDP growth rates (productivity led growth). A more contained positive trend in employment growth accompanies growth in western countries. In these countries, contrary to the New 12, an increase in productivity is evident, showing a higher GDP growth rate than the one in employment;
- Productivity gains are particularly present in Western countries with respect to the New12 countries, where GDP growth mostly takes place through employment creation. Despite the negative population growth rates in this part of Europe, labour force is made available from employees leaving the agricultural sector (if Eastern countries' contribution of agriculture to total GDP decreased from 11% in the 1990 to 6% in the 2008, it is still higher than western countries' one, which is around 2,4% in 2008) and from unemployed people returning to work;
- Productivity gains are limited in New 12 countries mainly for two main reasons: i) the traditional reconversion from agriculture to manufacturing activities that has characterised these countries since the fall of the Iron curtain is now more contained (the share of agriculture reached 6% of total GDP, and therefore the more contained shifts to industrial activities generate more limited productivity gains than before); ii) New 12 countries are characterised by a shift of employment from manufacturing to services, evidencing a clear new stage of development from industry to services; however, this industrial reconversion does not bring with it gains in productivity, being the new services low-value added services, like commerce.
- ***Baltic Sea – Artic region*****.** In the Nordic countries the modelled low increases in employment are related to the already high labour force participation rates and low unemployment rates from EU point of view. In the Baltic States the increases in employment are related to structural changes of the labour markets and to increasing importance of service sector
- ***North-west Europe.*** Combined to the previous map, this map shows a two-speed North Western Europe. Two economies emerge: high GDP economies with low employment creation rates concentrated in urban economic centres in Paris, London and Amsterdam and lowest GDP economies but with highest employment creation rates in peripheral regions such as Western France and South Western England.
- ***Central and Alpine region.*** The annual employment growth rates in the Baseline appear very high in particular for Germany with its declining and ageing population, but to a lesser degree also for Austria and Switzerland –a growth of employment of 2.0% annually over 20 years means a growth in employment of 49%, hardly imaginable for a country with a labour force participation rate of 77%.
- ***Central European region.*** In the region, emergence from the crisis might result in a lagging, mainly export-led recovery, with diminishing or even modest formal unemployment, but also a low activity rate and the lack (postponement) of labour market

reintegration for disadvantaged groups (unskilled, low-educated, disabled, Roma etc.). This poses a particularly severe problem under a metropolis-centric scenario, compounding differences between core and peripheral areas on both national and European levels and contributing to the depopulation of non-metropolitan areas. Wage convergence towards the EU average will stay below productivity gains, compounding the outflow of the best qualified workforce, affecting even the centres. Only the strengthening of medium-sized and medium cities seems to offer a counter.

- ***Eastern Mediterranean Region.*** Although high numbers of more qualified young people are entering the job market due to the investment done in education, due to the economic crisis, maintaining rates of job creation will not be sufficient to substantially reduce unemployment rates.
- ***South-Central Mediterranean Region.*** In the baseline scenario, much as other Western areas, Slovenian and Italian regions present on average positive, and non-negligible, total employment growth rates. Yet, because of a larger expected GDP growth in several industrialised areas in both Northern Italy and Slovenia, productivity gains can be expected.
- ***Western Mediterranean Region.*** An economic growth well below 1,5% in average in Spanish and Portuguese regions will likely mean that the high unemployment levels will remain for the decade to come, unless drastic reforms on labour markets are implemented leading to reduction of salaries. An expansion of the informal sector of the economy should be also expected, as well as increasing economic imbalances between few economic sectors export-oriented, and the rest, resulting in growing social disparities. If this situation happens simultaneously with sustained growth levels above 2% in the centre and north of Europe, a faster increase of north-south migration, mostly of retired persons will happen.

Service and manufacturing employment 2010 - 2030 (Baseline)

Measured as annual average employment growth rate related to EU average growth rate



Service and manufacturing employment growth

Results obtained by MASST3 forecast model

- Both rates below to EU average
- Manufacturing employment growth rate over to EU average
- Service employment growth rate over to EU average
- Both rates over to EU average
- No data (ESPON space)
- No data (No ESPON space)

Manufacturing employment grows at similar rates that services, in a reindustrialisation process. (ESPON space annual average of manufacturing employment growth is 1.49% and annual average of services employment growth is 1.69%).
MASST3 is an econometric, macroeconomic, sectoral, social and territorial model. It has been upgraded to explicitly take into account the impact of the current economic crisis.

Figure 4-28 Baseline – Manufacturing and Services jobs increase 2010-2030

Employment Structure: More Jobs in Manufacture

- An equilibrated increase of both manufacturing and service activities characterises Western countries. This suggests that a process of reindustrialization will take place in these countries, a process that can find explanations in lower salaries as a result of the long crisis the crisis, and a slowing down in off-shoring processes, especially towards Eastern countries, the latter will more and more suffer from the constant erosion of their relative advantage in low labour cost;
- Traditional industrial regions in the Rhine area loose manufacture jobs, but Europe registers an increase in manufacturing employment growth rates, also in most of the central regions.
- The increase of manufacturing employment growth rate is more limited in Eastern regions, which lose their competitive advantage in terms of labour cost. Well before 2030 the process of industrial delocalisation in Eastern Europe begins.
- Peripheral areas like Southern Italy, Greece and Spain gain manufacturing employment jobs, as a result of the reduction on salaries and other direct costs. There is an apparent end in the former delocalisation process of industry towards developing countries of the 2000-2010 decade, or the new job generation compensates delocalisation processes.
- ***Baltic Sea* – Artic Region.** The Nordic countries continue to be competitive with regards to manufacturing activi-ties especially in technology sectors. In most of their regions, with the exception of mid-Sweden, the growth of employment in this sector of the economy is superior to the average one across Europe. Dynamic regions such as the region of Gothenburg and Northern Denmark show strong signs of consolidating both their service and manufacturing activity basis. The Baltic economies comfort their transition to more service-oriented economic activities, with Estonia even consolidating its manufactur-ing base
- ***North-west Europe.*** The three countries Germany, Austria and Switzerland grow even more in manufacturing and service employment than the European average in all four scenarios.
- ***Central and Alpine region.*** The annual employment growth rates in the Baseline appear very high in particular for Germany with its declining and ageing population, but to a lesser degree also for Austria and Switzerland – a growth of employment of 2.0% annually over 20 years means a growth in employment of 49%, hardly imagineable for a country with a labour force participation rate of 77%.
- ***Central European region.*** Services will increase their employment share, but an emphasis on reindustrialisation and export-driven growth will influence the pace of structural change. An important qualitative split emerges between consumer and business services; the former have become omnipresent, while the latter gain most in metropolitan areas (national capitals), and on the peripheries, are more closely tied to successful manufacturing activities. Tertiarisation does not necessarily imply an optimal form of development. However, manufacturing employment is highly dependent on the path-dependent evolution of existing industrial milieus, or FDI: a major change of employment structure is unlikely.
- ***South-Central Mediterranean Region.*** In the baseline scenario, Northern Italy and Zahodna Slovenija present a process of further expansion of service jobs. Manufacturing jobs grow instead in Central Italy, whilst the Ljubljana area is characterized by a simultaneous growth of both manufacturing and service activities, with a process of further specialization with respect to the EU average. Interestingly, because in several of the aforementioned areas GDP is expected to grow more than employment, these results

suggest a process of restructuring of the portfolio of economic activities in these areas, towards higher value added products and services.

- ***Western Mediterranean Region.*** The reindustrialisation process in Baleares and Valencia, as well as Aragon, Castilla-la-Mancha and Murcia could be linked to industries such as food production and food processing (wine and beverages, processed meat industry). The very low growth of manufacture in the Basque Country, nowadays an industrialised and resilient region suffering the crisis to a lesser extend than others, seems the result of their incapacity either to reduce salaries or to be more productive and competitive globally.

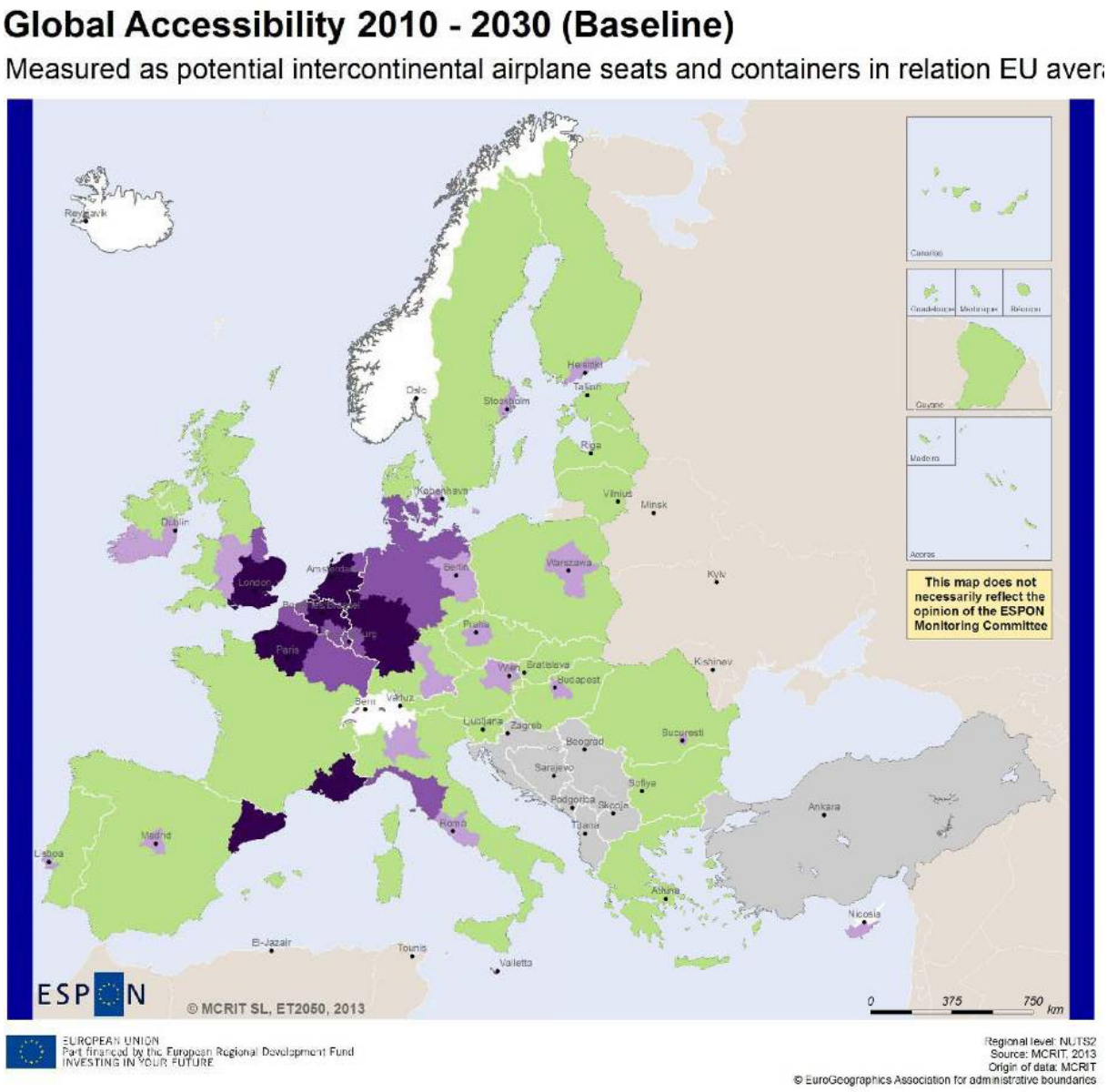


Figure 4-29 Baseline – Global Accessibility increase 2010-2030

Global Accessibility: Increasing Polarisation

- More relevant accessibility differences across European regions will be related to global connectivity.
- Accessibility to intercontinental flights will mostly be available around core airports in Europe (London, Paris, Amsterdam and Frankfurt). Madrid also emerges as a global hub. Several European capitals (Rome, Warsaw, Praha, Wien, Copenhagen, Stockholm, Berlin), and large metropolitan areas (Milano, Nice/Marseille, Barcelona) will play a complementary role, while small regional airports will grow because of specific purposes (e.g. low-cost, tourism, corporative…).
- Freight accessibility to extra-EU markets dominated, still as today, by Northern European ports, mostly by Rotterdam, Hamburg, Antwerp and Bremen, with the significant contribution of Felixtowe, the Hague and Zeebrugge. Limited growth of Mediterranean ports, especially Barcelona, Valencia and Genoa, not much other ports like Algeciras, Gioia-Tauro, Marsaxlock (Malta), Athens.
- The connexion between Second-Tier Cities and regions to main global hubs become a critical development condition. While more networked-like structures may emerge at European scale, increase hub-spoke hierarchical configurations emerge at global scale.
- ***Baltic Sea – Artic Region***. The hub strategies implemented by Nordic airline provides consolidate the position of the capital regions of Helsinki, Stockholm and Copenhagen as main the Nordic countries' main global gateways. However, in those countries, the active policy strategy of developing secondary airports gives the opportunity for local businesses and persons in other parts of these countries to benefit from this improved global accessibility. In the Baltic States, the lack of modern airport infrastructure and the limited extent of international-oriented services in their economic base limits their incentive and capacity to develop more global reach. In the latest years especially Helsinki but partly also Stockholm have started to profile their airports as getaways to Asia, especially to China and Japan.
- ***North-west Europe.*** The global accessibility of the North Western Europe is polarized in already highly accessible regions linking Frankfurt, London, Paris and Amsterdam, regions with high densities of transport infrastructures for airplane passengers and containers. The global accessibility of peripheral regions such as the Provence-Alpes-Côtes d'Azur in France and the Leinster / Munster regions in Ireland benefits of their harbours infrastructures combined to good airplane connections.
- ***Central and Alpine region.*** The Baseline map of global accessibility conforms to expectation.
- ***Central European region.*** Accessibility in the region mostly increases along TEN networks and in major aviation hubs; the South-Eastern transport connection plays a tertiary role in transport compared to the North-Eastern German–Russian corridor and the global integration of Core Europe. The weakness of urban counter-poles (with the potential exceptions of Poland and Romania) diminishes their individual transport roles, particularly with the assumption of a Europe of MEGAs. Under the absolutisation of global integration, the region will remain a backwater.
- ***South-Central Mediterranean Region.*** The relative peripherality of both EU Countries encompassed in this macro-region implies a relatively weak growth of accessibility in both of them. Lombardy, with Milan's airport system, and Lazio, with Rome's, are expected to experience a higher than average growth of passenger accessibility. Surprisingly, Tuscany and Liguria, that are usually less well-connected areas, present remarkable growth of both

passenger as well as freight accessibility. All other regions in this macro-region present low growth of both indicators.

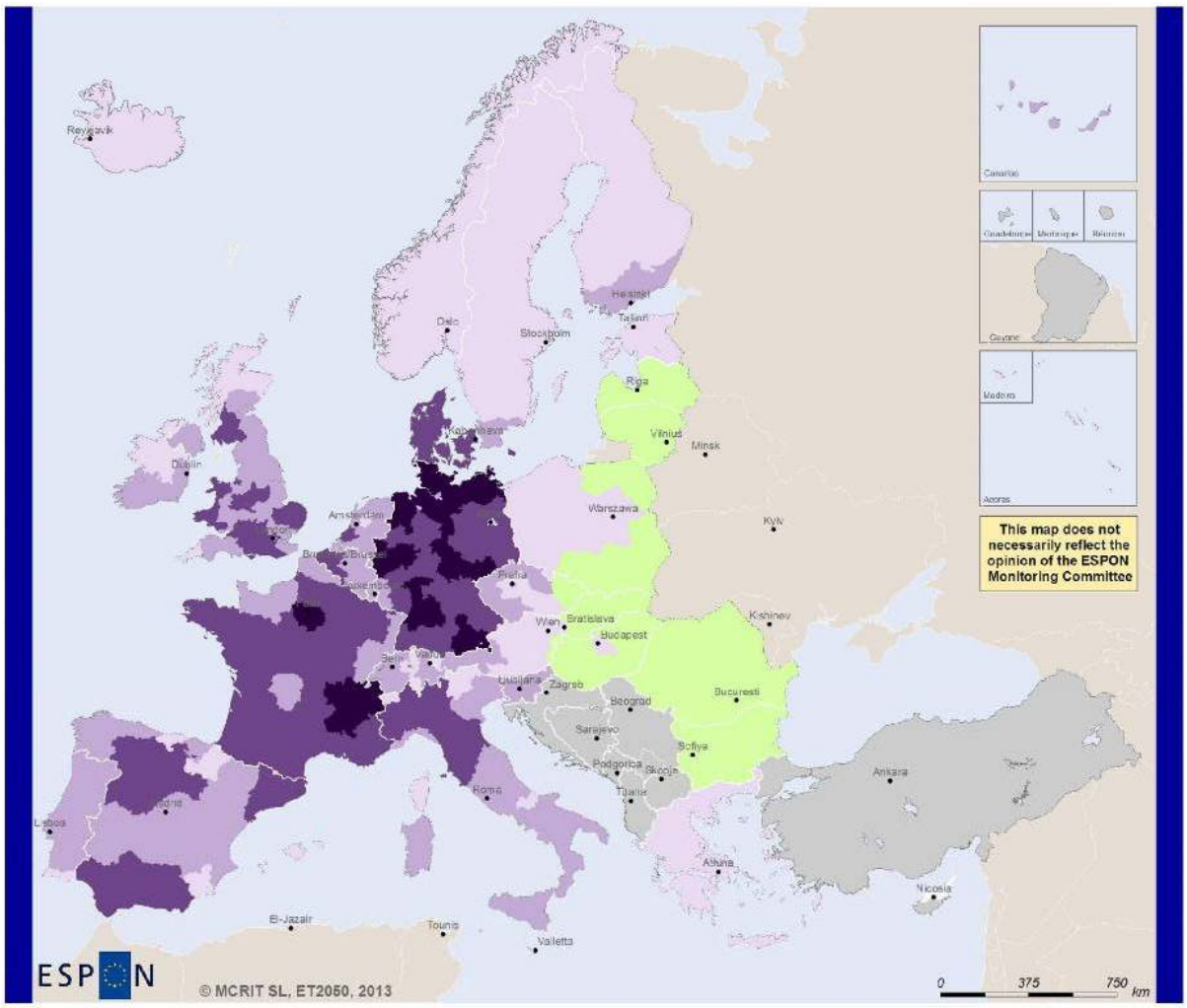
- ***Western Mediterranean Region.*** Consolidation of Madrid as the European getaway to South America, and a like increase in Europe-Africa traffics (e.g. Maghreb). Secondary role for Lisbon, Barcelona and Nice/Marseille airports. Intercontinental traffics in these airports far from leading airports in Europe. The development of these airports can be driven by a further development of intercontinental leisure tourism resulting from expanding middle classes in BRIC and other developing countries, and by global business tourism (e.g. fairs and congresses).

  Valencia, Balearic Islands and Canary Islands remain attractive only at European level, with relatively low intercontinental connections despite high levels of overall aerial traffics in airports such as Palma de Mallorca, Tenerife and Alicante, mostly linked to summer tourism. Andalusia far from these levels despite the importance of tourism in the region. Castilla-la-Mancha performing better than other regions due to the influence of Madrid.

  Mediterranean ports will not be able to effectively increase their hinterlands into Europe, despite recent important investments to increase capacity in several ports. Leading role of the tandem Barcelona-Valencia in the Western Mediterranean region, driven by relatively high role of manufacturing (exports) and the importance of the inland hinterland (imports), which comprises Madrid. Gibraltar, Marsaxlock (Malta), Gioia Tauro maintain a clear transhipment role in the future, by 2030. A greater role of Marseille could be expected in the future, taking into consideration the strength of the Europe / Asia traffics, and the good geographical location of this port in the head of the Rhone/Rhine axis.

European Accessibility 2010 - 2030 (Baseline)

Measured as change in accessible population weighed by shortest access time



EUROPEAN UNION
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Regional level: NUTS2
Source: MCRIT, 2013
Origin of data: MCRIT
© EuroGeographics Association for administrative boundaries

Absolute variation in accessibility 2010-2030 (Units: Millions Equivalent population)

- < - 0
- 1 - 5
- 5 - 25
- 25 - 50
- > 50
- No data (ESPON space)
- No data (No ESPON space)

Accessibility changes are very much influenced by population changes, because of the relative homogeneous transport endowment across Europe, and despite the relatively higher investments on infrastructure planned in Eastern European regions. The accessibility in each NUTS3 is measured as the sum of the population of all other NUTS3 weighed by the shortest multimodal access time. NUTS3 population is attached to the capital city. Population in 2030 by MULTIPOLES-MASST models and shortest multimodal access by MOSAIC model.

Figure 4-30 Baseline – Global Accessibility increase 2010-2030

European Accessibility: More infrastructure does not lead to More Accessibility

- Increase in transport endowment mostly concentrated in Eastern European, and still in Southern European, regions
- Even if investments on infrastructure are reduced in the coming years, accessibility patterns will tend to become more homogeneous across European regions, if measured in terms of endowment (but no if measured in terms of people or GDP accessible in a given time or generalised cost).
- Accessibility measured as the accessible population weighted by the time of reaching this population always improves when new infrastructure is built, excepts in regions where population declines. When considering the cost of using infrastructure, accessibility measured as accessible population within a limited travel budget does not increase everywhere. When higher travel costs associated to new transport infrastructure are not compensated by travel time savings, this may lower the accessibility in certain regions. This is especially relevant for passenger with lower values of time, e.g. private and holyday trips, and less for business travellers (e.g. infrastructure development in the Iberian Peninsula has almost no impact in accessibility for non-business trips.
- ***Baltic Sea* – Artic Region.** The relative small-size of the national economies and populations in the Baltic Sea and Arctic regions is a 'natural' limit for them to gain substantially in terms of European acces-sibility. Capital regions are the ones that gain most in terms of accessibility, even if other re-gions witness a slight improvement of their position with regards to accessibility. In the BSR, only Lithuania will witness a reduction of its relative accessibility.
- ***North-west Europe.*** Reinforcement of already highly positive dynamics in many North Western European Regions except in the South of Belgium, the North of Scotland and the North of The Netherlands which remain peripheral less accessible regions.
- ***Central and Alpine region.*** The Baseline map appears to be influenced by the choice of population as destination activity and the presentation of absolute rather than relative growth in accessibility between 2010 and 2030, otherwise the position of Germany would not be as dominant as shown in the map.
- ***Central European region.*** Improvement in absolute accessibility and transport infrastructure, but the increase of relative differences with respect to Core Europe. Highway investment projects may enjoy priority until the completion of adequate national networks; high-speed railways being restricted to a few select lines of European significance, connecting capital cities.
- ***South-Central Mediterranean Region.*** Accessibility as measured with millions of equivalent population experiences a very high increase in the traditionally industrialised areas in North-Western Italy, in line with rates to be found in Western Germany, Southern France, and South-Western England. Elsewhere in the macro-area, and in particular in Slovenia, only weak accessibility growth can be identified
- ***Western Mediterranean Region.*** Results confirms that accessibility in Southern regions is relatively high, at the level of the rest of Europe. Infrastructure in Spain, even if nowadays presents excess of capacity and high maintenance costs, is one of the key assets to help the future development of the country, together with land availability (in the interior regions). The infrastructure sector have grown during the latest decade to a very high level and begins to internationalise their activities.

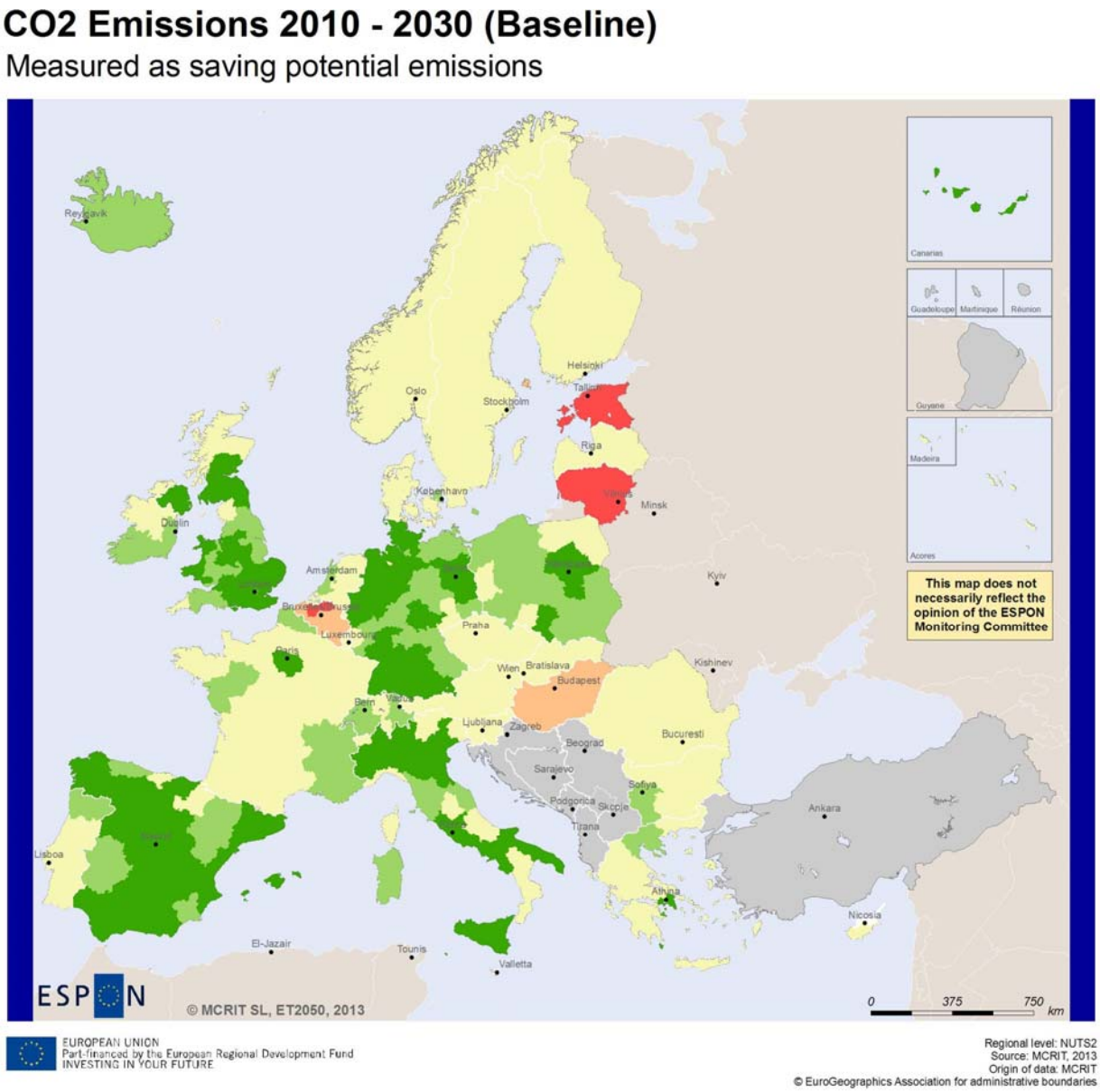

Figure 4-31 Baseline - Total CO2 emissions in 2030 in relation to 2010

Environment: GHG Emissions are Reduced not just because Decarbonisation.

- The combined impact of economic crisis with reduced GDP growth, and decarbonisation (e.g. the use of more environmentally friendly energy sources, savings and efficiency gains) leads to a net reduction of CO2 emissions specially in more industrialised and populated regions, even if there is a reindustrialisation process.
- The absolute reduction levels seems independent from the development level of each region, excepts in Eastern European regions.
- ***Baltic Sea* – Artic Region.** CO2 emissions will slightly decrease in the Nordic countries as well as in Latvia. In Estonia and Lithuania, the reindustrialisation process will trigger a strong increase in CO2 emissions.
- ***North-west Europe***. Global improvement in CO2 emissions in large urban areas of North Western Europe and a better efficiency in France and the United Kingdom than in Belgium and the Netherlands.
- ***Central European region.*** In Eastern Europe CHG emission is strongly correlated by the economic activity and development level of a certain region. It can be stated that Scenario B is even more likely than the Baseline. In which despite the general EU level decline CO2 emissions will grow in the economically developing CEE regions.
- ***Eastern Mediterranean Region.*** The economic crisis is likely to affect passenger and freight transport resulting however in an increase with impacts on GHG emissions and air pollution and pressures in maritime traffic.
- ***South-Central Mediterranean Region.*** Arguably because of an increase in energy-saving techniques, Northern Italy, despite positive medium run GDP growth rates, presents a remarkable decrease in CO2 emissions. Similar results can be found also on an axis stretching South-Eastwards from the capital region, Lazio, towards Apulia. Slovenia is instead characterised by milder decreases.
- ***Western Mediterranean Region.*** Reductions follow the same pattern observed at European scale: higher on more populated and industrialised regions, that happens to be along the coastal zones and in capital cities.

Land-use evolution

For the baseline scenario general land use behaviour is assumed to be similar to that of the historic period 1990-2006. Assumed demographic and economic developments from the respective models are as such allocated on the map using assumptions based on these historic developments.

Characteristics of these developments are a continuation of the urbanization process and the development towards larger urban centers. The exception to this is Western Europe, where the distribution remains largely constant. New residential land use will mostly be allocated on areas that were agricultural land before. Moreover, urban land use classes show a stronger dependency with other urban land uses in their allocation then agriculture, forest and natural vegetation. In South-eastern Europe and Western Europe, inland water bodies will remain attractive for new residential development; in Mediterranean and Western Europe, marine water bodies will remain attractive for the allocation of new residential land uses.

Forested areas are expected to increase in the first years of the baseline scenario. This expansion will mainly take place by the growth of existing forests. However, competition of land is expected to increase, due to a further urbanization, an increasing demand for meat and dairy products and the need to maintain a sufficient agricultural production, together with an increasing demand for

bio-energy crops, all while meeting ambitious environmental goals, such as the GAEC standards for permanent pastures, the nitrate and water framework directive and the biodiversity action plan BAP). This increasing demand for land is likely to slow-down the expansion of the forests that Europe experienced over the past decades.

Agriculture is the land use expected to show the largest decline in surface area in the European territory. Strongest decreases are expected to take place in Western Europe, followed by the Mediterranean region. Conversion from agriculture to all other land uses is expected throughout Europe, while new agricultural locations can mainly be found on land previously occupied by forest and natural vegetation.

Figure below shows an example (Mediterranean France) of new residential development close to existing urbanization and in particular the larger urban cores, taking over agricultural lands in the neighbourhood of current urbanization.

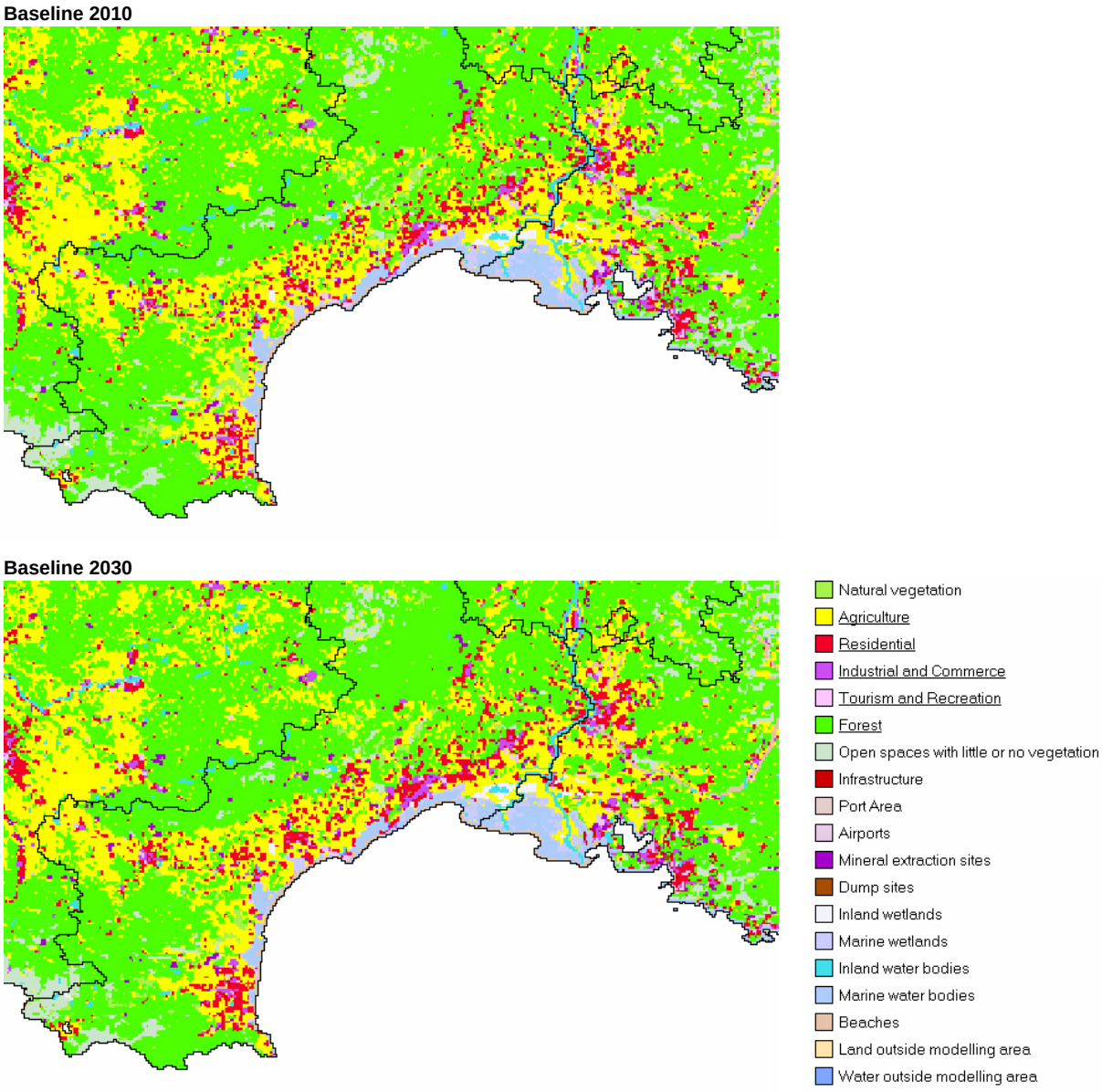

Figure 4-32 Baseline - Land-use pattern evolution 2010-2030

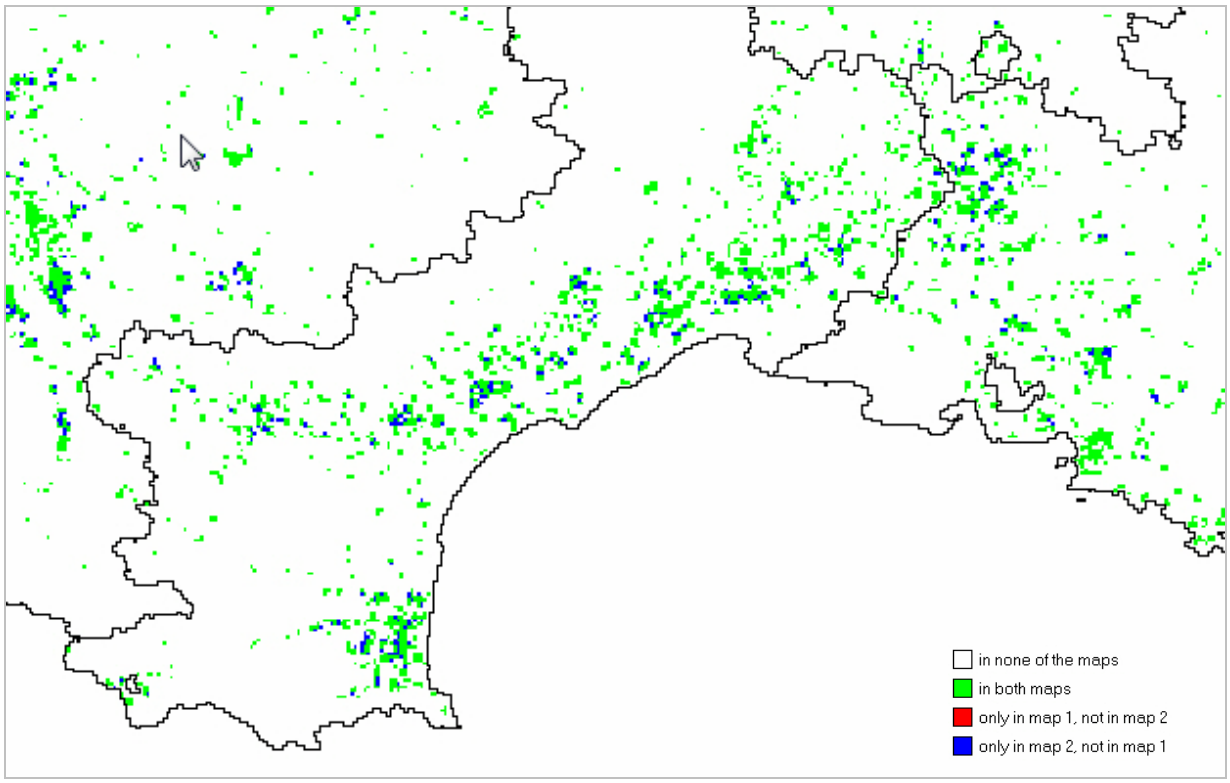

Figure 4-33 Baseline - Land-use pattern evolution. Relative difference 2010 to 2030

4.8 Conclusions by macro-regions

Even tough some variables remain stable or with just a marginal change, at aggregated level, there are increasing changes at regional and macro-regional level. The following overall trends have been observed by large macro-regions:

- Central and Northern countries and regions may emerge stronger from the crisis, being able to keep their public finances healthy, and growing at a reasonably high speed (above 2% every year in average for twenty years). This result is not surprising since these regions have, in average, very well educated and high living standard societies, with resilient regional economies and many sectors and corporations are able to compete successfully in Europe, as well as globally. All of these regions have many differences, and particularities, but most of them have efficient public administrations and sound planning systems.
- Eastern European countries will hardly be able to sustain the strategy of growth of the previous decade, when many industries were attracted, many from the Southern European regions. While large cities and capitals may have agglomeration economies, rural areas will tend to be depopulated. Migrations from East to West will continue. Social Welfare may grow slowly, and the gap with Northern and Central regions may also grow.
- Southern countries and regions growth in the last decade was not sustained enough by productivity and global competitiveness. If actual policies remain many of these regions will have in average just marginal growth in the next decade, pushing salaries down in many sectors, and the gap with many Central and Northern regions may grow twice the level is today. The deindustrialisation process will be slowed down because of the salary reductions, and touristic areas and the coastal zones will likely received increasing senior

residents from the rest of Europe. The gaps between regions inside Southern countries will grow, creating explosive social and political conflicts at national and European level.

5. Exploratory Scenarios 2010-2030

This section will present modelling results obtained by MULTIPOLES, MASST3 and MOSAIC for the Exploratory scenarios (METRONAMICA modelling still ongoing).

5.1 Approach

To define the play-ground for the discussions concerning the Territorial Vision, Exploratory Scenarios have been developed as follows:

- Definition of clearly different spatial patterns (or even *extreme*, but still realistic enough to be politically meaningful), involving social and economic development across European regions, urban structures, urbanisation processes and land-use change, social and environmental impacts, and territorial governance.
- Definition of framework and exogenous conditions consistent and most likely related to the spatial development trends (even though there is no a deterministic neither synchronic dependency between socioeconomic, technologic and territorial dynamics).
- Definition of the most likely and consistent public policies, particularly at European level: Cohesion policies, Transport, Agriculture and Environmental.
- Quantitative figures for key indicators, obtained by using forecast modelling tools and consolidated by a meta-analysis procedure, as well as Territorial Impact Assessment tools.
- Integrated narrative

Starting Point: Flows, Cities and Regions Scenarios from Project Specifications

The point of departure were the three Exploratory Scenarios suggested in the Project Specification:

- *Europe of the Flows*. This scenario provides an image of the European territory in which economic and population growth as well as public investments are mainly stimulated to take place within main corridors that structure the European territory. Europe of the Flows is characterised by strong connections between cities and transport nodes. Political focus lies on issues such as enhancing connections and long distance networks and global integration.
- *Europe of the Cities.* This scenario provides an image of the European territory in which economic and population growth as well as public investments are mainly stimulated to take place within existing cities that structure the European territory; cities that have a role as driving forces in the global, national and/or regional level. Europe of the Cities is characterised by economically strong and compact cities. Political focus lies on issues such as intensified use of urban space, strong preservation of open space, reduction of long-distance traffic.
- *Europe of the Regions.* This scenario provides an image of the European territory in which economic and population growth as well as public investments are mainly stimulated to take place on the basis of specific regional identities and strengths. Europe of the Regions is characterised by strong urban and rural territories that form a mosaic of different regions and types of territories with strong identities. Political focus lies on issues such as regional self-reliance, small-scale development and landscape protection.

First sketches of three original scenarios presented in the ET2050 Project Specification were studied and debated in the first TPG meeting in Barcelona. Consistency, likelihood and desirability were tested with specific questionnaires.

Scenarios were adjusted, and a fourth scenario was temporarily introduced to cover a more ecological and local, place-based view. All four scenarios were presented and discussed in the ESPON Krakow Seminar in November 2011. Again questionnaires were distributed among expert participants, and analysis of results revealed a positive increase in consistency, likelihood and desirability of the scenarios.

In the TPG meeting in Brussels in March 2012 a new discussion on Exploratory Scenario assumptions helped to further refine them.

The purpose of the Exploratory Scenarios was based on investigating Territorial Cohesion issues, in terms of how different spatial structures and patterns could influence the social and economic future evolution of Europe, and vice versa. Therefore, the latest revision of the initial scenarios was focused on emphasising *polycentricity* as the key dimension of the scenarios.

Conceptual framework: Polycentrism at different scales

Polycentricity is the overarching concept behind the Territorial Cohesion goal, from the ESDP to the *Teritorial Agenda 2020*, that its first priority says that *promoting polycentric development is the precondition of territorial cohesion and a strong factor of territorial competitiveness*.

Polycentricism, as a concept, is understood at three different geographic scales by the Exploratory scenarios (named A, B, C as a provisory names):

- Scenario A: At global scale, to ensure European successful economic competitiveness, the size and agglomeration advantages of **European larger metropolis,** linked to knowledge sharing and technologic innovation, is promoted by National and European policies. Therefore, public policies at European and National level to promote higher agglomeration economies in largest metropolis and transport nodes and corridors (Mega-cities and Mega-corridors, so to speak) or at less removing constrains to their spontaneous growth are foreseen (this Scenario, called A, focused on the promotion of large metropolitan global areas, would be in line with the *Europe of Flows* presented in the Project Specifications).
- Scenario B: Congestion costs in large and more dense European metropolis will grow more rapidly than in other continents, and the promotion of **urban regions and second rank cities** well connected to global metropolis, as well as to smaller cities and more rural areas, with relatively diversified economic activities, and social inclusiveness, is a preferable political option in Europe, not necessarily producing less economic growth (this Scenario, called B, focused on the promotion of large and medium size cities, would be in line with the *Europe of Cities* presented in the Project Specifications)
- Scenario C: Local and regional scales favouring geographic proximity have to be strongly promoted by public policies to support endogenous development and increase economic resilience in a world with increasing economic vulnerability and scarce and more expansive transport and energy, even if this leads to zero growth in the short-term. European Cohesion policies should be targeted to **small and medium-size towns and rural regions**, especially in less developed countries, favouring changes in people and corporative behaviour. This territorial policy will support emerging alternative economic practices such as consumer cooperatives, agro-ecological production networks, social currency networks, seed banks, etc, therefore balancing the strong deterritorialisation trends of contemporary global financial capitalism (this Scenario, called C, focused on the

promotion of small and medium size cities, especially in less developed regions, would be more in line with the *Europe of Regions* presented in the Project Specifications)

Comparison with Spatial-oriented Scenarios

Next table presents a comparison of the scenarios proposed in ET2050 together with other scenarios designed in relevant spatial-oriented scenario-building studies (see First Interim Report for a more extensive description of these scenarios):

Scenario Study	Scenario Orientations			
ET2050 - Project Specifications	A Europe of Flows Promotion of MEGAS	B Europe of Cities Promotion of Cities	C Europe of Regions Promotion of Regions	VISION
ET2050 - Interim Report 1	Global Flows	Creative Cities	Balanced Regions & Self-sufficient towns	VISION
ESPON 3.2	Pro-Competitivess		Pro-Cohesion	
Netherlands 2040	Talent Towns	Metropolitan markets & Cosmopolitan Centers	Egalitarian Ecologies	
France 2020	Archipelago exploded	Centralism renovated	Local differentiated	Networked polycentrism
Territoires 2040	Postpolisation	Hyperpolisation	Depolisation	Regiopolisation
PLUREL 2025	Fragmentation and High-tech		Self-reliance and Sustainability	

Figure 5-1 Comparison between ET2050 Exploratory Scenarios and existing references

The modelling of Exploratory scenarios by MULTIPOLES, MASST3, MOSAIC and METRONAMICA for 2030 (with insights for 2050) is complemented with the modelling of scenario policy variants, and wild card-variants (e.g. more severe economic crisis, or more expensive) by SASI forecast model for 2050.

Based on the polycentricity concept, the type of regions to be promoted under each scenario (Metropolitan Global Areas, Cities and Regions) were defined based on population density criteria.

5.2 Scenario A (Territorial Strategy: Promotion of Metropolitan Global Areas)

This scenario (in line with the FLOWS scenario from the Project Specifications) provides an image of Europe in which the territory is more dynamic, flexible and adaptable to technological, social and economic change[19].

[19] The **A Scenario** is inspired by the work of the following authors. Relevant references provided in each case:
Ascher, François, Metapolis. Les Nouveaux principes de l'Urbanisme (2004)
Castells, Manuel, The Space of Flows
Bauman, Zygmunt, 44 letters from the Liquid Modern World (2011)
Dupuy, Gabriel, Systèmes, réseaux et territorires. Réseautique territorial (1985)
García Vázquez, Carlos, Antípolis, (2011)
Garreau, Joel, Edge Cities (1993)
Hanley, Richard, Moving people, goods and information in the 21th century. The cutting-edge of infrastructures of networked cities (2004)
Hall, P., Megacities, World Cities and Global Cities, in Megacities (2010)
Mitchel, William, Me+ & e-topia(2003)
Nijkamp, Peter, Megacities: Lands of Hope and Glory, in Megacities (2010)
Kasarda, John, Aerotropolis. The Way We'll Life Next (2011)
Kunstler, James Howard, The geography of nowhere (1993)
Rowe, Peter, Making a Middle Landscape (1991)
Sassen, Saskia, Urban Economics and Fading Distances, in Megacities (2010)
Senett, Richard, Megacities and the Welfare State, in Megacities (2010)

This scenario follows the *Europe 2020* strategy of promoting global competitiveness of Europe by promoting the economic development of the largest metropolitan areas of global importance in Europe, i.e. of the 76 Metropolitan European Growth Areas (MEGAs) defined in ESPON 1.1.1 (2005, 118). The policies applied are mainly investments in MEGAs supporting of high-level R&D as well as European transport infrastructure, such as high-speed rail, and enhancing connections and long distance networks, favouring more efficient technologies and management strategies.

More integrated trans-national zones emerge by the networking of cities in cross-border areas, and transport and energy corridors link major European centres of production and consumption with neighbouring countries and the rest of the World.

5.3 Scenario B (Territorial Strategy: Promotion of Cities)

This scenario provides an image of the European territory in which economic and population growth, as well as most private and public investments, take place within existing cities that give structure to the European territory: national capitals and major regional capitals as driving forces[20].

It is a place-based scenario that follows the priority of the European Spatial Development Perspective (1999) and the two Territorial Agenda (2007; 2011) for balanced polycentric urban systems at the macro-regional or national scale for the 261 cities of European or national significance defined in ESPON 1.1.1 (2005, 114).

Policies applied are mainly in the fields of Cohesion funds being mostly targeted to cities, including urban renewal and reurbanisation, and R&D investments distributed among cities, and promotion of regional and national transport networks.

This scenario is characterised by economically strong and compact cities as centres of excellence. The increasing concentration of added-value activities in cities does not necessarily implies a process of rural decline, but its increasing functional dependency on large cities.

5.4 Scenario C (Territorial Strategy: Promotion of Regions)

Scenario C provides an image of the European territory in which urban and rural territories form a mosaic of different regions and types of territories with identities nourished by local and regional governments able to cooperate in areas of common interest[21].

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[20] The **Scenario B** is inspired by the work of the following authors:
Benevolo, Leonardo, The European City. The Making of Europe (1993)
Einsele, Martin, The Upper Rhine, an Alternative Metropolis, (1988)
Florida, Richard, The Creative Cities (2009)
Jacobs, Jane, Dead and Life in the American Cities
Glaser, Edward, Triumph of the City, (2011)
Rifkin, Jeremy, The Empathic Civilisation, (2010)
Ohmae, Kenichi, The End of the Nation State and the Rise of Regional Economies, (1996)
Savitch, H. V., Post-Industrial Cities, (1991)
Solà-Morales, Ignasi, Metrópolis, (2005)
White, William H., City. Rediscovering the Center (1988)

[21] The **C Scenario** is inspired by the work of the following authors. Relevant references provided in each case
Geddes, Patrick, Regional Planning,
Forman, Richard T.T., Land MOSAICs. The Ecology of landscapes and regions, (1995)
Klein, Naomi, The Shock Doctrine. The Rise of Disaster Capitalism (2007)
Munford, Lewis, The Regional Framework of Civilisation. Regions to live in, (1968) Davis, Mike, Dead Cities, (2002)
Rubin, Jeff, Why Your World is About to Get a Whole Lot Smaller, (2009)
Smith, Neil, ¿Cities after Neo-Liberalism? (2009)
Calthorpe, Peter, The Next American Metropolis. Ecology, Community and the American Dream, (1993)
Illych, Ivan, The Art of Habitat (1984)
Latouche, Serge, Petit traité de la décroissance sereine (2009)

This scenario responds to the challenges of energy scarcity and climate change expressed in the Territorial Agenda 2020 (2011) by promoting small and medium-sized cities as centres of self-contained and economically resilient regions with more sustainable mobility patterns yet taking account of the necessary economies of scale of services of general interest and the prospects of an ageing society.

Policies applied are mainly from the fields of cohesion funds targeting mostly rural less developed areas, and transport investments focused on local and regional networks. The focus lies on promoting medium-sized cities and reducing the existing imbalances at the medium and lower level of the urban hierarchy and their functions for the surrounding regions. Policies aim at organising the settlement systems in a more polycentric approach, economically resilient, at regional scale.

Local production and local markets gain much importance, migration of skilled people from large cities to rural areas accelerates localism, large cities become further decentralized into more productive, slow neighbourhoods. Strengthening the social and economic balance of Europe at the regional level, promoting endogenous development and empowering regional institutions may lead to more efficient provision of public services. Many of the changes in this scenario are much lead by changes of values and behaviour of new generations, policy becoming a support for these.

5.5 Scenario Assumptions

General Scenario Orientations

Each of the ET2050 scenarios was assigned a specific spatial development pattern in the first Interim Report.

	A Scenario (Promoting MEGAS)	B Scenario (Promoting CITIES)	C Scenario (Promoting REGIONS)	BASELINE
Spatial distribution of population and economic growth, (and territorial governance)	Relative accessibility and connectivity to international transport networks and agglomeration economies attract growth, following spontaneous market tendencies. Global cities, mostly MEGAS grow bigger.	Large cities attract both more people and activities because effective public policies promoting them at National scale. Internal migrations from sparsely populated areas to urban centres.	Medium-size cities and towns attract people based on their cultural and environmental quality, and strong public policies and incentives. Change in consumer behaviour favouring proximity and self-sufficiency. Intense decentralisation at local and regional level. Limited external migrations.	No relevant modification on actual spatial patterns

Figure 5-2 Spatial distribution of activities among ET2050 Scenarios

These general criteria were made explicit generating three sets of regions in Europe which would be promoted when establishing exogenous assumptions for each of the Scenarios.

- Type 1 regions, to be promoted in the A Scenario, are regions with a share of LUZ[22] population over regional population > 1,500,000 inhabitants;
- Type 2 regions, to be promoted in the B Scenario, with a share of LUZ population over regional population between 1,500,000 and 300,000 inhabitants;

Salingaros, Nikos A., Principles of Urban Structure, (2005)
Sansot, Pierre, Du bon usage de la lenteur, (2000)
Platt. R. H., The Ecological City, (1994)

[22] Large Urban Zones as defined by Eurostat in the frame of Urban Audit

- Type 3 regions, to be promoted in the C Scenario, with a share of LUZ population over regional population < 300,000 inhabitants.

Most relevant assumptions are presented in the next table:

	A Scenario (Promoting MEGAS)	**B Scenario (Promoting Cities)**	**C Scenario (Promoting Regions)**	**BASELINE**
Demographic Policies	Openness to migrants from outside Europe	Relative openness.	More strict immigration policies. Public support to natality and families.	Continuation of actual trends
Fertility	1,5 in 2030	1,66 in 2030	1,8 in 2030	1,66 in 2030
Mortality	For the initial 5-year period, between 2010 and 2015, mortality rates are assumed as the ones proposed by the "Limited Social Europe" (LSE) scenario for the 2015-2020 period (in the ESPON DEMIFER study). After 2015, life expectancy is linearly increased until the values of 85 years for men and 90 years for women in 2050.			
ExtraEU Migration	Total immigration increases at a rate of 3-7% every 5 years, substantially faster than in the Baseline	Total immigration increases at a rate of 2-4.3% every 5 years, still faster than in the Baseline.	Total immigration decreases at a rate of 2% every 5 years	Total immigration increases at a rate of 2% every 5 years, with the increase being delayed by 5 years in the most crises-hit countries (CY, GR, IT, ES, PT, IE)
IntraEU Migration between countries	Flows tend to move from all over in Europe towards largest metropolises integrated in the global economy (regions type A)	Flows tend to move from rural and sparsely populated areas towards other areas in Europe (regions type B)	Flow from rural and sparsely populated areas towards other areas significantly decreases (regions type C)	Emigrating rates are kept constant as in pre-crisis times for leading economies in Europe (based on MIMOSA and IMEM studies), and are significantly increased for least performing economies
Monetary policies	In Western European countries, stability of interest rates, ULC, exchange rates, inflation; Progressive convergence of Eastern EU towards Western European Countries values Decrease of interest on bonds: end of speculation periods			
Fiscal policies	Slow tendency towards stability pact: 60% of Debt/GDP. Decrease of public expenditure growth rate especially in vicious countries.	Debt/GDP remains constant	Slow divergence from stability pact. Slight increase of public expenditure growth rate	Increase of tax rates in the Western and Eastern Countries. Debt/GDP remains constant
Macro-economic framework	The crisis ends in 2015			
Transport Infrastructure Policies	€ 1.630 billion (2013-2030) in transport investment, 0.60% of EU GDP. 50% of transport budget in new infrastructure provision. Modal allocation of investment in TENs, substantially increased for air and ports, substantially decreased for rail Investments in long-distance infrastructure (mostly in regions type A) are 20% of total transport budget (€ 330 billion 2013-2030). *30% for short distance.*	€ 2.290 billion (2013-2030) in transport investment, 0.85% of EU GDP. 60% of transport budget in new infrastructure provision. Modal allocation of investment in TENs, increasingly rail based. Investments in long-distance infrastructure (mostly on regions type B) are 18% of total transport budget (€ 470 billion 2013-2030). *42% for short-distance.*	€ 1.790 billion (2013-2030) in transport investment, 0.67% of EU GDP. 45% of transport budget in new infrastructure provision, 25% allocated in TENs (€ 160 billion). Investments in short-distance infrastructure (mostly in regions type C) are 34% of total transport budget (€ 160 billion 2013-2030). *11% for long-distance.*	From 1.04% of EU GDP in transport investment to 0.73%. New transport provision from 70% to 53% of total transport investment. Network maintenance from 30% to 45%. Investments in long-distance infrastructure, from 28% (€ 610 billion 1995-2012) to 17% (€ 330 billion 2013-2030).
Transport Market Regulation Policies	0,07% of EU GDP yearly in smart ITS infrastructure equipment -10% vehicle emission factors respect to Baseline,	0,02% of EU GDP yearly in smart ITS infrastructure equipment More 10% average rail speed due to enhanced	0,04% of EU GDP yearly in smart ITS infrastructure equipment +5% average rail speed due to enhanced	0,02% of EU GDP yearly in smart ITS infrastructure equipment Car emission factors in 2030 a 30% lower than in

	A Scenario (Promoting MEGAS)	B Scenario (Promoting Cities)	C Scenario (Promoting Regions)	BASELINE
	due to environmental regulation Pricing in those motorways were there are no tolls today Increased efficiency of fossil fuels, some RES, emergence of CCS. Targets partially met.	management -10% vehicle emission factors respect to Baseline, due to environmental regulation High development of centralised RES and nuclear. Targets partially met.	management - 5% average road speeds due to regulation -20% vehicle emission factors respect to Baseline, due to environmental regulation + 5% road and air transport costs due to taxation Decentralised RES. Lower energy consumption. Targets met.	2010, with development of new technologies and driven by Euro Standard regulations Fossil fuels remain important. Emissions reduced but targets are not met.
Environment	Increased efficiency of fossil fuels, some RES, emergence of CCS. Targets partially met.			
Cohesion policies	Half of the present budget. Allocation among regions in 2007-2013 as 2000-2007	Budget kept constant. Allocation among regions in 2007-2013 as 2000-2007	Budget doubled. Regions type C get 2/3 of the budget, Type B 1/3	Budget kept constant. Allocation among regions in 2007-2013 as 2000-2007

Figure 5-3 Synthesis of Scenario Assumptions on Exogenous Conditions and Policies

Detailed demographic Exogenous and Policy Assumptions by MULTIPOLES

Total Fertility Rate (TFR) assumptions

Based on this Baseline (in line with the EUROPOP 2010 projection by the Eurostat, TFR increasing up to 1.66 in 2030), the following hypothesis are taken for the different Exploratory Scenarios:

- Scenario A: a progressive decrease of TFR up to 1.5 in 2030
- Scenario B: as in the Baseline, TFR increasing up to 1.66 in 2030
- Scenario C: progressive increase of TFR up to 1.8 in 2030

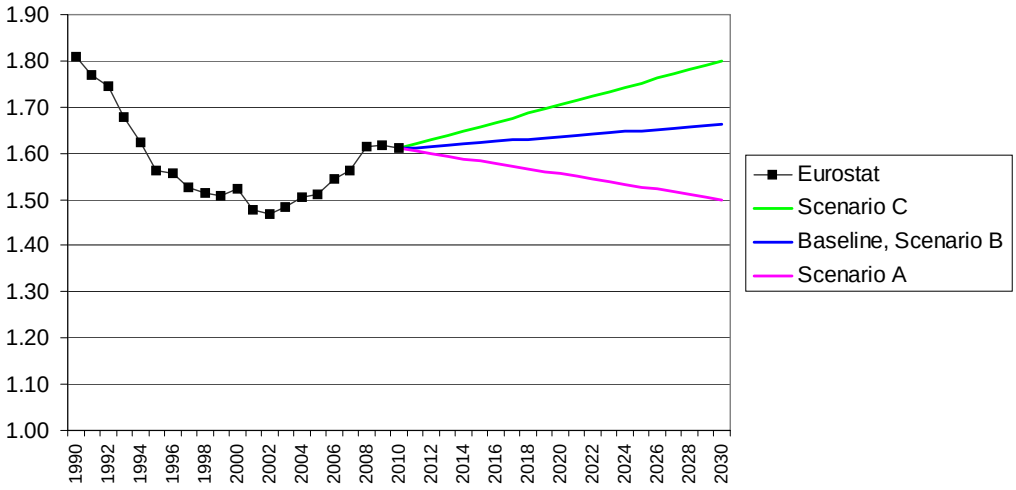


Figure 5-4 Total Fertility Rate Assumptions in ET2050 Scenarios and Baseline

Mortality assumptions (life expectancy)

For mortality indexes, all Scenarios take the same assumptions as the Baseline.

- For the initial 5-year period, between 2010 and 2015, mortality rates are assumed in ET2050 as the ones proposed by the "Limited Social Europe" (LSE) scenario for the 2015-2020 period (in the recent ESPON DEMIFER study). These hypotheses are in line with the current economic crisis.
- After 2015, considering an alleviated crisis situation, life expectancy is linearly increased until the values of 85 years for men and 90 years for women in 2050, just like in DEMIFER's LSE scenario (in 2011, 76 years for men and 83 year for women).

Migration assumptions

In general, the Scenario A is marked by a higher degree of openness to migrants from outside Europe, while the Scenario C tends to be stricter on immigration policies, with the B Scenario in between previous two. Assumptions vary regionally according to the following principles:

- In the A Scenario, immigration flows tend to be larger towards highly globalised European metropolises,
- In the B Scenario, immigration flows tend to be larger towards medium sized cities well integrated in the European markets and their surrounding regions
- In the C Scenario, there is a decrease of outflows from peripheral and rural regions

For extra-*Europe migration*,

- In the Baseline, the total immigration increases at a rate of 2% every 5 years, with the increase being delayed by 5 years in the most crises-hit countries (CY, GR, IT, ES, PT, IE)
- In the A Scenario, the total immigration increases at a rate of 3-7% every 5 years, substantially faster than in the Baseline.
- In the B Scenario, the total immigration increases at a rate of 2-4.3% every 5 years, still faster than in the Baseline.
- In the C Scenario, the total immigration decreases at a rate of 2% every 5 years.

Both for *international intra European migrations and for internal migrations within Member States*,

- In the Baseline, emigrating rates are kept constant as in pre-crisis times for leading economies in Europe (based on MIMOSA and IMEM studies), and are significantly increased for least performing economies.
- In the A Scenario, flows tend to move from all over in Europe towards largest metropolises integrated in the global economy.
- In the B Scenario, flows tend to move from rural and sparsely populated areas towards other areas in Europe
- In the C Scenario, the flow from rural and sparsely populated areas towards other areas significantly decreases

Detailed Economic Exogenous and Policy Assumptions by MASST3

MASST3 incorporates the demographic outputs of MULTIPOLES, and considers alternative investment scenarios in terms of Cohesion Policy expenditures, and Transport Policy expenditure provided by MOSAIC.

For all scenarios, in Western European countries:

- Stability of interest rates, ULC, exchange rates, and inflation is considered.
- Progressive convergence of Eastern EU towards Western European Countries values.
- Decrease of interest on bonds: end of speculation periods.
- The crisis is over in all Scenarios in 2015

The Scenario A considers:

- Slow tendency towards stability pact: 60% of Debt/GDP. Decrease of public expenditure growth rate especially in so-called vicious countries.
- Half of the present budget for Cohesion Policy. Allocation among regions in 2007-2013 as 2000-2007

The Scenario B specifically considers:

- Debt/GDP ratio remains constant
- Cohesion budget kept constant. Allocation among regions in 2007-2013 as 2000-2007

The Scenario C considers:

- Slow divergence from stability pact. Slight increase of public expenditure growth rate
- Cohesion budget doubled. Regions type C get 2/3 of the budget, Type B 1/3.

As a reference, the Baseline considered:

- Increase of tax rates in the Western and Eastern Countries. Debt/GDP remains constant
- Cohesion Budget kept constant. Allocation among regions in 2007-2013 as 2000-2007

Next figures present the geographic allocation of Cohesion funds among NUTS2, in relation to labour market expenditures, as considered by the MASST model.

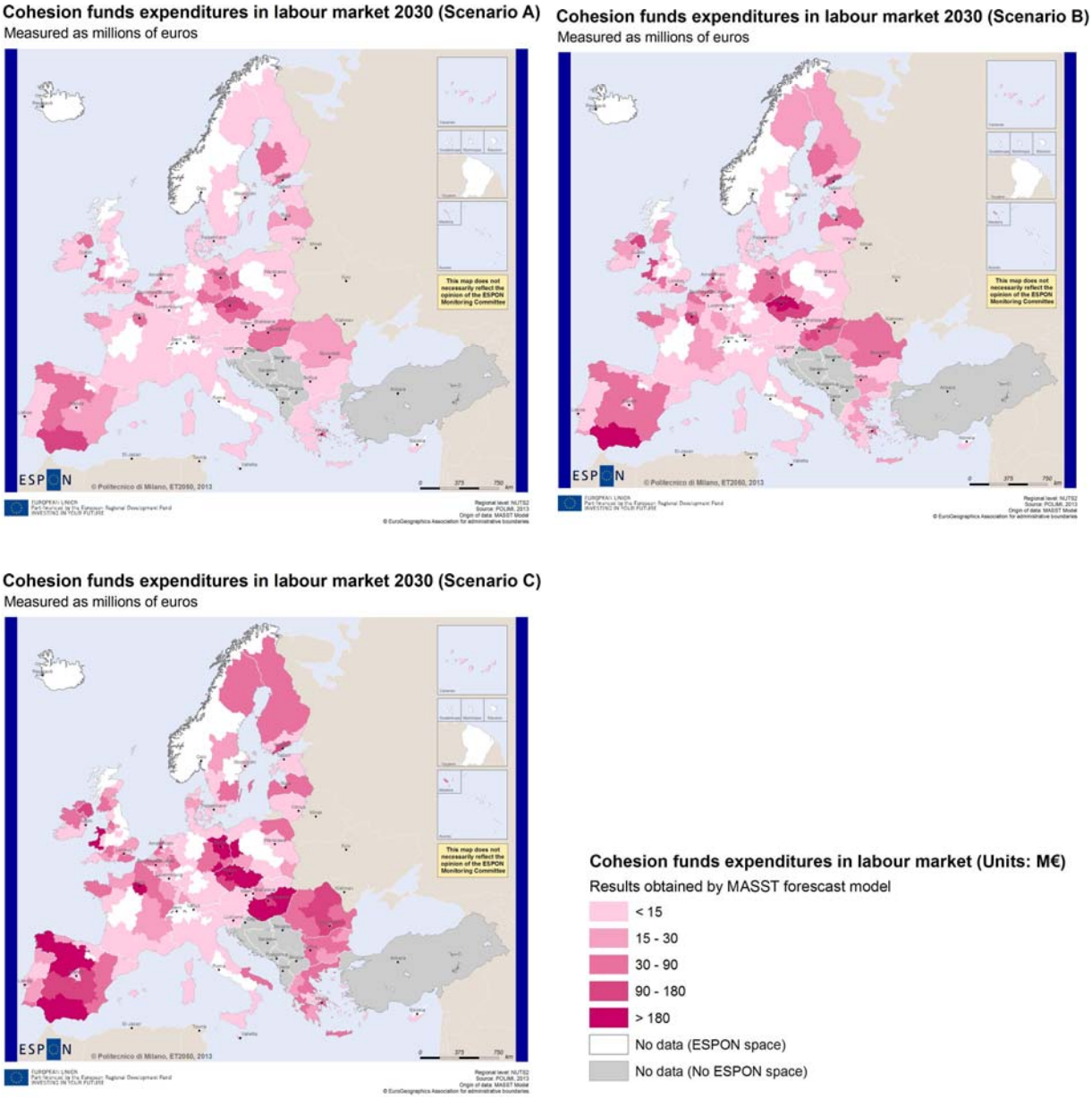


Figure 5-5 Cohesion Fund expenditures territorial allocation in the labour market adopted in MASST3 for Scenario A, B and C. Baseline just as Scenario B.

Transport Exogenous and Policy Assumptions

Different transport policies have been considered when defining each scenario. Next table presents a synthesis:

	A Scenario (Promoting MEGAS)	B Scenario (Promoting CITIES)	C Scenario (Promoting REGIONS)	BASELINE

	A Scenario (Promoting MEGAS)	B Scenario (Promoting CITIES)	C Scenario (Promoting REGIONS)	BASELINE
Market liberalisation	-5% road and air transport costs due to liberalisation +5% rail cost increases due to decreased public subsidies	Like Baseline	-5% rail cost decrease due to increased subsidies	Limited liberalisation to procedures of public tendering of services
Infrastructure provision	0,30% of EU GDP in infrastructure provision, allocated in 40% in TENs	0,50% of EU GDP in infrastructure provision, 30% allocated in TENs	0,30% of EU GDP in infrastructure provision, 25% allocated in TENs	From 0,72% of EU GDP in transport infrastructure to 0,38%
Optimised service management	0,07% of EU GDP yearly in smart ITS infrastructure equipment +10% average air speed due to enhanced management (mostly airport take-off / land optimisation)	0,02% of EU GDP yearly in smart ITS infrastructure equipment +10% average rail speed due to enhanced management	0,04% of EU GDP yearly in smart ITS infrastructure equipment +5% average rail speed due to enhanced management	0,02% of EU GDP yearly in smart ITS infrastructure equipment
Bans and regulations	-10% vehicle emission factors respect to Baseline, due to environmental regulation	-10% vehicle emission factors respect to Baseline, due to environmental regulation	- 5% average road speeds due to regulation -20% vehicle emission factors respect to Baseline, due to environmental regulation	Car emission factors in 2030 a 30% lower than in 2010, with development of new technologies and driven by Euro Standard regulations
Transport taxation and pricing	Pricing in those motorways were there are no tolls today	Like today	+ 5% road and air transport costs due to taxation	Like today
Energy and environment	Increased efficiency of fossil fuels, some RES, emergence of CCS. Targets partially met.	High development of centralised RES and nuclear. Targets partially met.	Decentralised RES. Lower energy consumption. Targets met.	Fossil fuels remain important. Emissions reduced but targets are not met.

Figure 5-6 Transport and energy assumptions for A, B and C Scenarios

In relation to infrastructure policies:

- The Scenario A considers relatively low levels of infrastructure investment, allocated in those projects where investments provide more return (busiest links of the networks). Airports and ports are a priority. Within each country, available regional investments are allocated in those areas more open to the global economy.
- The Scenario B considers higher levels of infrastructure investment than all other scenarios, with high stress in rail infrastructure. European investments are allocated based on balanced criteria of efficiency and cohesion. Within each country, available regional investments are allocated in those areas being more populated.
- The Scenario C has lower investment than B but higher than A. It gives more attention to local and regional infrastructure than to TENs. Management and infrastructure maintenance is increasingly important compared to other scenarios. European scale investments follow more territorially balanced patterns, tending to benefit Eastern Europe. Within each country, available regional investments are allocated according to landscape and environmental conservation criteria.

Based on the GDP (provided by MASST3 model) for each scenario, as well as on alternative hypothesis of transport investment evolution as a percentage of total GDP, the different transport investment scenarios were defined for each scenario, as follows:

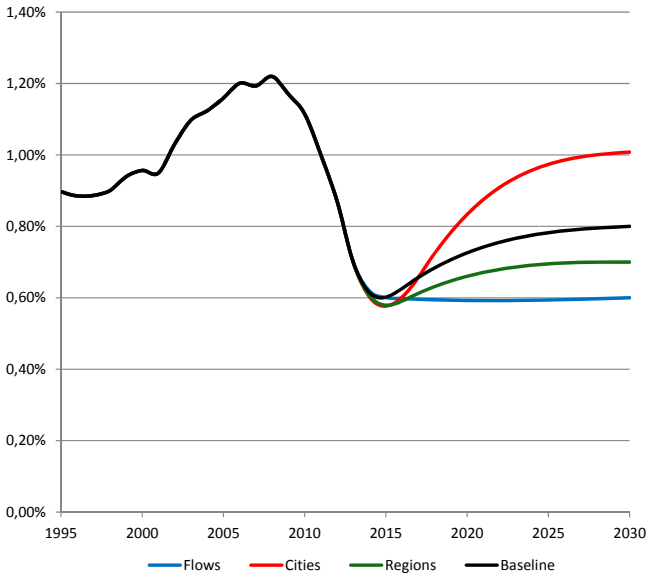


Figure 5-7 Total transport expenditure per scenario, including new infrastructure investments, maintenance, management and technological development (% of GDP)

All scenarios consider a reduction of transport investment budgets in Europe between 2007 and 2014, in line with trends observed for the Gross Capital Formation in Europe between 2007 and 2011 (based on AMECO DB, Civil engineering and transport equipment categories). Overall investments for the 2013-2030 period are in all cases lower than in the 1995-2012 period.

The main result obtained is that TENs are not completed in any of the 2030 Exploratory scenarios (this result is consistent with SASI when modelling 2050 horizon, when assuming TENs to be completed by 2050 in the Baseline scenario).

Below, the key hypotheses are detailed below for each scenario.

The scenario A considers:

- € 1.630 billion (2013-2030) in transport investment, 0'60% of cumulated GDP. Infrastructure investment rate in 2030 converging to typical North America levels (0,6%).
- 10% of budget on ITS implementation
- Yearly maintenance budget reduced to 0,6% in 2030
- € 330 billion in TENs and € 500 billion in National and Regional networks (40% in the TENs)
- 60% of required investments to complete the TENs engaged up to 2030
- € 290 billion in the CORE network and € 35 billion in Comprehensive network. Projects mostly allocated in the Core (85% // 15%).
- Modal allocation of investment in TENs, substantially increased for air and ports, substantially decreased for rail.

The scenario B considers:

- € 2.290 billion (2013-2030) in transport investment, 0'85% of cumulated GDP. Infrastructure investment rate in 2030 converging to typical EU level in the 1990s (1,0%).
- 2% of budget on ITS implementation, like in Baseline
- 1% yearly maintenance budget maintained

- € 470 billion in TENs and € 865 billion in National and Regional networks (35% in the TENs)
- 85% of required investments to complete the TENs engaged up to 2030
- € 231 billion in the CORE network and € 235 billion in Comprehensive network. Projects evenly allocated between core and comprehensive networks (50% // 50%).
- Modal allocation of investment in TENs, increasingly rail based.

The scenario C considers:

- € 1.790 billion (2013-2030) in transport investment, 0'67% of cumulated GDP. Infrastructure investment rate in 2030 converging to 0,7%.
- 5% of budget on ITS implementation
- Yearly maintenance budget increased to 1,2% in 2030
- € 220 billion in TENs and € 540 billion in National and Regional networks (29% in the TENs)
- 40% of required investments to complete the TENs engaged up to 2030
- € 65 billion in the CORE network and € 160 billion in Comprehensive network. Projects mostly allocated in the Comprehensive network (30% core // 70% comprehensive).
- Balanced modal allocation of investment in TENs, as in Baseline

Next table presents a summary of the main figures already described:

Transport Investment in Europe	1995-2012		Baseline 2013-2030		**SCENARIO A (2013-2030)**		**SCENARIO B (2013-2030)**		**SCENARIO C (2013-2030)**	
Average anual GDP growth	1,55%		1,88%		2,22%		2,31%		1,82%	
% GDP spent in transport investment	**1,04%**		**0,73%**		**0,60%**		**0,85%**		**0,67%**	
in TEN CORE infrastructure	28,5%	*607.152 M€*	8,5%	*166.768 M€*	17,3%	*282.920 M€*	10,1%	*234.319 M€*	3,5%	*63.171 M€*
in TEN COMPREHENSIVE infrastructur	0,0%	*- €*	8,2%	*161.273 M€*	2,9%	*47.874 M€*	10,3%	*238.106 M€*	8,8%	*156.554 M€*
in National & Regional infrastructure	42,2%	*901.228 M€*	36,0%	*707.429 M€*	31,8%	*518.214 M€*	38,2%	*885.714 M€*	30,2%	*538.287 M€*
in management and maintenance	29,3%	*625.220 M€*	45,2%	*889.499 M€*	37,1%	*605.360 M€*	39,1%	*905.629 M€*	52,4%	*934.622 M€*
in ITS and smart infrastructure	0,0%	*- €*	2,1%	*42.039 M€*	10,8%	*176.577 M€*	2,3%	*53.481 M€*	5,1%	*90.844 M€*
TOTAL	100,0%	2.133.600 M€	100,0%	1.967.008 M€	100,0%	1.630.946 M€	100,0%	2.317.248 M€	100,0%	1.783.478 M€
Modal split of infrastructure investment in TENs (CORE + COMPREHENSIVE)										
% road	29,9%	*181.727 M€*	29,5%	*96.636 M€*	36,2%	*119.685 M€*	26,3%	*124.124 M€*	30,3%	*66.577 M€*
% rail	44,6%	*270.835 M€*	42,1%	*138.256 M€*	24,6%	*81.491 M€*	49,6%	*234.240 M€*	43,3%	*95.180 M€*
% air	9,9%	*60.303 M€*	10,6%	*34.849 M€*	17,8%	*58.741 M€*	8,5%	*40.272 M€*	10,9%	*24.002 M€*
% ports	8,0%	*48.751 M€*	10,3%	*33.697 M€*	16,4%	*54.337 M€*	8,1%	*38.358 M€*	10,5%	*22.979 M€*
% intermodal	7,5%	*45.536 M€*	7,5%	*24.603 M€*	5,0%	*16.540 M€*	7,5%	*35.432 M€*	5,0%	*10.986 M€*
Provision of new infrastructure in the TENs										
New or upgraded roads (km)	21.400 km		11.400 km		14.100 km		14.600 km		7.800 km	
New HSR lines	8.500 km		4.300 km		3.100 km		8.900 km		3.000 km	
Upgraded rail lines	4.900 km		2.500 km		300 km		1.000 km		1.700 km	
In the CORE network										
Roads			5.130 km		8.460 km		4.088 km		1.950 km	
HSR lines			2.430 km		3.100 km		5.340 km		750 km	
Conventional rail			1.413 km		300 km		600 km		425 km	

Figure 5-8 Synthesis of key indicators of transport investment in ET2050

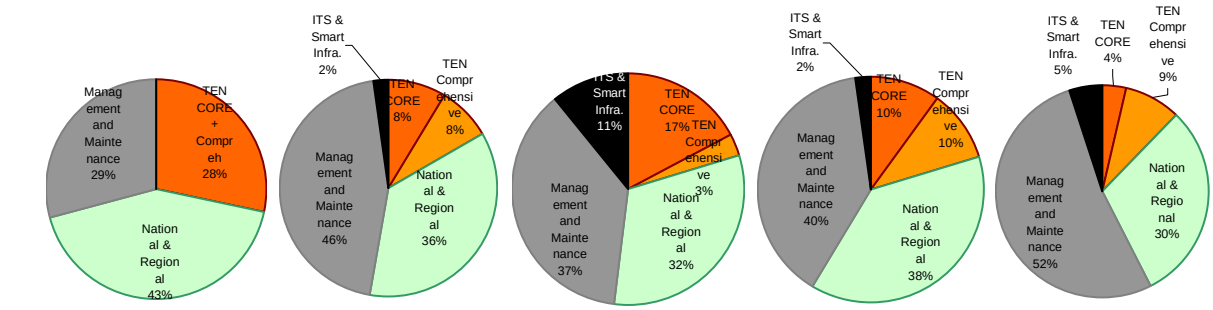


Figure 5-9 Total transport investment by major chapters. 2013-2030 for different scenarios, compared to 1995-2012 observations.

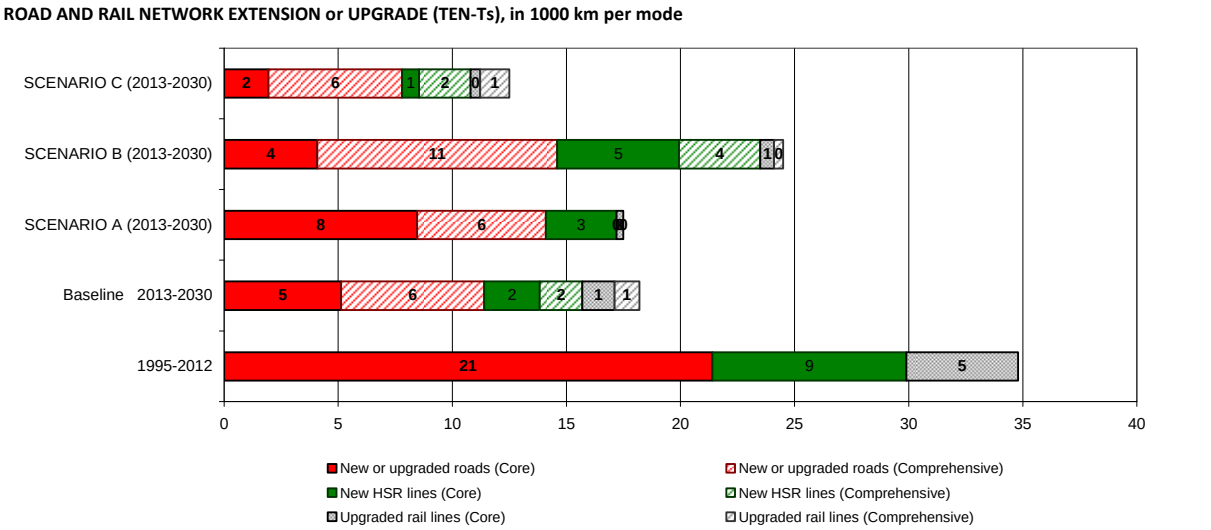


Figure 5-10 TENs network development per modes. 2013-2030 for different scenarios, compared to 1995-2012 observations (in kilometres)

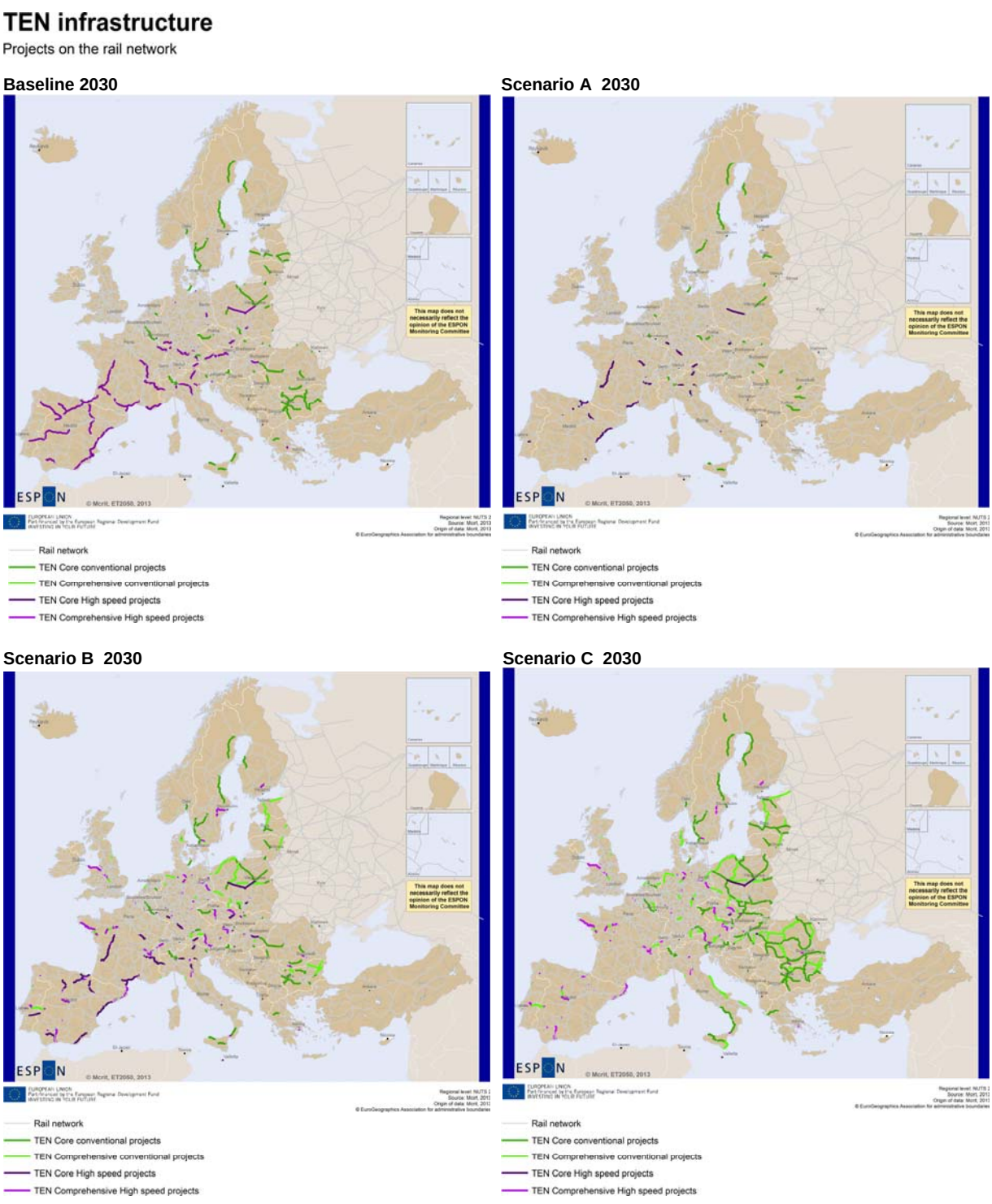


Figure 5-11 Transport Policy – Implemented Rail Projects 2010-2030

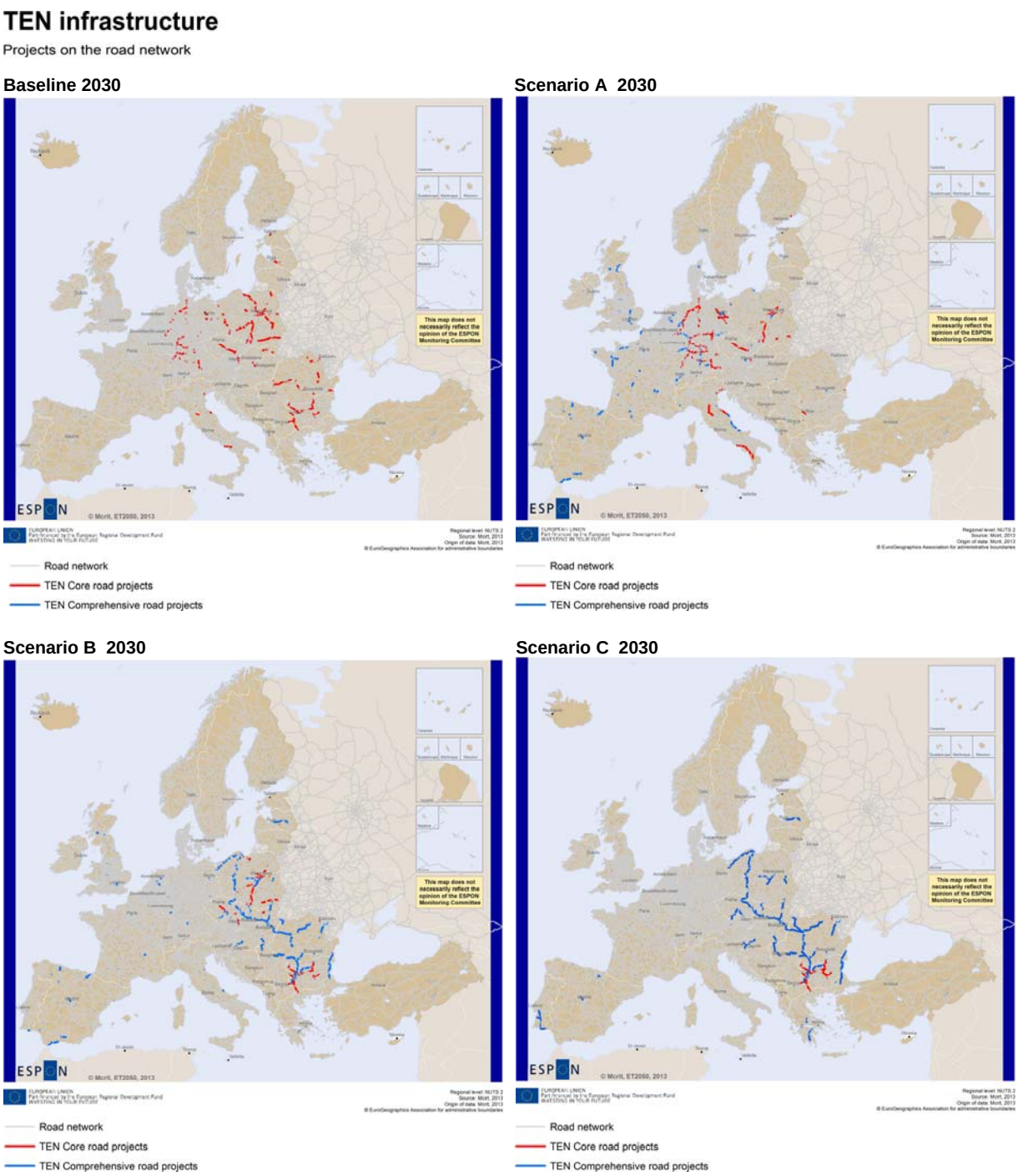
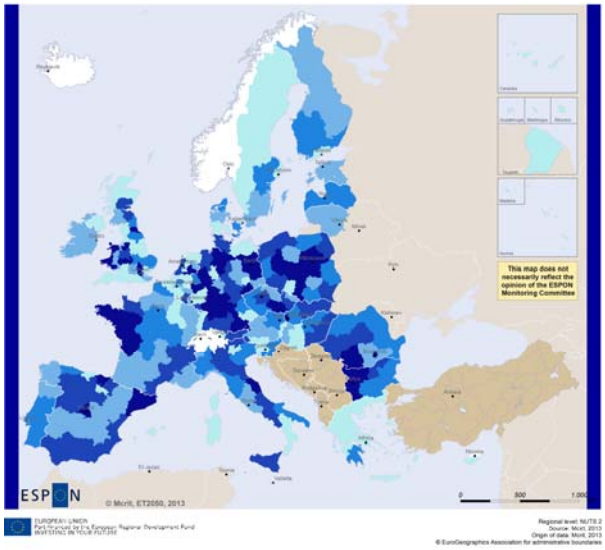


Figure 5-12 Transport Policy – Implemented Road Projects 2010-2030

European Transport Investments 2013 - 2030

Measured as Investment per area (millions €/km2)

Baseline 2030

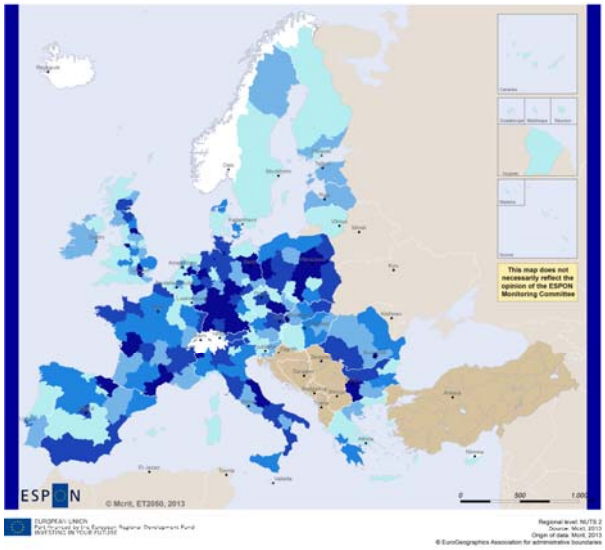


BASELINE 2030. Transport Investments in TENs (maintenance excluded)

Budget allocated to each NUTS2 represented in Million Euros per km2. Accumulated 2013-2030

- 0,00
- 0,01 - 0,03
- 0,04 - 0,08
- 0,09 - 0,17
- 0,18 - 4,73

Scenario A 2030

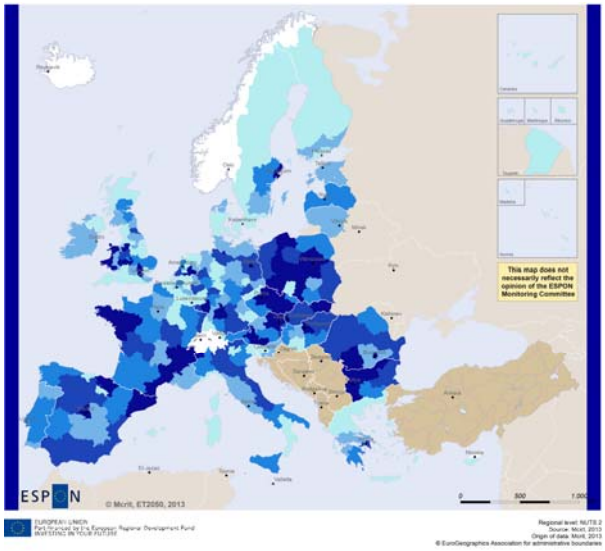


SCENARIO A 2030. Transport Investments in TENs (maintenance excluded)

Budget allocated to each NUTS2 represented in Million Euros per km2. Accumulated 2013-2030

- 0,00
- 0,01 - 0,05
- 0,06 - 0,09
- 0,10 - 0,19
- 0,20 - 4,57

Scenario B 2030

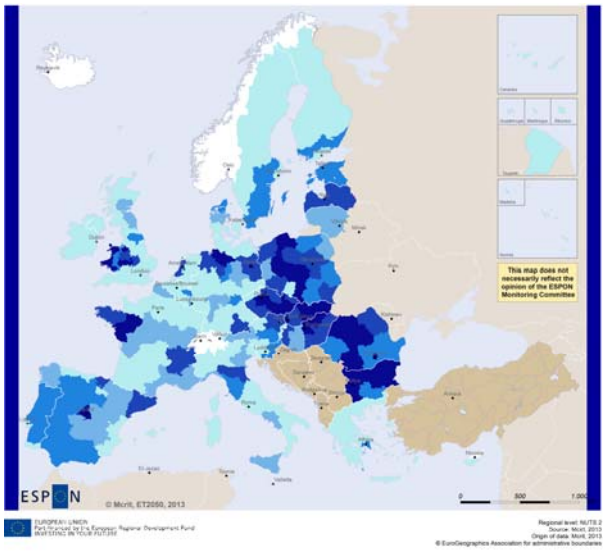


SCENARIO B 2030. Transport Investments in TENs (maintenance excluded)

Budget allocated to each NUTS2 represented in Million Euros per km2. Accumulated 2013-2030

- 0,00
- 0,01 - 0,05
- 0,06 - 0,11
- 0,12 - 0,21
- 0,22 - 6,17

Scenario C 2030



SCENARIO C 2030. Transport Investments in TENs (maintenance excluded)

Budget allocated to each NUTS2 represented in Million Euros per km2. Accumulated 2013-2030

- 0,00
- 0,01 - 0,02
- 0,03 - 0,09
- 0,10 - 0,23
- 0,24 - 2,95

Figure 5-13 Transport Investments in the TENs 2013-2030 (at NUTS2 level)

The total budget for National Investments in Europe determined in the previous steps is now allocated to each NUTS3 according to the following criteria:

- The overall budget for National investments in Europe is distributed among countries (NUTS0 level) proportionally to their total GDP, obtaining 31 National budgets.
- For each National budget, investments are then allocated in each NUTS3 according to the general orientations of each scenario (types of regions).

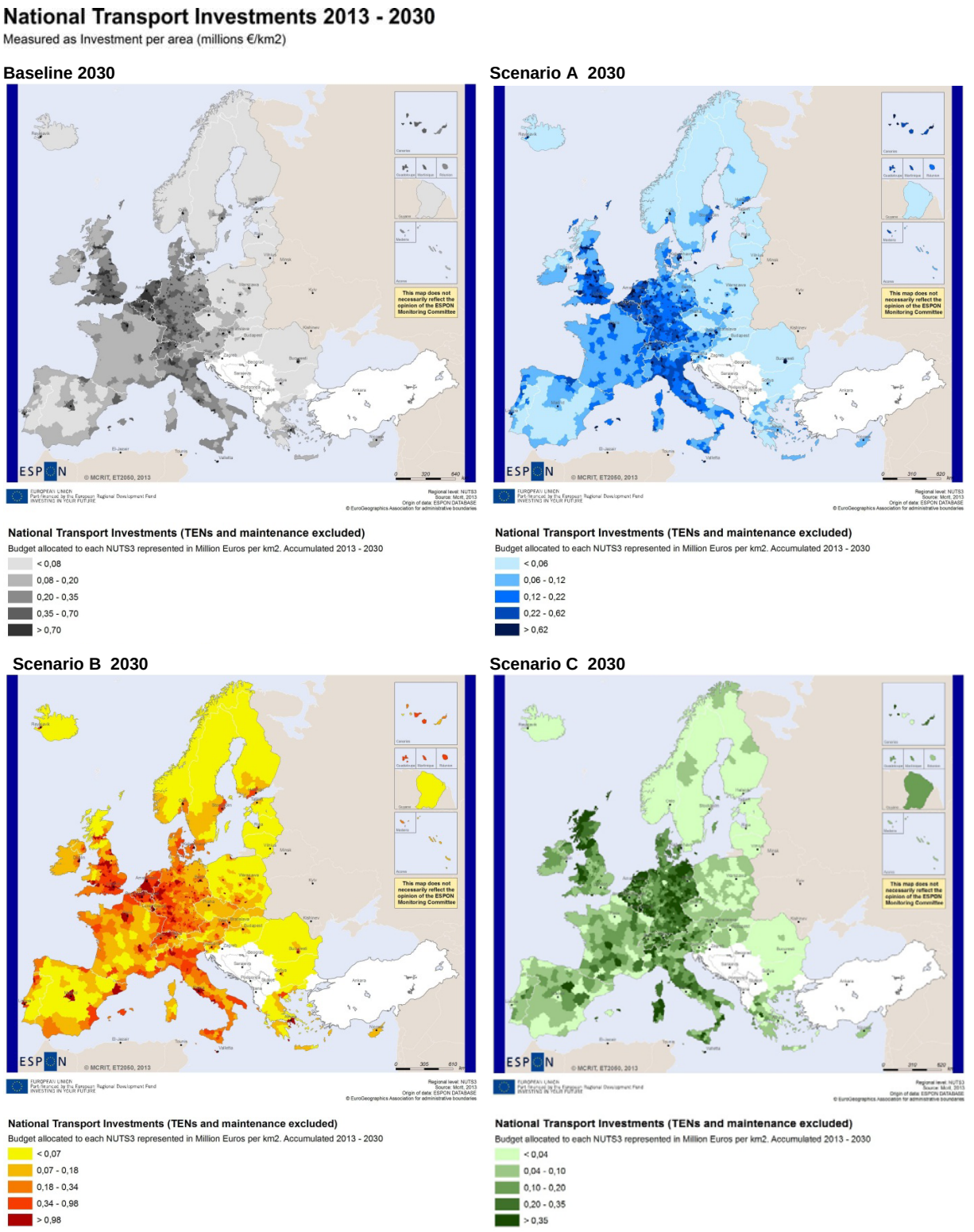


Figure 5-14 Transport Investments in the National Networks 2013-2030 (at NUTS3 level)

5.6 Exploratory Scenario Results 2030

Demographic Results

The total population of 31 European countries may grow from 514 million in 2010 to around 530 million in 2050. Europe as a whole is growing but many regions are declining. In Scenario A population is lower than in the Baseline, despite increased immigration, because of lower fertility. In Scenario B population is slightly higher than in the Baseline thanks to higher immigration. In Scenario C we observe, despite decreased immigration, the largest increase of population, which is generated by higher fertility.

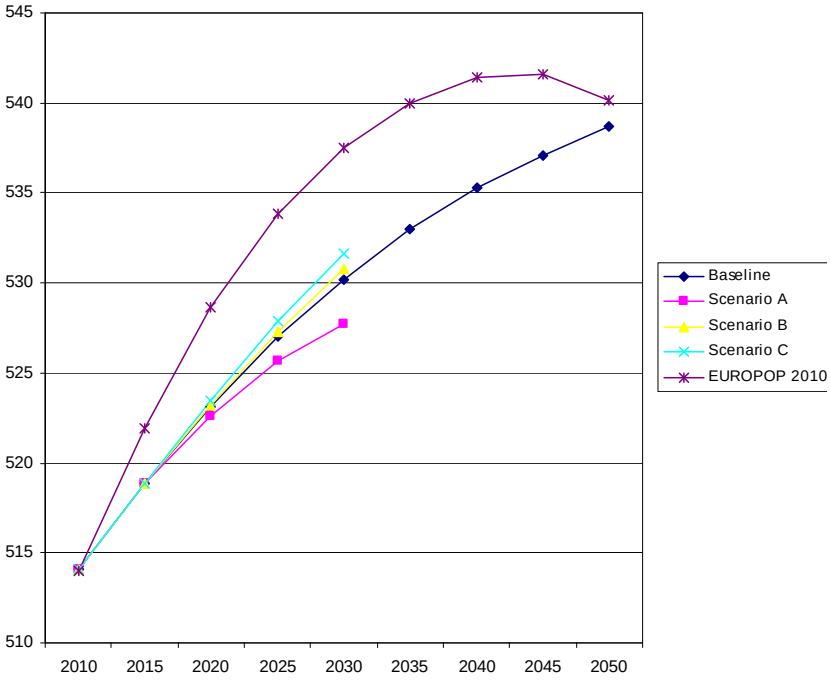


Figure 5-15 Population change 2010-2030 in ET2050 Scenarios and Baseline

A decrease in the number of births in the ESPON area is predicted in all three exploratory scenarios. In Scenario C, a small decrease will be observed despite the assumption on pro-family and pro-natalist policies and increasing fertility. This is related to population aging and the related decrease in the number of women in the fertile age. Scenario A, which is based on the assumption of highly competitive economy with a limited social security component would result in nearly 800 thousand drop in the number of births per year between 2010 and 2030.

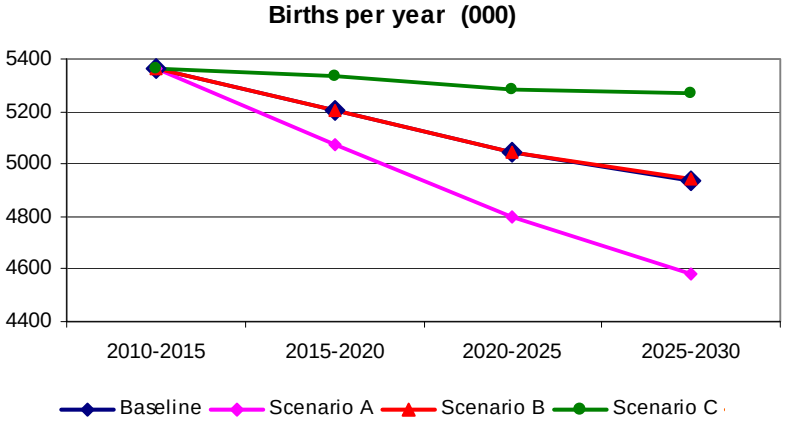


Figure 5-16 Annual number of births in the three exploratory scenarios and in the Baseline

The decreasing number of births, combined with an increasing number of deaths would result in decreasing natural change. Natural change would be negative (more deaths than births) starting from the 2015-2020 period in Scenarios A and B and starting from the 2020-2025 period in Scenario C.

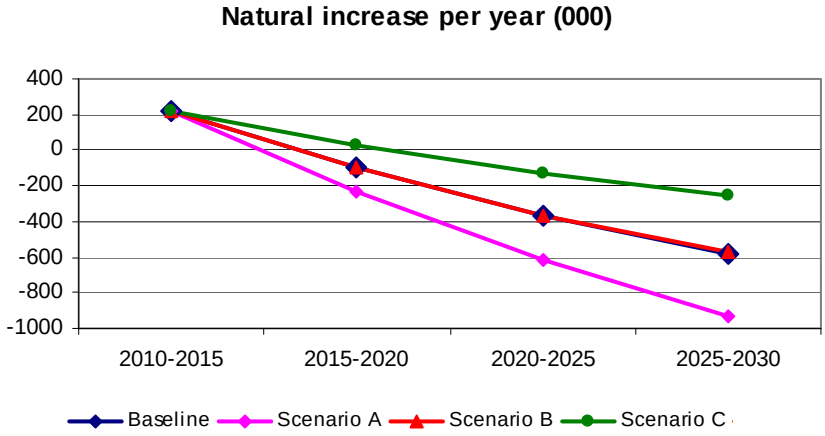


Figure 5-17 Annual natural increase in the three exploratory scenarios and in the Baseline

With a negative natural change, the growing extra-European migration will constitute a key balancing factor of population dynamics.

In the exploratory scenarios the assumption on low fertility was accompanied by the assumption on high net migration gains (Scenario A), and the assumption on higher fertility was coupled with the one on low net migration (Scenario C). As a consequence, the resulting total population did not differ very much between the scenarios, but this lack of a difference is somewhat illusive. In Scenario A characterized by high net migration, the national, cultural and ethnic composition of population will be much more heterogeneous than in Scenario C characterized by low net migration.

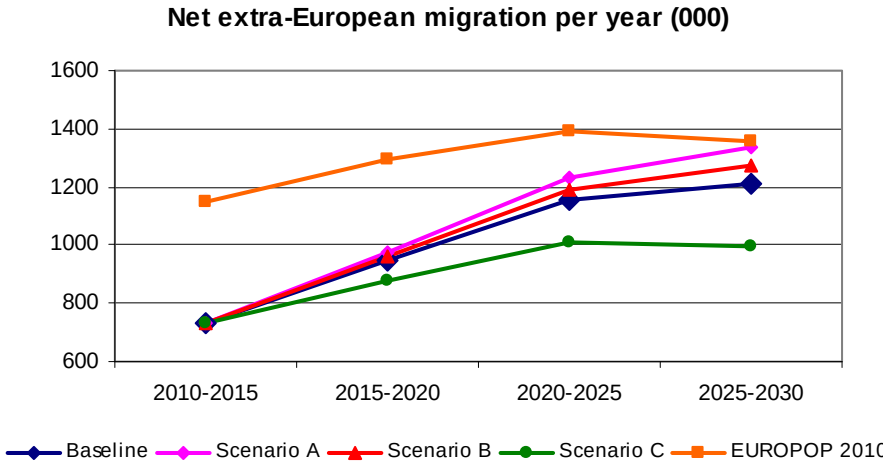


Figure 5-18 Annual net extra-Europe migration in the three exploratory scenarios, in the Baseline and in EUROPOP 2010

In most of the regions, population in Scenario A will be lower than in the Baseline scenario. The exception are European metropolitan areas. They will have population higher than in the Baseline thanks to an increased inflow of migrants that will counterbalance the declining fertility. Scenario A leads to the concentration of population in the largest cities. In Scenario B, medium sized cities

have population slightly larger than in the Baseline scenario thanks to increased inflows. In Scenario C, most of the regions will have higher population than in the Baseline thanks to growing fertility. Rural and peripheral areas will benefit additionally from reduced emigration. At the same time, some large cities will have lower population than in the Baseline, because of smaller inflows. Overall, Scenario C will lead to a more balanced distribution of population between various categories of regions.

The differences in the speed of ageing (expressed as the percentage change of ODR in the 2010-2030 period) between the exploratory scenarios and the Baseline generally follow the migration pattern assumed in the exploratory scenarios. In each scenario the promoted regions gain young migrants faster than the other regions, therefore the ageing in these regions is slower. The strongest reduction of the speed of aging in the promoted regions is observed in Scenario A, which is related to the highest immigration in this scenario. In Scenario C, the reduction of aging in the peripheral and rural areas is related to a large extent to a reduced emigration of working age population.

The result of substantially higher fertility assumed in Scenario C is hardly visible, as in 2030 too little time will have passed for most of children born between 2010 and 2030 to join the labour force.

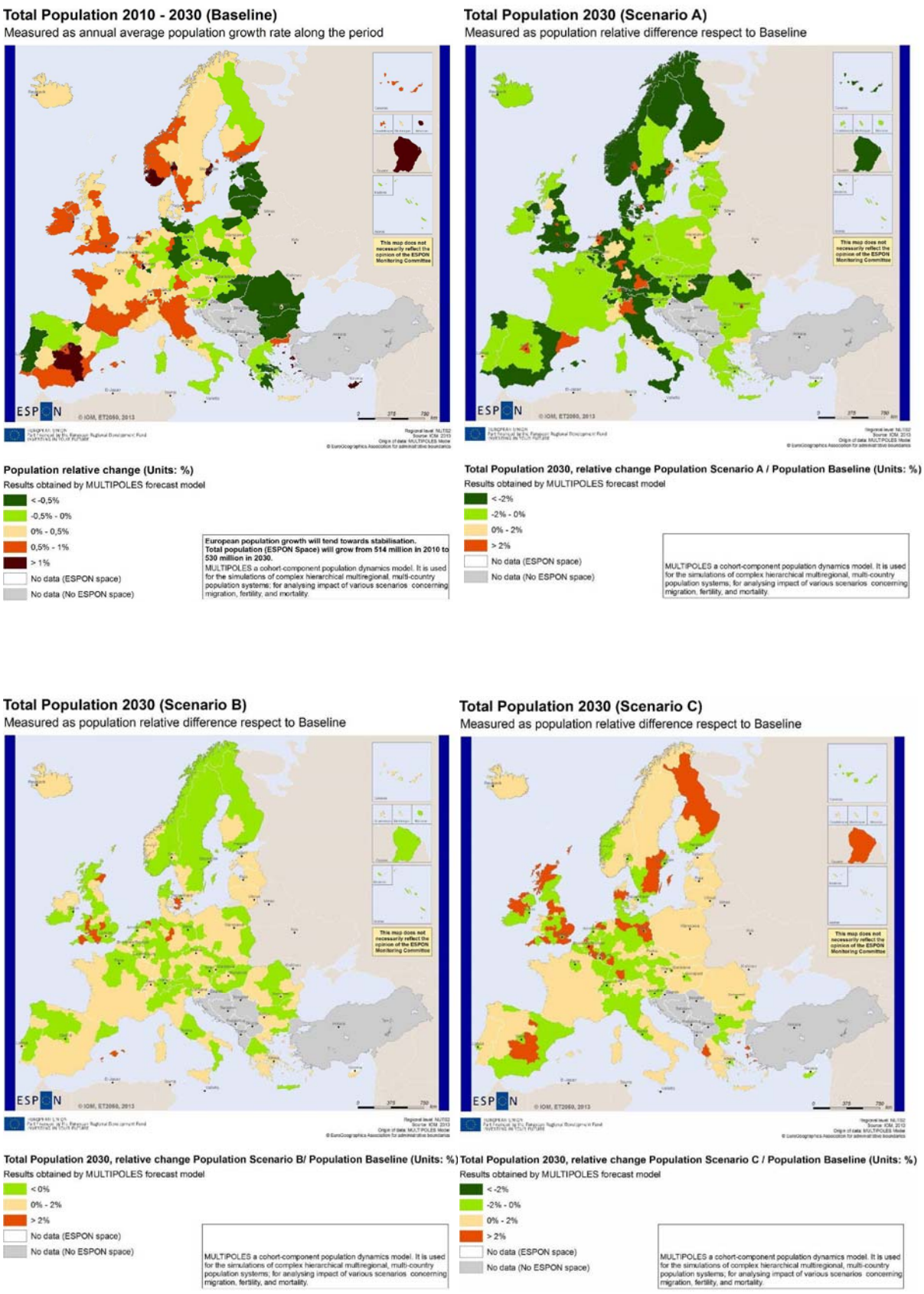


Figure 5-19 Exploratory Scenarios - Total Population 2030 compared to Baseline

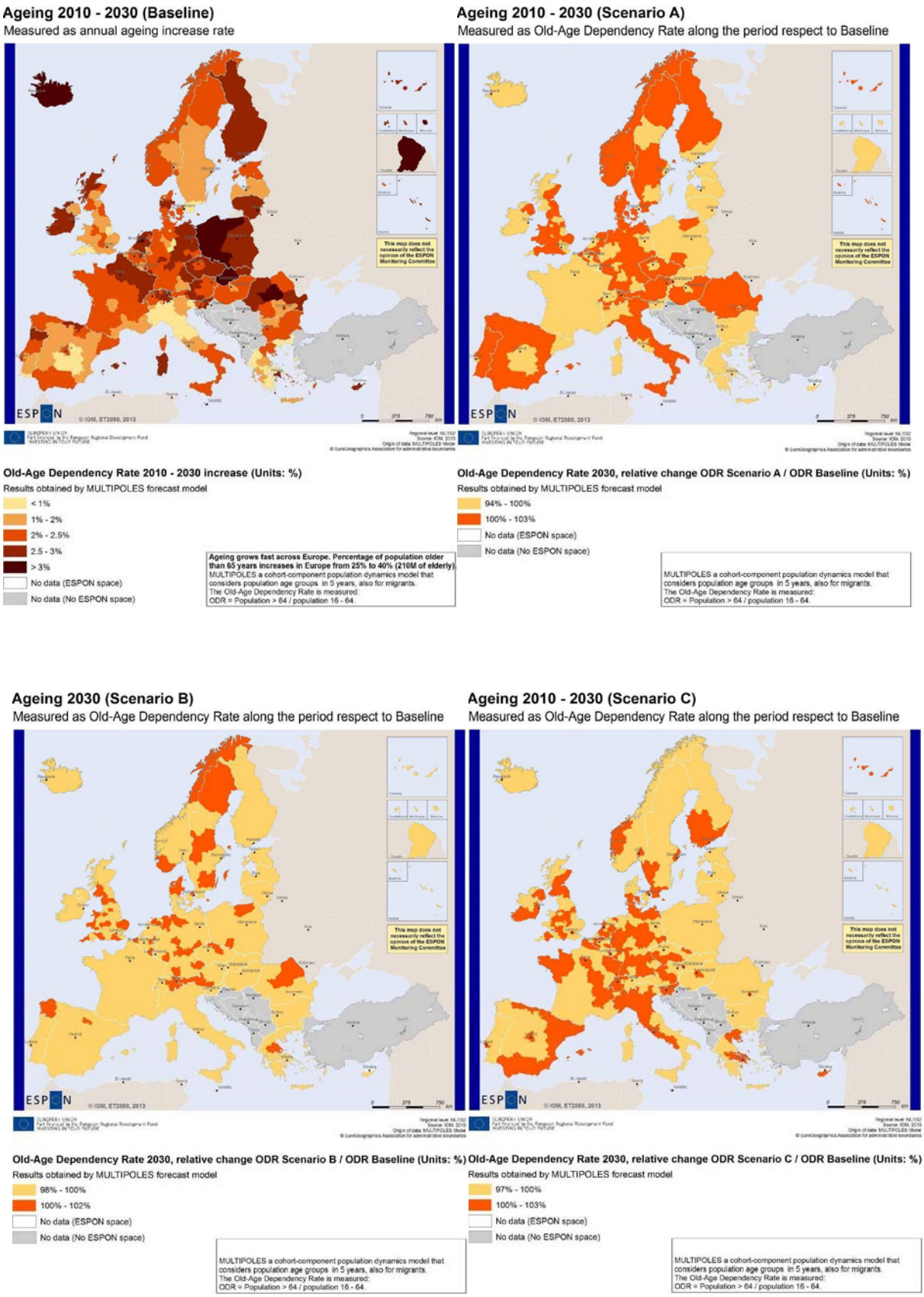


Figure 5-20 Exploratory Scenarios – Ageing 2030 compared to Baseline

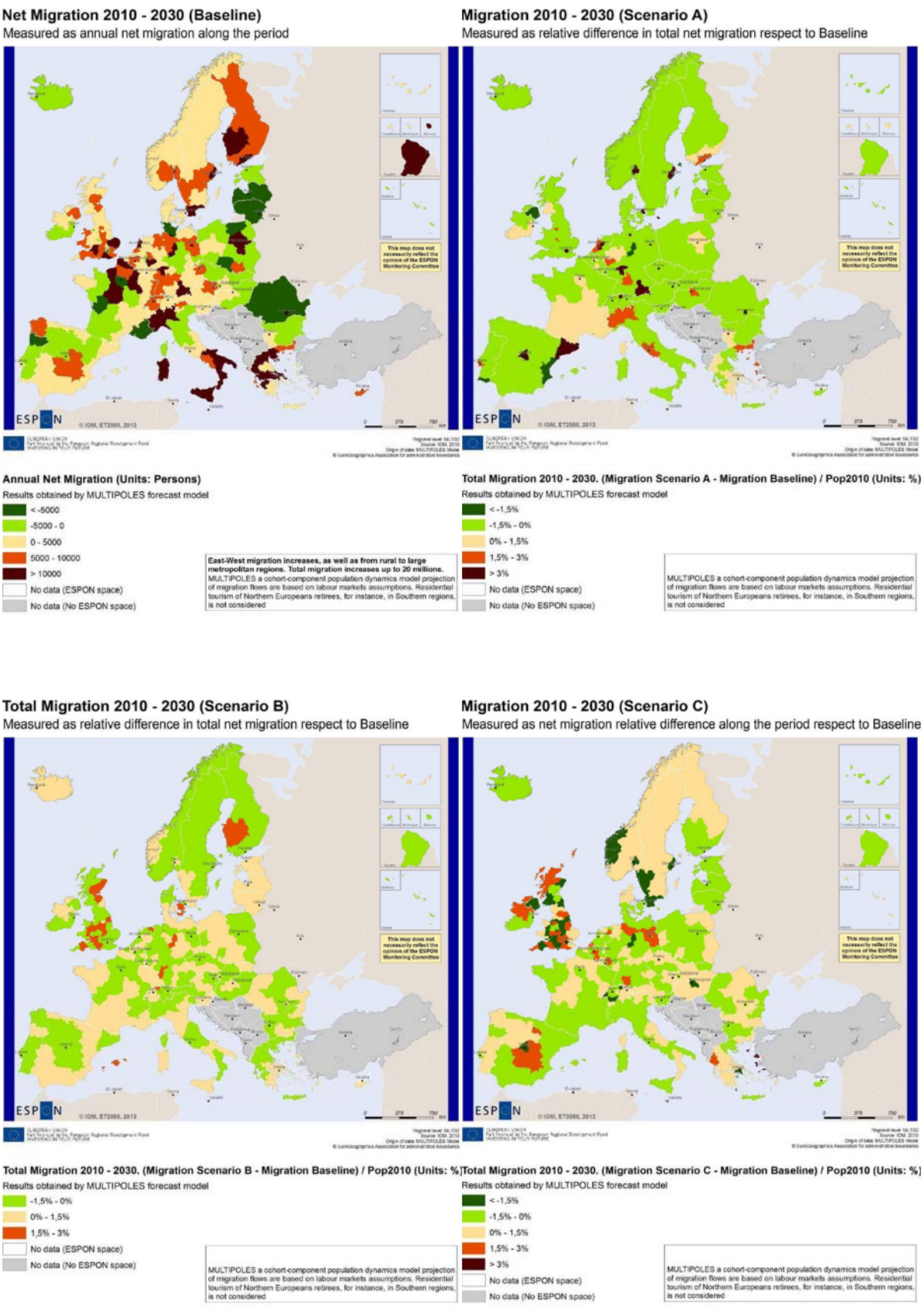


Figure 5-21 Exploratory Scenarios - Total Migration 2010-2030 compared to Baseline

Economic Results

Next two tables present the annual average GDP growth rate of the 3 Exploratory Scenarios[23], both in absolute terms and with respect to the Baseline, and the annual average growth rates for what concerns total employment, and its subdivision between manufacturing and service.

	Baseline	A Scenario	B Scenario	C Scenario	A vs. Baseline	B vs. Baseline	C vs. Baseline
ESPON Space EU31	1.89	2.22	2.31	1.82	0.33	0.42	-0.06
Western EU15 countries	1.88	2.22	2.31	1.81	0.34	0.43	-0.07
Eastern EU12 countries	1.93	2.22	2.23	1.98	0.30	0.30	0.05

Figure 5-22 Annual average GDP growth rates for ET2050 Scenarios 2011-2030

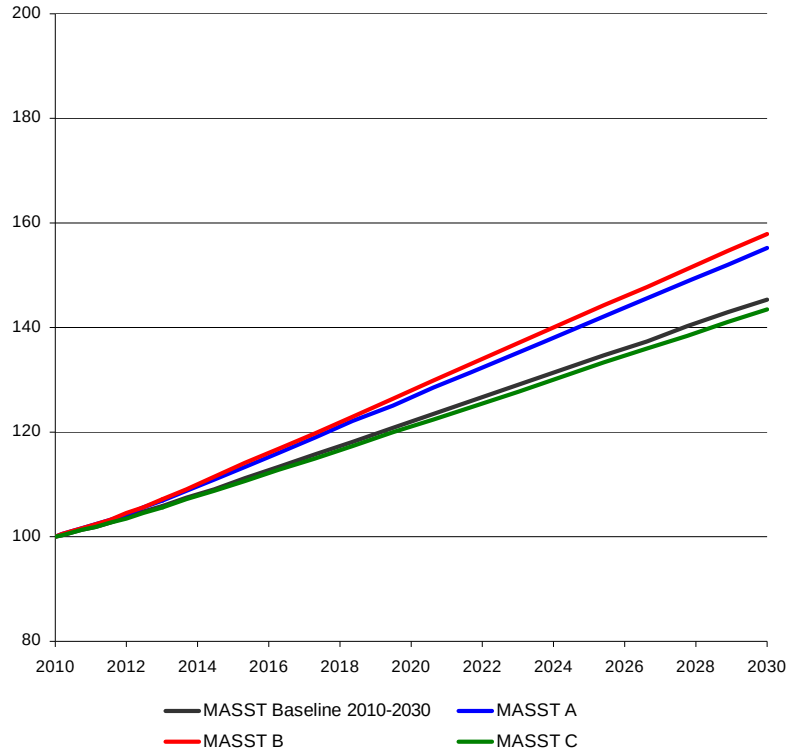


Figure 5-23 Total GDP growth 2010-2030 (2010=100)

The Scenario B is the most expansionary scenario in terms of GDP, followed by the A Scenario and then by the C Scenario, and this holds particularly for Western Countries, although also the New 12 Countries show a strong similarity between the A and the B scenarios. This result may be different if the world reference scenario applied would not be the baseline, but one more favourable to the A pro-growth and pro-globalisation strategy. The higher expansion of growth in

[23] Simon Kuznets - one of the pioneers of GDP as we know it today - warned us already since 1962 that "distinctions must be kept in mind between quantity and quality of growth. Goals of "more growth" should always specify more growth "of what" and "for what purpose"

the B scenario can be explained by the higher and more efficient exploitation in this scenario of territorial capital elements, of local specificities, present in both large and second rank cities that allows local economies to achieve higher competitiveness. Development based also on second rank cities implies the existence of an integrated and equilibrated urban system, made of efficient second rank cities working with first rank cities in providing quality services and allowing the latter to avoid strong diseconomies of scale that can be of detriment to growth. The weak presence of equilibrated and efficient urban systems in the Eastern countries may explain why these nations register very similar growth rates between the A and the B scenarios, being both the result of growth based on efficient first rank cities. With respect to the baseline, New12 countries gain the same from A and B scenarios, while the western countries have a clear higher advantage from the B scenario than from the A scenarios when compared to the Baseline.

The Scenario C tells a different story: ESPON space countries as a whole gain less, in terms of economic growth, from this scenario than from the Baseline scenario. When the average growth rate is divided between western and New 12 countries, the advantage that the latter countries achieve with respect to the baseline emerges, confirming that when cohesion policies are reinforced, their effect is visible. However, the C scenario is not the one from which the New 12 countries gain the most compared to the Baseline; both the A and the B scenarios register higher growth rates than the C also for the New 12 countries. This result underlines the importance of a "competitiveness" driven attitude, and at the same time reminds the relatively lower effect of cohesion policies when they are not accompanied by an endogenous effort in moving towards competitiveness. The two combined aspects, cohesion policies from one side, and local competitiveness from the other, can probably be the best recipe for growth.

	GDP	Total employment	Manufacturing employment	Service employment
ESPON Space EU31	1.89%	1.58%	1.38%	1.63%
Western EU15 countries	1.88%	1.53%	1.48%	1.54%
Eastern EU12 countries	1.93%	1.90%	0.98%	2.33%

Figure 5-24 Aggregate annual average growth rates between 2011 and 2030 - Baseline scenario

	GDP	Total employment	Manufacturing employment	Service employment
A Scenario (Promoting MEGAS)				
ESPON Space EU31	+0.33	+0.34	+0.74	+0.23
Western EU15 countries	+0.34	+0.35	+0.82	+0.24
Eastern EU12 countries	+0.29	+0.25	+0.41	+0.19
B Scenario (Promoting Cities)				
ESPON Space EU31	+0.42	+0.38	+0.28	+0.41
Western EU15 countries	+0.43	+0.38	+0.31	+0.40
Eastern EU12 countries	+0.30	+0.37	+0.12	+0.46
C Scenario (Promoting Regions)				
ESPON Space EU31	-0.06	-0.03	-0.30	+0.04
Western EU15 countries	-0.07	-0.03	-0.40	+0.04

	GDP	Total employment	Manufacturing employment	Service employment
Eastern EU12 countries	+0.05	0.00	+0.09	+0.05

Figure 5-25 Annual average growth rate (2011-2030) with respect to the baseline of GDP, total employment, manufacturing and service employment

When trends in employment are analysed with respect to the Baseline, other relevant political messages emerge, namely:

- Scenario A registers a higher manufacturing than service employment growth rate, and this is particularly true for western countries;
- Scenario B, service employment is more expansionary than manufacturing, and this is particularly true for the New 12;
- Scenario C is characterised by a higher manufacturing employment growth rate than the other two scenarios in the New 12 countries, while western countries register a higher service employment growth rate than the manufacturing one.

These results suggest that each scenario is accompanied by a relative increase of a specific industrial profile in each block of countries.

- The most competitive scenario, namely the A scenario, is in favour of a reindustrialization process all over, and especially in the western countries, being a scenario based on a re-launch of new technological paradigms, higher rhythm of innovation, higher productivity linked to an increased share of high-level functions.
- The B scenario registers a higher expansion of service employment with respect to the baseline; being a more spatially diffused scenario, both population and business services are required all over Europe.
- In the C scenario, the trends in the sectoral profile are different between western and Eastern countries; the high social welfare requirements call for additional population services in western and eastern countries, but the latter benefit from additional cohesion funds for the re-launch of industrial activities.

A Scenario (Promotion of Metropolitan Global Areas)

- *GDP growth is higher than in the baseline scenario in all countries of Europe, but not necessarily in all regions*. There are some peripheral areas of western countries, such as North Eastern Scotland, Murcia, Drente, Groningen, Schleswig-Holstein, Mecklenburg-Vorpommern, Brandenburg and Trento, where GDP growth is lower than in the baseline due to the fact that these regions are just crossed by the major corridors without being nodes;
- *Some countries appear to gain more than the others*. In particular, gain is lower in Nordic countries (Sweden, Finland and Denmark), while, unexpectedly, southern countries, including Portugal, Spain and especially Greece are not particularly damaged by a competitiveness. These countries appear to take advantage of a re-launch of the European economy, increasing their demand for exports, able to overcome the still weak internal market;
- As expected by a scenario of policy concentration, within western countries *the highest gains in GDP growth rate are experienced in the most important urban poles*, including London, Manchester, Paris, Lyon, Madrid, Lisbon, Porto;

- The gain in GDP growth is also high, and in some cases even higher, in some urban second rank areas, such Karlsruhe, Rheinhessen-Pfalz, Hampshire, Berkshire, Buckinghamshire and Oxfordshire, Campania, Piedmont. This means that *the Megas scenario favours the drivers, but not only;* thanks to growth spillovers, input-output linkages, increased demand, *development spreads to the rest of the regions*;
- *in New 12 member countries* the gain in GDP growth rate is more evenly distributed than in western countries, and *core and capital regions are indeed winners but not more than their respective countries*. This is due to the fact that growth in these countries has been concentric in the past and continues to be concentric in the Baseline scenario, so that an increase of demand and production as the one of the Megas scenario cannot be confined within the core areas but needs to be spread elsewhere.

In relation to total employment:

- *The differential of employment growth is larger in western with respect to New 12 countries*. The latter do not have the same high differential GDP in the first instance, but also appear to have more productivity gains;
- As with GDP, Nordic countries are relatively lesser winners, and southern countries are among the major winners, thanks to increased external demand;
- At regional level, *the gains of employment growth in western countries are diffused*, and all regions are positive, but the regions with the largest increases are generally regions hosting large urban areas, although not necessarily the largest of their countries, such as Lyon, Toulouse, Lille, Munich, Stuttgart, Hannover, Helsinki, Barcelona and Porto;
- *In New 12 countries, the gains of employment growth are even more diffused* than in the western countries, and regional differentials are weak, with core and capital regions performing similarly to the rest of the country. This confirms the spread effect of GDP growth.
- Manufacturing employment growth is highly concentrated, especially at regional level, in the regions with the most important areas of their respective countries. Dublin, London, Birmingham, Manchester, Liverpool, Glasgow, Paris, Lille, Lyon, Toulouse and Bordeaux, Amsterdam, Rotterdam, Munich, Stuttgart, Köln, Copenhagen, Stockholm, Helsinki, Wien, Milan, Turin, Rome, Naples, Athens, Madrid, Barcelona, Lisbon are all the best performers of their respective countries. This is due to the fact that manufacturing is more advanced in this scenario with respect to the past and to the Baseline scenario, it involves a larger use of innovation and hence involves an increased share of high-level functions;
- The same pattern also applies in New 12 countries, where manufacturing employment growth is concentrating in core and capital regions, as evident in Prague, Bratislava, Budapest, Bucharest, Sofia, Warsaw, Lodz, Cracow;
- Rural and peripheral regions have a lower manufacturing employment growth, as it concentrates elsewhere. This is true in the sparsely populated regions or Nordic countries, in Eastern Germany (with the obvious exception of Berlin), Highlands and Icelands, Cornwall, Namur, Tyrol, Centro, Extremadura, the Italian Mezzogiorno, Dytiki Ellada;
- The gains of service employment growth are very different from those of manufacture. First of all, this indicator is less spatially concentrated, with gains more evenly spread and losses which are in a smaller number of regions;
- a number of the metropolitan regions which gain high-level manufacturing-related functions, also expel low-level services, and have in this way a negative differential of

service employment growth. This is the case of Milan, Turing, Barcelona, Seville, Dublin, Stuttgart, Dortmund, Helsinki;

- However, other metropolitan areas are able to also maintain their service employment, although with lower differential growth rates if compared with the rest of the country. This happens in Madrid, Rome, Athens, Paris, London, Stockholm, Copenhagen, and all the capitals of New 12 countries;
- Service employment growth is high in third order regions, not necessarily peripheral, belonging to Western countries: Central and Eastern France, all non-metropolitan Britain, Småland, Vali-Suomi, Centro (PT) and Alentejo. These regions appear to be hosting the low level services which are ejected from metropolitan and capital regions;
- Service employment growth is especially strong in Greece, where the increased demand makes it possible an upsurge of tourism, fulfilling its potential in this sector. This is also one main reason behind the higher GDP growth with respect to the Baseline scenario;
- Finally, a small number of areas show a good balance between service and manufacturing employment growth rates, with positive gains in both. This happens for example in the case of Auvergne, the English South-East, Freiburg and Tubingen.

Scenario B (Promotion of Cities)

This Scenario suggests a particularly remarkable performance for Southern European countries, namely Spain, Italy, Greece, and France. Altogether, these countries outperform core areas such as regions in Belgium, the Netherlands, and Austria, which benefit less from the realization of the Cities scenario with respect to the Baseline one.

- The spatial distribution of regional GDP growth rates suggests a rather original model of development, centered around districts, cooperation networks, and Small-Medium Enterprises (henceforth, SMEs). In fact, development takes place mostly in medium-large cities, where the presence of SMEs, industrial districts, clusters is relatively larger;
- Regions in New 12 countries tend to benefit vastly from the implementation of this scenario, whereas the positive effects are comparable to those stemming from the more competitive “Megas” scenario. However, in Western regions the spatial distribution of GDP growth rates seem to be even more equal, because of the wider presence of second-rank cities in the EU15 (and, conversely, of the relative lack of such cities in New 12);
- Large metropolitan areas generate non-negligible spillover effects, with scale dis-economies explaining the increasing intensity of economic activity in second-rank cities. As the latter tend to outperform the former, however, scale dis-economies affecting first-rank cities tend to decrease over time.

The results of the Cities Scenario simulation also present interesting findings in terms of employment growth rates,

- Similarly to what has been found for GDP growth rates, employment growth seems to be pervasively diffused over the whole ESPON space. Employment growth rates are comparable between the western countries and New 12; it turns out to be relatively less pronounced in Germany, Czech Republic, Austria, Netherlands, and Belgium;
- Manufacturing employment has a particularly remarkable development in countries such as France, Spain, Italy, the English regions in the UK, and in Baltic countries. However,

Scandinavian countries, Bulgaria and Romania, and Greece present a relatively weaker manufacturing employment growth rates with respect to the Baseline;

- The fact that this scenario is particularly expansive can also be proved by the relatively large number of regions where both manufacturing and service employment register positive medium-run (up to 2030) growth rates;
- In combination with the GDP growth rates map, employment maps suggest that a few areas (namely, Southern Ireland with Dublin and Cork, and the metro areas of Stockholm and Malmö in Sweden) present remarkably high rates of productivity growth, mainly because of an overall contraction of total employment, which is nevertheless matched by positive GDP growth;
- This scenario tends to be manufacturing-driven. Regions faring bad in manufacturing also tend to register mild GDP growth;
- Analogously with what found for the “Megas” scenario, Greece benefits from an overall faster growth of European economies, doing particularly well in the service (and in particular, tourism) industry;
- Finally, areas registering negative manufacturing employment growth rates tend to substitute manufacturing employment with jobs in the service industry; since overall productivity in this scenario tends, in the areas affected by this substitution process, to decrease, this suggests a process of substitution of jobs from relatively high productivity manufacturing activities to service ones with relatively low-function jobs.

Scenario C (Promotion of Regions)

This scenario presents on average a relatively slower rate of GDP growth with respect to the Baseline scenario. This is mostly driven by slower growth in western countries, whilst the convergence process (New 12 regions growing on average faster than their western counterparts) becomes even more pronounced, mostly because of the slowing down of growth in western regions. The difference between western and New 12 countries as a whole reaches about 0.2 percentage points per year, which implies about 15 per cent of the current GDP differences between these two areas would be eroded by 2030.

Several policy-relevant patterns emerge in this scenario:

- Among countries, more peripheral ones take particular advantage of the “Regions” scenario; on average New 12 grow faster than western countries;
- Within countries, irrespective of the macro area where regions are located, rural and peripheral areas tend to benefit more from this scenario (e.g., Northern Sweden and Finland, Southern Italy, rural Spain and France). This also implies that, within each country, rural areas perform relatively better with respect to the baseline scenario.

Analogously to what found for the B Scenario “CITIES”, in the C Scenario “REGIONS” there seems to be a positive correlation between GDP growth and manufacturing employment growth. The main employment trends in this scenario suggest:

- With the sole exception of Italy, employment growth in this scenario takes place mostly in first-rank and second-rank metro areas, both in New 12 as well as in western countries;
- As mentioned above, Italy represents a major exception in this trend; it seems like most peripheral areas in this country are not able to fully reap the benefits of cohesion policies, with a few notable exceptions faring way better than in the Baseline scenario (namely, Apulia, Campania, and the islands);

- Employment-wise, cohesion policies positively affect both rural and peripheral areas, which are expected to benefit the most from this scenario; interestingly enough, also some strong regions benefit from job creation policies;
- Strong regions present nevertheless a very strong pattern. They tend to register positive employment growth rates, matched, however, by a relatively mild GDP growth (typically, GDP growth is slower for strong regions with respect to the baseline scenario). This implies that overall productivity growth tends to slow down in metro areas, with a likely restructuring of the industrial composition of the labour market from high-level functions towards relatively low-level services. This goes the opposite way with respect to the “Megas” scenario;
- Conversely, rural and peripheral areas benefit from a buoyant GDP growth, even higher than the increase of manufacturing employment, which testifies for a remarkable productivity increase, at the roots of the continuing process of convergence which can be found in this scenario. This increase in productivity is either obtained by the creation of qualified small businesses and handcrafting activities, or by eliminating un-efficient industries, reconverting towards higher value-added sectors. Examples of this kind can be found throughout Europe, in Spain, Scandinavia, Greece, the Italian Adriatic coast regions, Eastern Polish regions, bordering Belarus and Ukraine;
- Some rural areas and metropolitan areas of peripheral countries register an increase in service employment, not enough to compensate for the loss of manufacturing jobs, ending up with a lower total employment growth ate with respect to the Baseline. When this situation is accompanied by a higher decrease in GDP growth rate, this implies a loss in productivity gains, probably due to the increase in low value-added service jobs. This situation is found in some regions like areas in southern France, North of Portugal, regions around Warsaw.

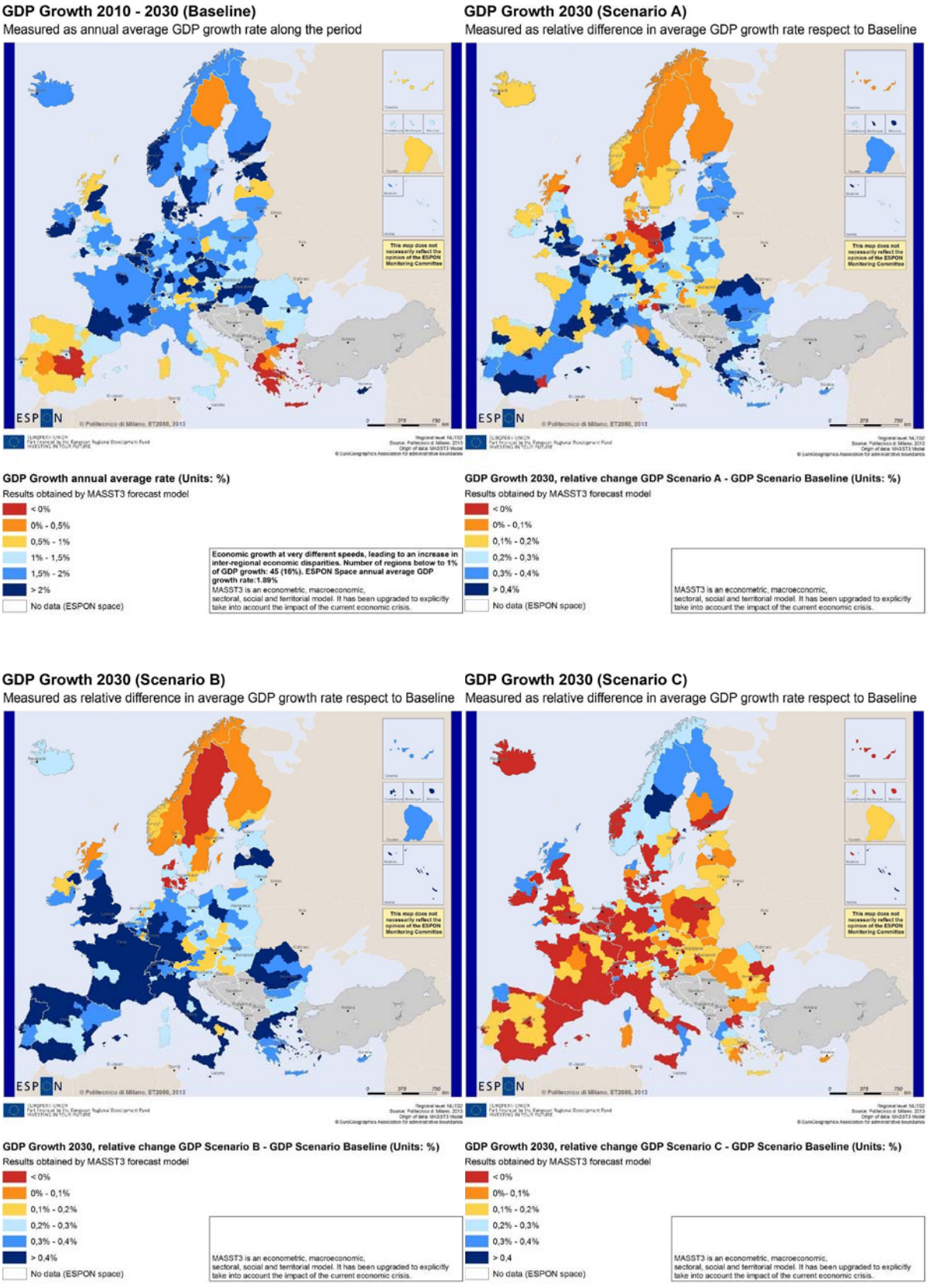


Figure 5-26 Exploratory Scenarios – GPD growth 2010-2030 compared to Baseline

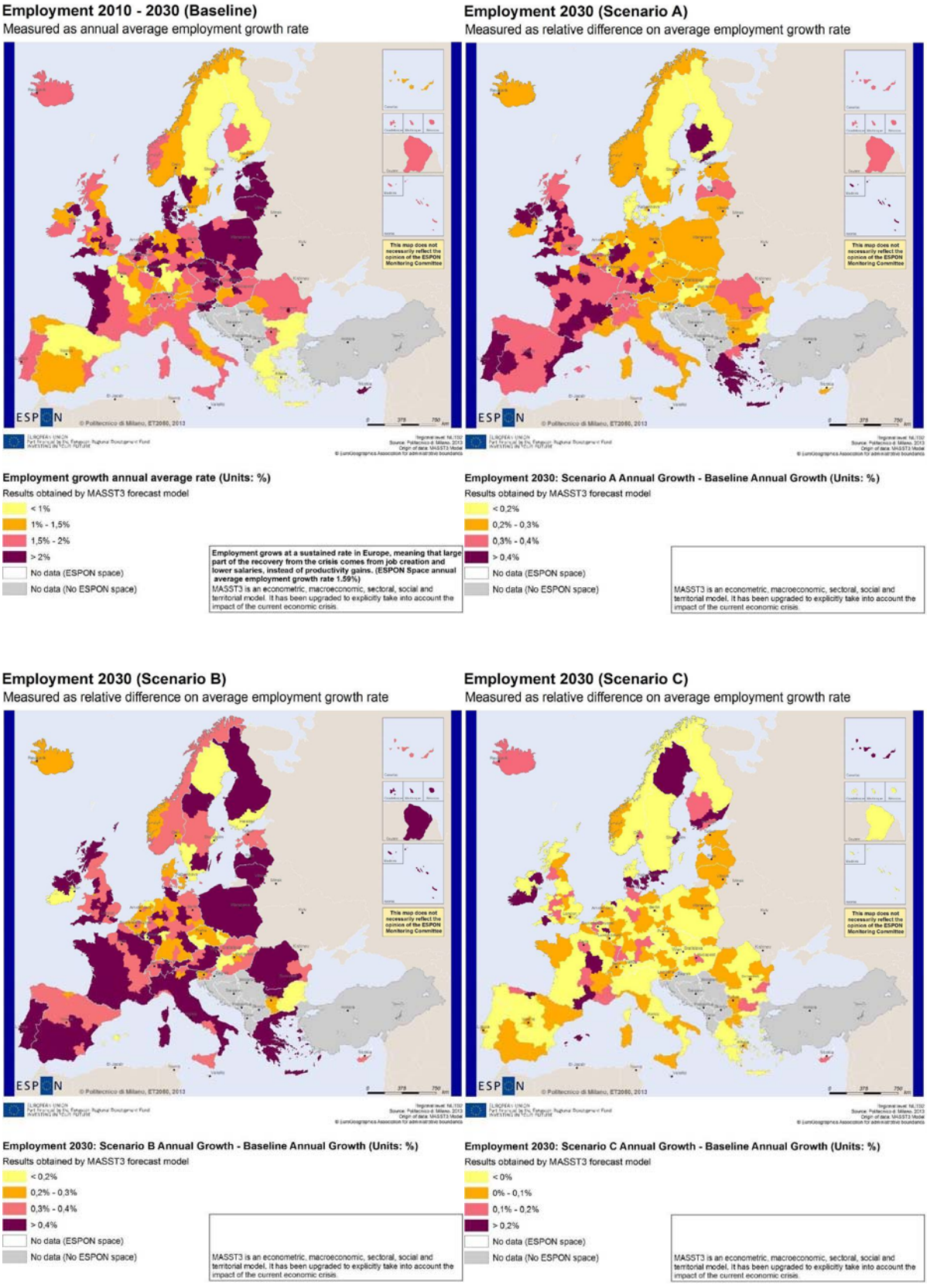


Figure 5-27 Exploratory Scenarios – Employment growth 2010-2030 compared to Baseline

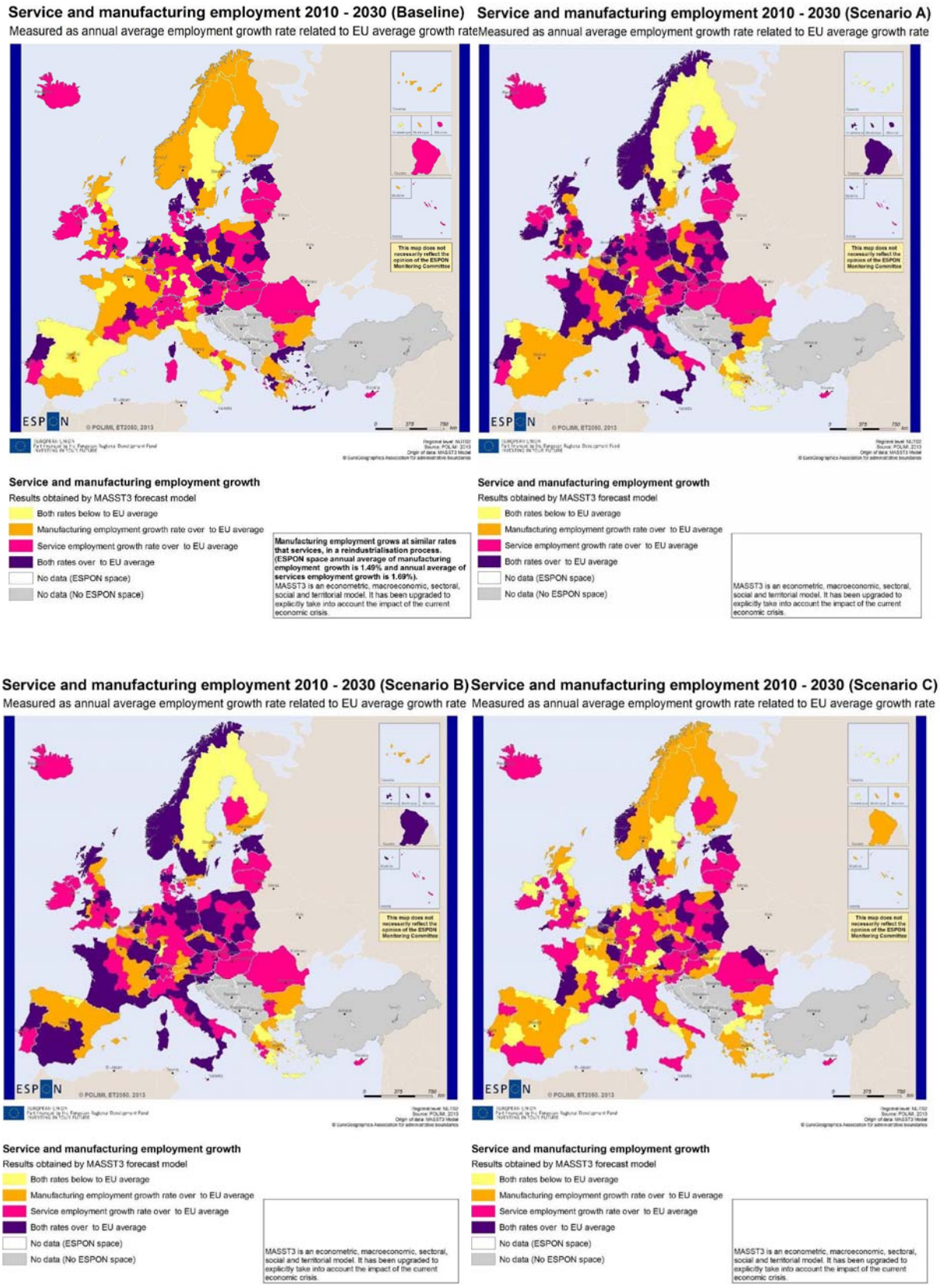


Figure 5-28 Exploratory Scenarios – Service and Manufacturing Employment growth 2010-2030 compared to Baseline

Transport Results

Aggregated indicators at European level

The number of trips between NUTS3 in Europe increases in all scenarios between 2010 and 2030, between 61% in Scenario C and 86% in Scenario A. The largest body of inter-NUTS3 trips remains the trips due to personal affairs (private trips), followed holydays.

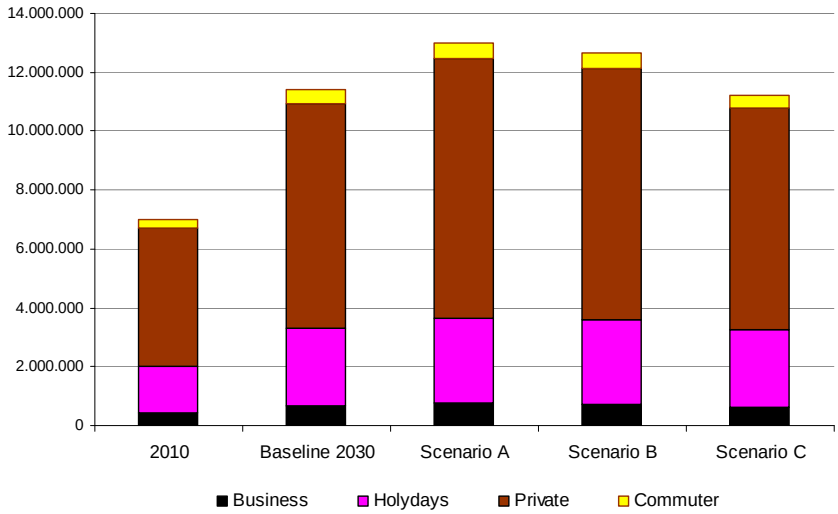


Figure 5-29 Total number of trips travelled yearly in Europe 2010 and 2030 (Baseline+Scenarios) by trip purpose

Long distance mobility in Europe is expected to grow from 2010 to 2030 in all scenarios, between 32% (Scenario C) and 39% (Baseline 2030). All scenarios result in less overall passenger·kilometres than the Baseline in 2030. The fact that the total number of trips inter NUTS3 increase much faster than the total passenger·kilometres indicates that trips tend to be shorter for all scenarios in 2030 than in 2010.

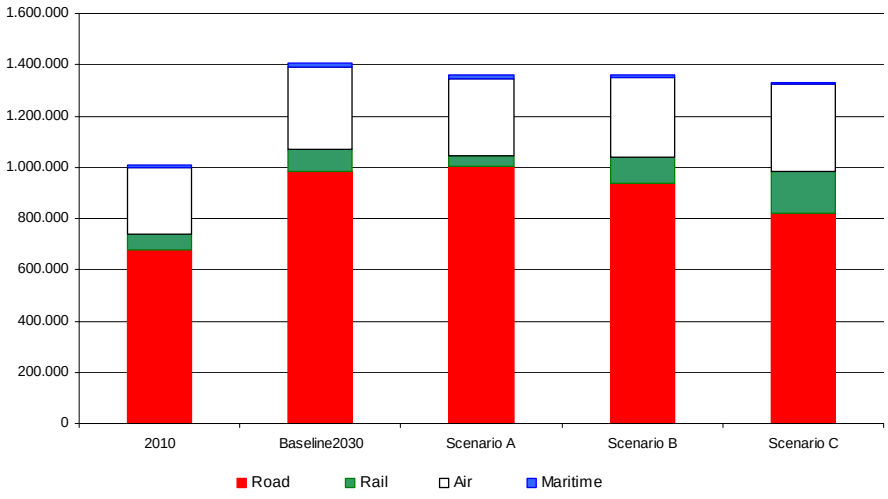


Figure 5-30 Total trip·kilometres travelled yearly in Europe 2010 and 2030 (Baseline+Scenarios) by mode of transport

Road will remain the main mode for passenger transport in Europe (between 62% and 70% in 2030 compared to 67% in 2010), but some degree of modal shift can be achieved depending on

the policies applied. Rail has the highest growth potential in the Scenario C “Regions”, up to 12% in 2030 compared to 6% in 2010, but also the Scenario B “Cities” provides for moderate rail modal share increases, whereas Scenario A causes rail share to decrease by one half.

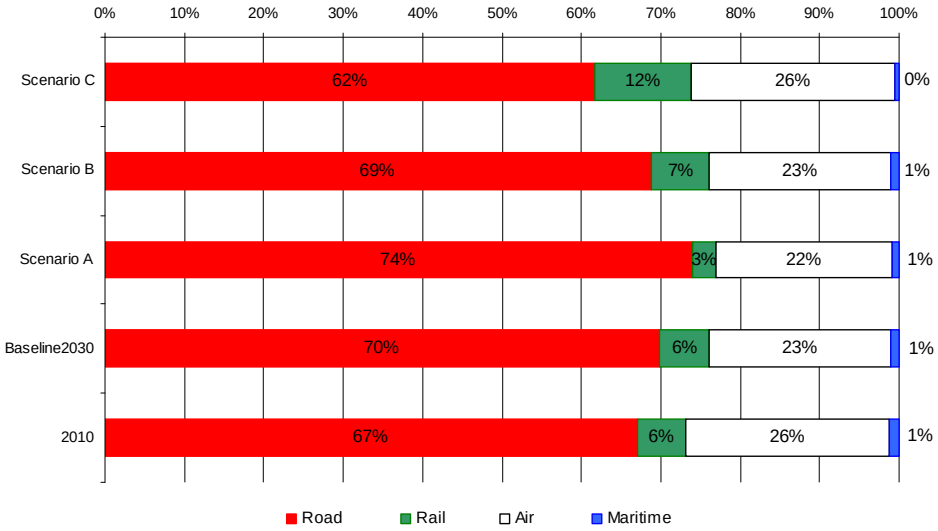


Figure 5-31 Modal Split based on Total trip·kilometres travelled yearly in Europe 2010 and 2030 (Baseline+Scenarios) by mode of transport

Total travel time increases in Baseline 2030 by 41.7% against Baseline 2010, about +7% more than the increase of total trip kilometres (39.0%). This implies that the overall transport system is slower in 2030 than in 2010, for the Baseline. Scenarios B and C maintain approximately the same speeds as Baseline 2010, meaning that the total number of hours spent in travelling in Europe increases just at the same rhythm as the number of passenger·kilometres travelled (0.7% speed increase in Scenario B, and 1.8% speed decrease in Scenario C). Only Scenario A shows a 32% average speed increase.

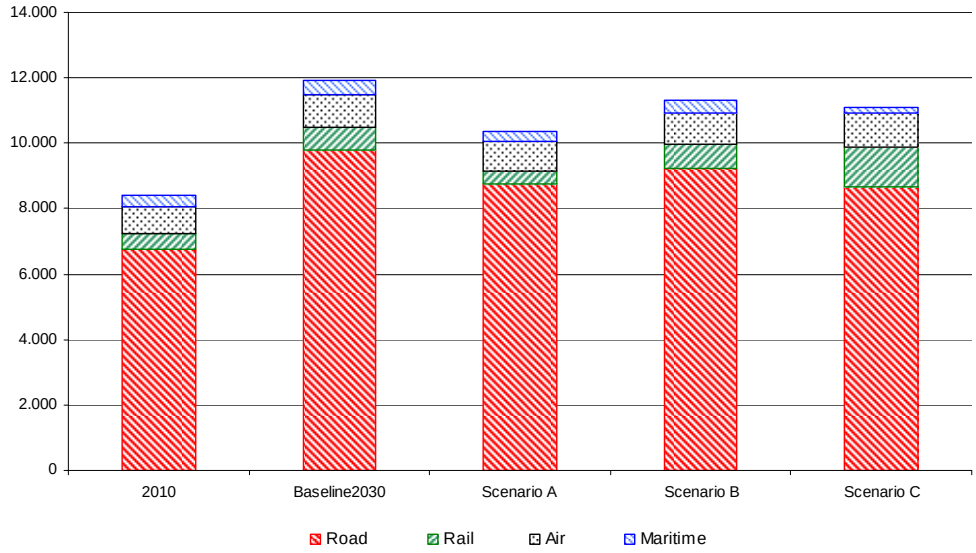


Figure 5-32 Total time spent travelling yearly in Europe 2010 and 2030 (Baseline+Scenarios) by mode of transport

Scenario C shows a lower share of multimodal trips, implying that trips in Scenario C require less changes between modes than in other scenarios (11% of trips in 2030 in Scenario C require using more than one mode, whereas 18% require so in the 2010).

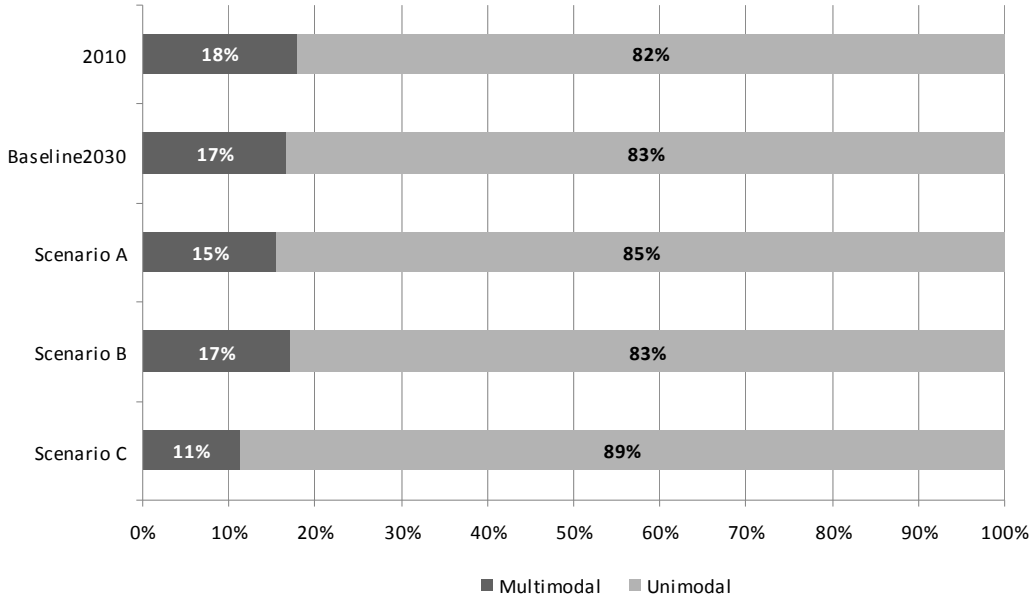


Figure 5-33 Share of trips in Europe requiring the use of only 1 mode of transport (unimodal) and requiring more than 1 (multimodal), 2010 and 2030 (Baseline + Scenarios)

All Scenarios show a relative decline of transport emissions and fuel consumption in relation to 2010. This is mostly due to the increase in vehicle efficiency (reduced emission factors in 2030 in relation to 2010), and larger shares of non-conventionally fuelled vehicles in the future. Scenario C shows the largest gains in environment, and the fact that the scenario is successful in increasing the rail share translates onto a relative factor decline of the CO2 emissions in relation to the total fuel consumption.

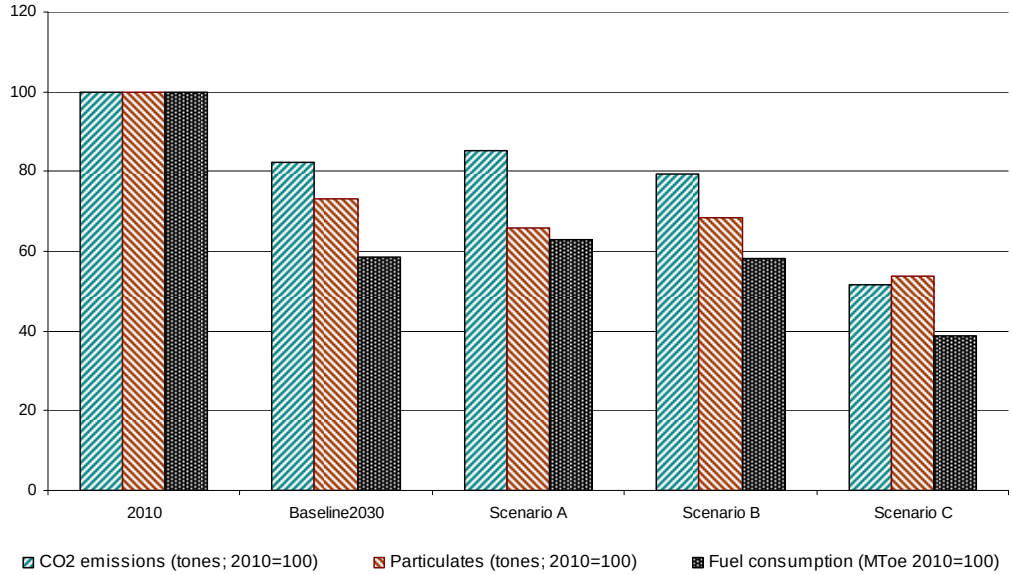


Figure 5-34 Environmental and Energy indicators of transport in 2030, relative to 2010 (2010=100)

Transport results analysed at regional level

Global accessibility tends to remain concentrated in the core of Europe for the Baseline scenario and the A Scenario, indicating that key global hubs (ports and airports) will mostly remain inside the Pentagon, in the future. Scenario B explores the possibility of a strong development of the Mediterranean ports for the commerce with Asia, whereas Scenario C tends to distribute activities to a higher extent all over the continent.

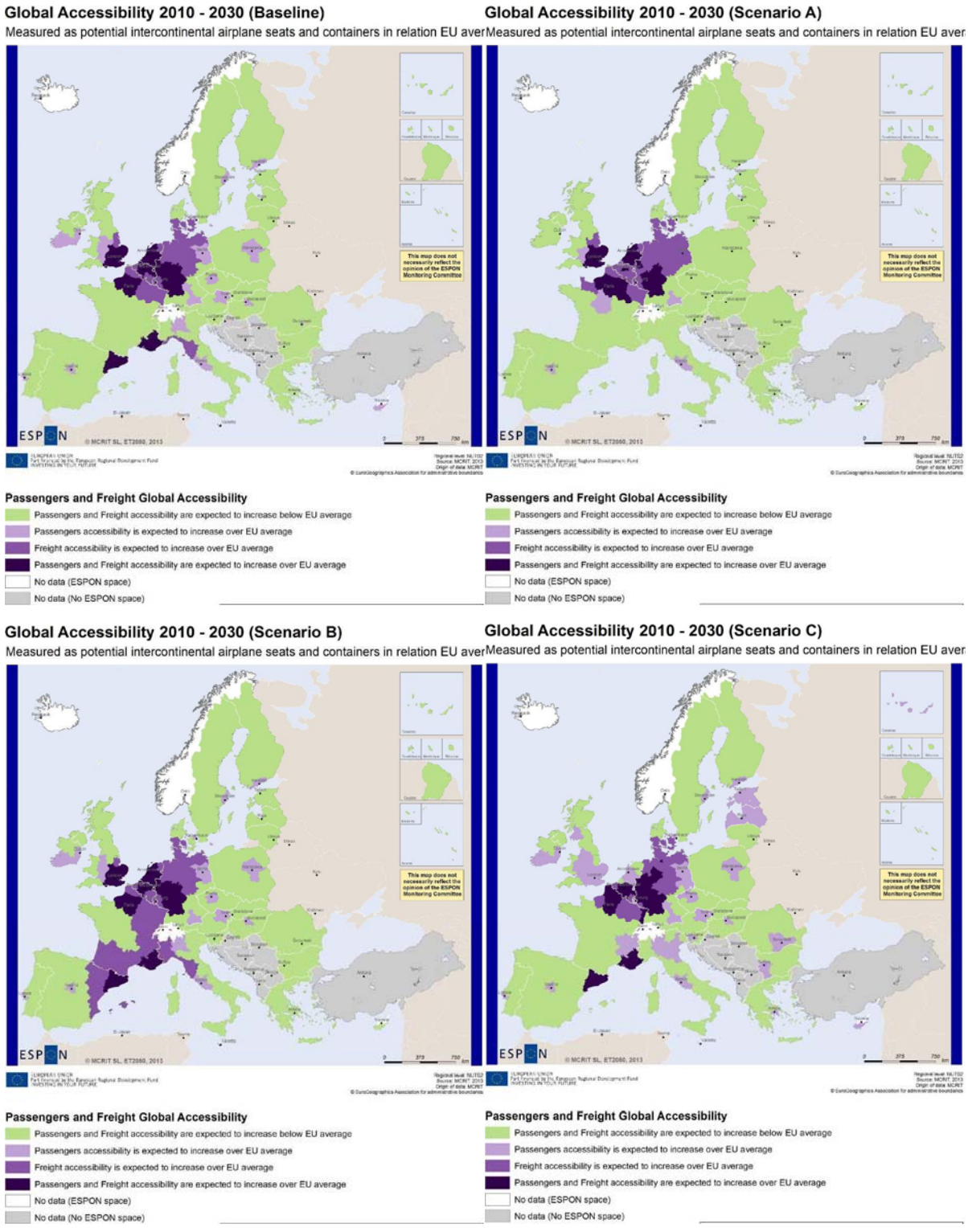


Figure 5-35 Exploratory Scenarios – Global Accessibility Increase 2010-2030

Whereas the B Scenario and the Baseline are mostly coincident in terms of European accessibility (showing a general increase of core and western accessibility in Europe in relation to 2010), the Scenario C provides only with marginal accessibility increases but mostly concentrated in the Northern and Southern peripheries, while Scenario A provides greater accessibility to Eastern Europe, mostly due to new motorway projects.

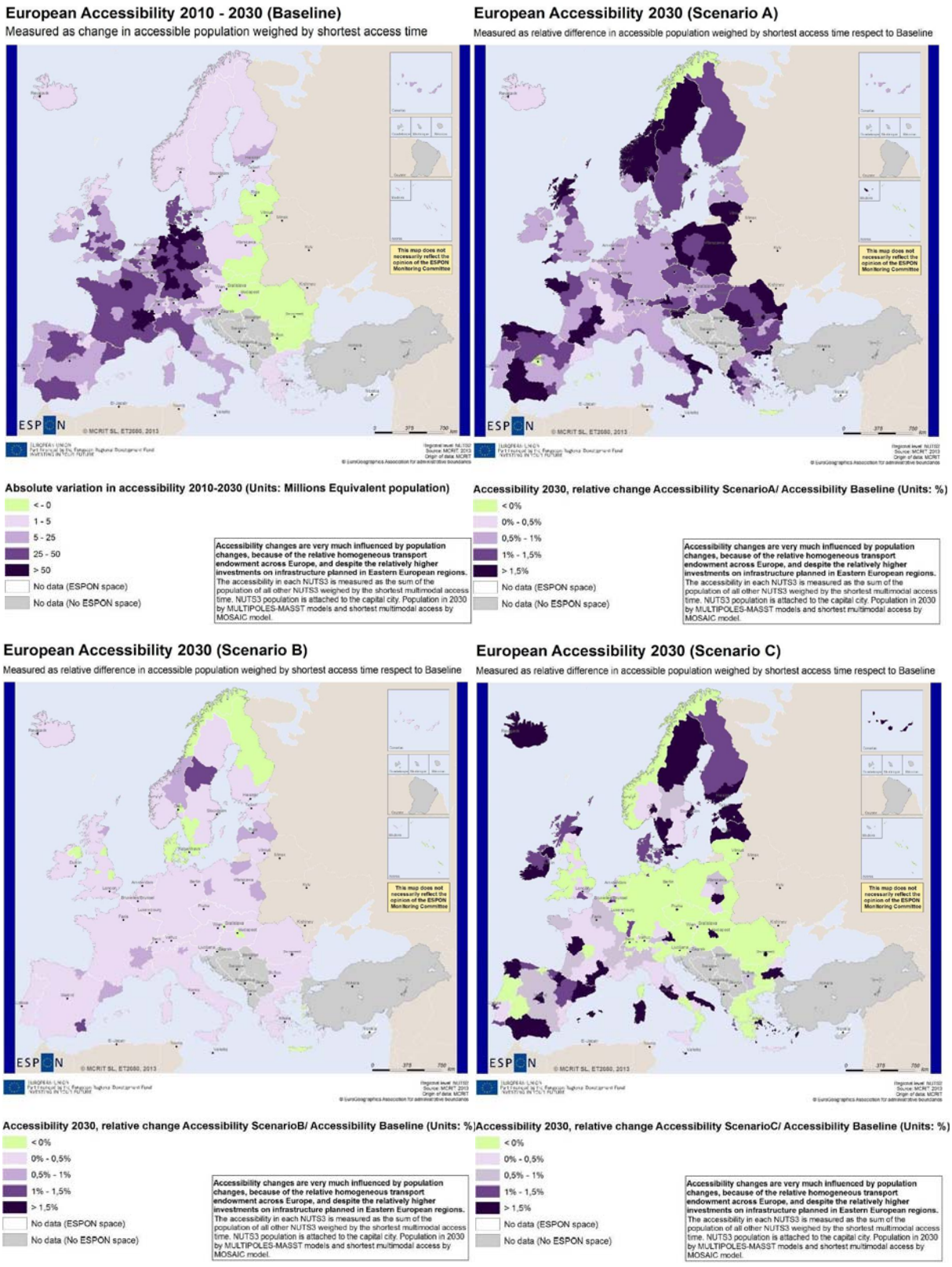


Figure 5-36 Exploratory Scenarios – European Accessibility Increase 2010-2030

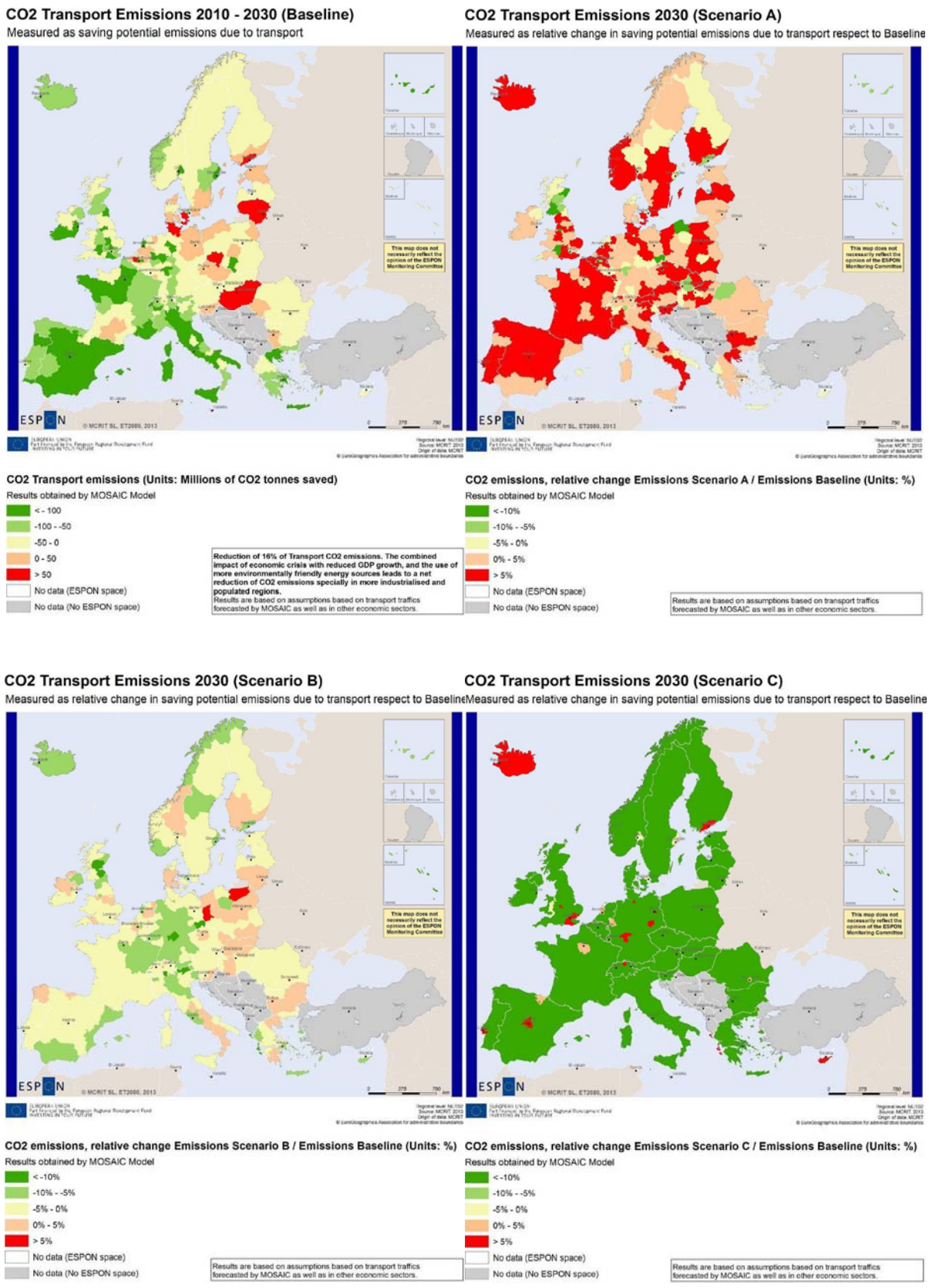


Figure 5-37 Exploratory Scenarios – Co2 Emission Savings from transport 2010-2030 compared to Baseline

5.7 Synthesis of results

The following two tables provide synthesis indicators for the ET2050 Scenarios (Baseline as a reference), and the qualitative character of each of the scenarios for the major sectoral divides.

	A Scenario (Promoting MEGAS)	B Scenario (Promoting Cities)	C Scenario (Promoting Regions)	BASELINE
Total EU31 Population in 2030 (in millions; *514 million in 2010*)	527.7	530.8	531.6	530.2
Population Ageing (weighted average of ODR in NUTS2; *25% in 2010*)	38.9%	38.9%	39.1%	38.9%
Total Migrations 2010-2030 (cumulated number of migrants in millions)	39.6	38.8	37.2	37.9
Economic Growth (average yearly increase 2010-2030)	+2.22%	+2.31%	+1.82%	+1.89%
Regional Divergence (GINI coefficient in 2030; *26.1 in 2008*)	28.0	28.2	28.3	28.5
Total Employment (average yearly increase 2010-2030)	+1,92%	+1,96%	+1,55%	+1.59%
Manufacturing Employment (average yearly increase 2010-2030)	+2,12%	+1,66%	+1,08%	+1.38%
Service Employment (average yearly increase 2010-2030)	+1,86%	+2,04%	+1,67%	+1.63%
Total transport demand for passengers (total pax·km increase 2010-2030 in %)	+34.3%	+34.8%	+31.6%	+39.0%
Total travel cost (total euros increase 2010-2030 in %)	+29.7%	+34.9%	+29.0%	+39.3%
Total time spent travelling (total hours increase 2010-2030 in %)	+23.3%	+34.5%	+32.1%	+41.0%
Total CO2 due to transport (total tones increase 2010-2030 in %)	-40.3%	-58.4%	-35.4%	-25.2%
Total CO2 (total tones increase 2010-2030 in %)	N/A	N/A	N/A	-28.9%

Figure 5-38 Synthesis of Results for ET2050 Scenarios in 2030

	A Scenario (Promoting MEGAS)	B Scenario (Promoting Cities)	C Scenario (Promoting Regions)	BASELINE
Population (total population)				
Society (Social inequities)				

	A Scenario (Promoting MEGAS)	B Scenario (Promoting Cities)	C Scenario (Promoting Regions)	BASELINE
Economy (economic performance)				
Technology (innovation)				
Energy (total consumption)				
Transport (total traffics)				
Land-Uses (artificial land occupation)				
Environment (climate change progression)				
Governance (participative governance)				

Figure 5-39 Main Features of ET2050 Scenarios in 2030

6. Exploratory Scenarios up to 2050

As indicated in the previous chapter, the scenario results produced with the MULTIPOLES, MASST, MOSAIC and METRONAMICA (still pending) have been complemented by long-term simulations until 2050 using the SASI integrated model. The purpose of the SASI exercise is also to assess the validity and plausibility of the scenario results of the models applied so far for the period 2010-2030 by comparing them with those of an integrated independent model of spatial development based on different and complementary theoretical foundations.

6.1 Approach

The core question investigated with the SASI simulations in the 2010-2050 period is also whether after the recent economic crisis the trend of the last thirty years towards reduction of the economic disparities between the more advanced and the economic lagging regions in Europe will continue, and how much cohesion, transport and alternative spatial development patterns will influence these evolutions. This issue, which is currently discussed in the regional economics community, is of great relevance for the orientation of the future spatial policy of the European Union. The intention of this chapter is to contribute to this debate providing long term forecast.

The following two sections present the 2050 Baseline Scenario and the specifications for the three exploratory scenarios and their main results. The concluding Section discusses lessons learnt from these simulations and the planned next steps in the application of SASI.

In the next step of the use of the SASI model, systematic variants of the three exploratory scenarios presented in this chapter combining different framework conditions and policies will be examined[24].

6.2 Exogenous and Policy Assumptions for the 2050 Baseline Scenario

The specification of the 2050 Baseline Scenario to be modelled are SASI is based on the specifications of the Baseline Scenario simulated with the MULTIPOLES, MASST and MOSAIC models for up to 2030, that consider the most recent forecasts by Eurostat, the European Commission and the International Energy Agency.

All simulations with the SASI model start from 1981 because the model is able to reproduce the past development and therefore show how the future development continues or deviates from the past development. Because the database of the SASI is model largely based on census data, it ends with 2051 instead of 2050.

Next table summarises the specification of the SASI Baseline Scenario between 1981 and 2051.

Year	Population EU27 (million)	Population EU31 (million)	GDP EU27 (billion € of 2010)	GDP EU31 (billion € of 2010)	Annual net migration EU27 (1,000)	Annual Structural Funds (billion € of 2010)	Oil price per barrel (€ of 2010)
1981	459.8	470.5	7,067	7,472	77	5.0	39
1986	464.3	475.2	8,073	8,524	285	8.2	19
1991	471.4	482.7	9,534	10,037	1078	17.8	18

[24] One important feature of the simulations with models is the distinction between exogenous assumptions and policies. Exogenous assumptions refer to changes of the framework conditions of the simulations that cannot be influenced by policy makers. Policies are deliberate interventions of policy makers at the European national, regional or local level. Only one of the two, assumptions or policies, should be changed between scenarios. Only if this *ceteris paribus* condition is observed, can the results of the model be traced back to the policies changed.

Year	Population EU27 (million)	Population EU31 (million)	GDP EU27 (billion € of 2010)	GDP EU31 (billion € of 2010)	Annual net migration EU27 (1,000)	Annual Structural Funds (billion € of 2010)	Oil price per barrel (€ of 2010)
1996	478.1	489.7	10,334	10,875	748	34.7	20
2001	482.1	494.1	11,710	12,251	654	37.6	25
2006	491.2	503.6	12,751	13,329	1578	48.2	55
2011	500.6	513.6	12,596	13,158	857	50.3	63
2016	514.1	527.7	13,370	14,009	1239	55.4	90
2021	526.0	540.0	14,548	15,207	1327	60.2	96
2026	534.8	549.3	15,774	16,487	1300	65.4	102
2031	540.7	555.6	16,903	17,668	1290	70.5	109
2036	542.4	557.7	18,105	18,952	1265	75.6	115
2041	540.0	555.5	19,393	20,273	1217	80.9	121
2046	534.4	550.1	20,772	21,718	1163	86.7	127
2051	526.0	541.7	22,251	23,268	1094	92.6	133

The population totals indicated are no fixed constraints but targets to be achieved by the demographic submodel. The GDP totals implement the "sluggish recovery" hypothesis and are enforced by the model only in the Baseline Scenario. In the exploratory scenarios additional generative effects of the policies introduced may lead to higher GDP totals.

Population

1995-2010: Eurostat. http://epp.eurostat.ec.europa.eu. Table tps00001

2015-2050: Eurostat population projections. http://epp.eurostat.ec.europa.eu/ Table tps00002

Net migration:

European Commission (2012a, b)

GDP:

1995-2013: http://sdw.ecb.euopa.eu

2015.2050: http://ec.europa.eu/economy_finance/publications/european_economy/2012/pdf/ee-2012-2_en.pdf

HICP (Harmonised consumer price index):

European Central Bank Statistical Data Warehouse. http://sdw.ecb.europa.eu

Oil price:

IEA (2012)

Figure 6-1 Baseline Scenario specification 1981-2051 for SASI

The population totals indicated are no fixed constraints but targets to be achieved by the demographic submodel. The GDP totals implement the "sluggish recovery" hypothesis and are enforced by the model only in the Baseline Scenario. In the exploratory scenarios additional generative effects of the policies introduced may lead to higher GDP totals. The figures in the table refer to the European Union (EU27) and the ESPON Space consisting of the EU plus Iceland, Liechtenstein, Norway and Switzerland (EU31), respectively.

The 2050 Baseline Scenario is a business-as-usual scenario, i.e. it assumes that current policies are continued in the future.

The kind of spatial policies considered in SASI, Structural Funds subsidies and transport policies, are the same as those applied by the other models in their simulations until 2030, but are treated in a slightly different manner:

Cohesion Policy assumptions

Concerning Structural Funds subsidies consist of EU regional policy expenditures from the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (CF).

In relation to the total volume of the EU Cohesion policy fund, the following hypotheses were taken:

- No separate assumptions are made about the volumes of the three funds of the EU Cohesion policy (ERDF, ESF and CF).
- Total Cohesion Policy expenditures (ERDF, SFF and CF) are linked to total EU27 GDP in real terms, i.e. are estimated as a percentage of total EU real GDP.
- Baseline Scenario: the share of cohesion policy expenditures respect to EU27 GDP remains constant along time (0.4% of EU27 GDP)
- A Scenario: expenditures remain constant in nominal terms, i.e. are almost halved compared to the Baseline Scenario (€ 49.2 billion)
- B Scenario: the same as in the Baseline Scenario.
- C Scenario: expenditures grow annually by 5%, i.e. grow almost three times as fast as in the Baseline Scenario.

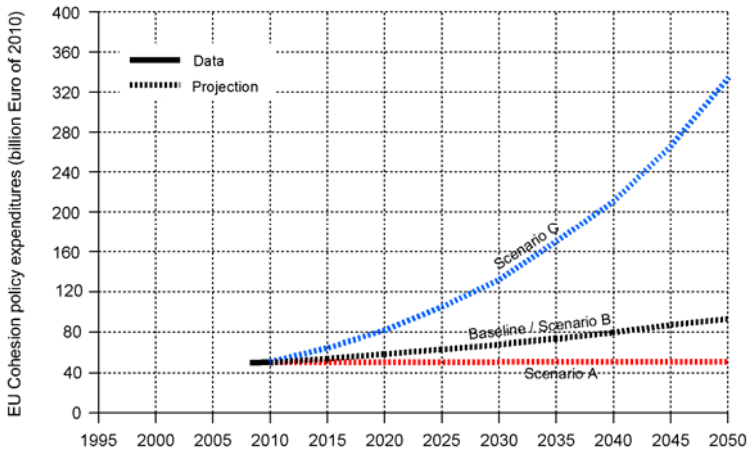


Figure 6-2 Proposed total Cohesion expenditures in the A, B and C scenarios

It is assumed that the total volume of these funds will stay the same as in the funding period 2007-2013 and will grow in proportion to the expected growth of the economy of the European Union

As regional allocation rule the inverse exponential function of GDP per capita empirically derived from the allocation in the funding period 2007-2013 was used:

$$b_i = \exp\left[-0.035 \times \left(y_i - 51.0\right)\right] \times 3.0$$

where

b_i is Cohesion policy expenditure as per cent of GDP in region *i*, and

y_i is GDP per capita in region *i* as per cent of the average GDP per capita of the European Union (EU27=100).

Next figure shows how this function was derived from data of the funding period 2007-2013. Cohesion policy expenditures are treated as transfers, i.e. are paid by all regions in proportion to their GDP per capita.

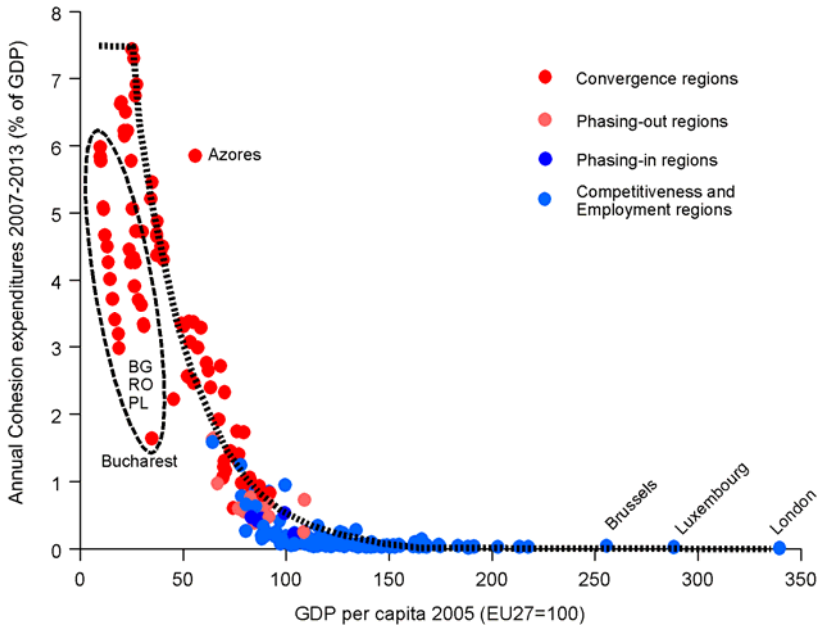


Figure 6-3 Cohesion expenditures of regions as % of GDP v. GDP per capita (EU27=100)

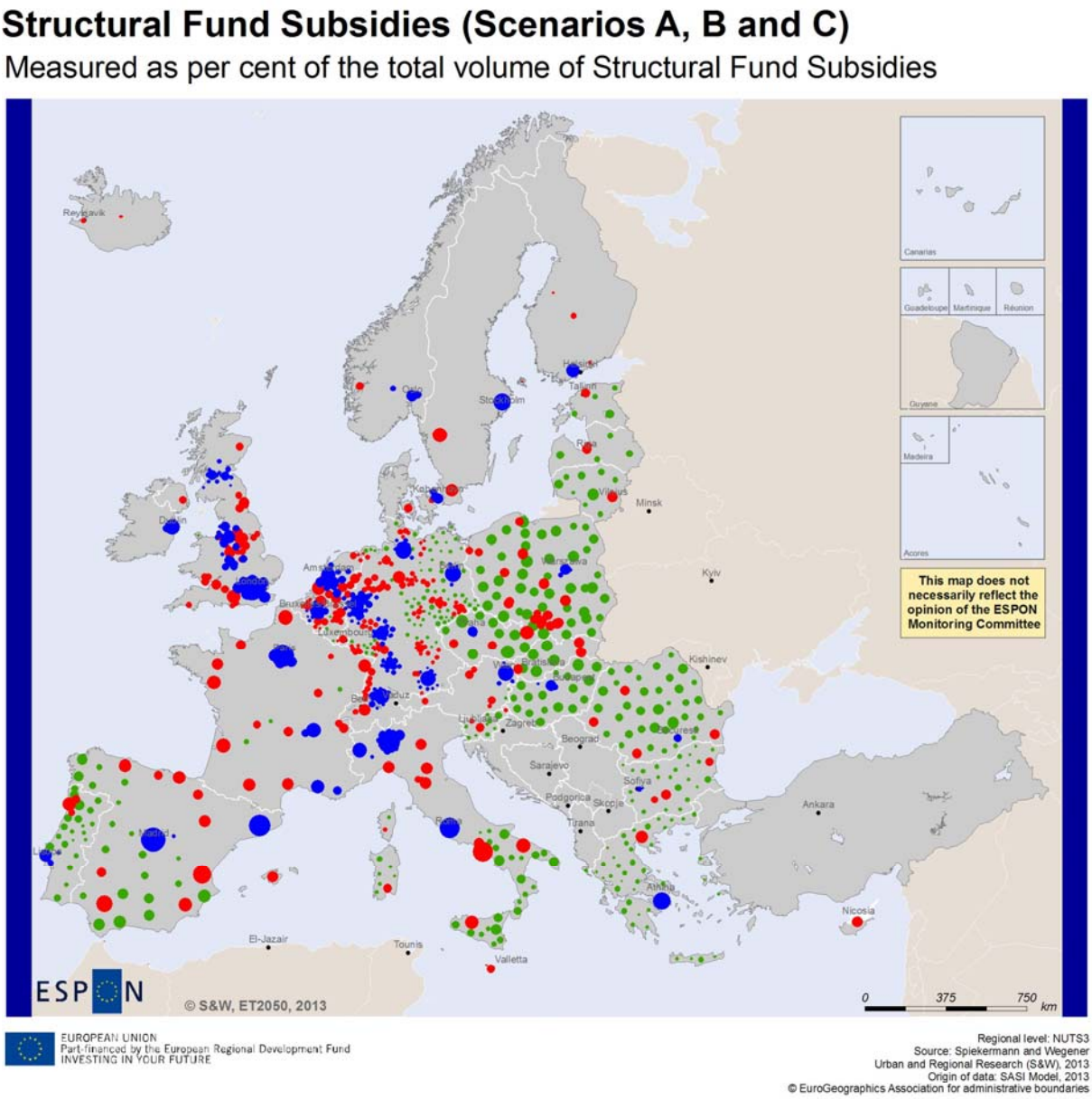


Figure 6-4 Structural Funds Subsidies allocation 2010-2050

Transport Policy assumptions

Transport policies consist of time-sequenced network changes as well as changes of the generalised costs of passenger and goods transport through energy price increases or advances in energy efficiency of vehicles.

All changes in transport costs are relative to the concurrent changes in affluence expressed as changes in GDP per capita, i.e. if transport costs increase by the same rate as GDP per capita, no change in accessibility is assumed. This the case in the Base Scenario and the three exploratory scenarios presented in this chapter.

6.3 Policy Assumptions for the 2050 Exploratory Scenarios

In three exploratory scenarios modelled by SASI so far, the framework conditions are kept the same as in the Baseline Scenario, and only policies, i.e. the allocation of Structural Funds subsidies and the transport policies are changed. In this respect, these scenarios (named A0, B0, C0) are policy-variants of the Baseline, and do not continue exactly the same A, B and C path scenarios developed until 2030 by MULTIPOLES; MASST3 and MOSAIC. For comparability, the total volume of Structural Funds expenditures were kept equal across all three exploratory scenarios and only the allocation of subsidies to regions was changed according to the scenario profiles. Therefore, A0, B0 and C0 are policy variants to the Baseline scenario, each one in the direction of the A, B and C scenarios modelled for 2030.

Cohesion policy assumptions by SASI

The definition of the three exploratory scenarios was based on the same region typology used by the other models to identify MEGAs, Cities and Regions to be promoted in each one.

As the typology used in the other models was based on NUTS-2 regions, it was converted to the NUTS-3 regions used by SASI. The principle used in this conversion was to first select the NUTS-3 region of the core city in each NUTS-2 region classified as A region and associate it with neighbouring NUTS-3 regions within a radius of 50 km as metropolitan area. By that the 42 MEGAs in the EU translated into 233 NUTS-3 regions. The same principle was used for B regions except that a radius of 33 km was used. By that the 113 cities selected translated into 254 NUTS-3 regions. Each of the remaining 803 C regions was treated individually.

The predefined total volume of Structural Funds (see above) was allocated to the designated NUTS-3 regions in proportion to their GDP in Scenario A0, their population in Scenario B0 and the same inverse exponential function of GDP per capita as in the Baseline Scenario in Scenario C0, which led to greater subsidies (in terms of per cent) in the less affluent regions in eastern and southern Europe. To avoid ineffective fragmentation of funds, in Scenario C subsidies below one per cent of GDP were set to zero. This reduced the number of C0 regions receiving subsidies to 355. The map in Figure 2 on the following page shows the results of this conversion. The size of the circles in the map corresponds to the volume of subsidies allocated to each region expressed in per cent of the total volume of Structural Funds subsidies. The map contains also MEGAs and cities outside the EU not receiving EU funds.

Assumptions for Transport Policies by SASI

While in the A, B, and C scenarios up to 2030 transport policies are included in the economic modelling in terms of global accessibility changes, each exploratory scenario A0, B0, C0 are based on the following assumptions:

- In the Scenario A0 (Promoting MEGAs), it is assumed that all MEGAs not more than 500 km apart will be linked by road and rail connections with at least 90 km/h airline speed for cars and 200 km/h for rail. In addition, it is assumed that the metropolitan areas will improve their intra-regional transport system.
- In the Cities Scenario B0 it is assumed that cities not more than 300 km apart will be linked by connections with at least 80 km/h airline speed for cars and 160 km/h for rail. In addition, it is assumed that they will improve their intra-regional transport system.
- In the Regions Scenario C0 it is assumed that regions will be linked with the surrounding metropolitan areas of the A and B Scenarios not more than 200 km apart by connections

with at least 65 km/h for cars and 80 km/h for rail. In addition, it is assumed that the C-regions will improve their intra-regional transport system.

These assumptions are understood as minimum levels. If the transport infrastructure of the Baseline Scenario offers already connections of at least that quality, for instance through existing high-speed trains, no further improvement is introduced.

6.4 Results of 2050 Baseline Scenario by SASI

The main results of the Baseline Scenario and the three exploratory scenarios can be presented in this section.

The map in next page shows average annual growth of GDP in the NUTS-3 regions between 2011 and 2051 in the SASI Baseline Scenario.

According to the specification of the SASI Baseline Scenario, total GDP of the ESPON Space (EU31) is assumed to grow from 13,158 to 23,268 billion Euro of 2010, or on average 1.44 per cent annually as suggested in the ET2050 First Interim Report.

The map shows that according to the SASI model the regions with the highest growth rates are in the Baltic States and in Romania and Bulgaria. This is due to the highest growth in productivity expected in these countries (based on their growth in productivity until 2006) and the fact that it is assumed that the allocation of Structural Funds subsidies will continue to follow the inverse negative exponential function of GDP per capita used in the funding period 2007-2013 (see previous Figure) also in the subsequent funding periods. Despite its equally low GDP per capita the Polish regions grow less because they have shown lower productivity growth before 2006. Noteworthy are the high average annual growth rates in Ireland and Iceland despite their deep recessions in the course of the economic crisis.

The following map shows the distribution of GDP per capita in the Baseline Scenario in the year 2051.

Next map illustrates the sobering prospect that after forty years of economic convergence there will exist a significant gap in income between the prosperous old EU member states in western and northern Europe and the new member states in eastern Europe, but also in parts of Portugal, Spain, southern Italy and Greece, even though these regions will on average more than double their GDP per capita in these forty years.

As expected, the pattern of GDP per capita in the western and northern Europe remains more or less as today with higher GDP per capita in the economically more successful metropolitan areas and capital cities and the traditional high values in Switzerland, Luxembourg and the north-European countries. It is remarkable again that Ireland and Iceland seem to have completely overcome their severe recessions

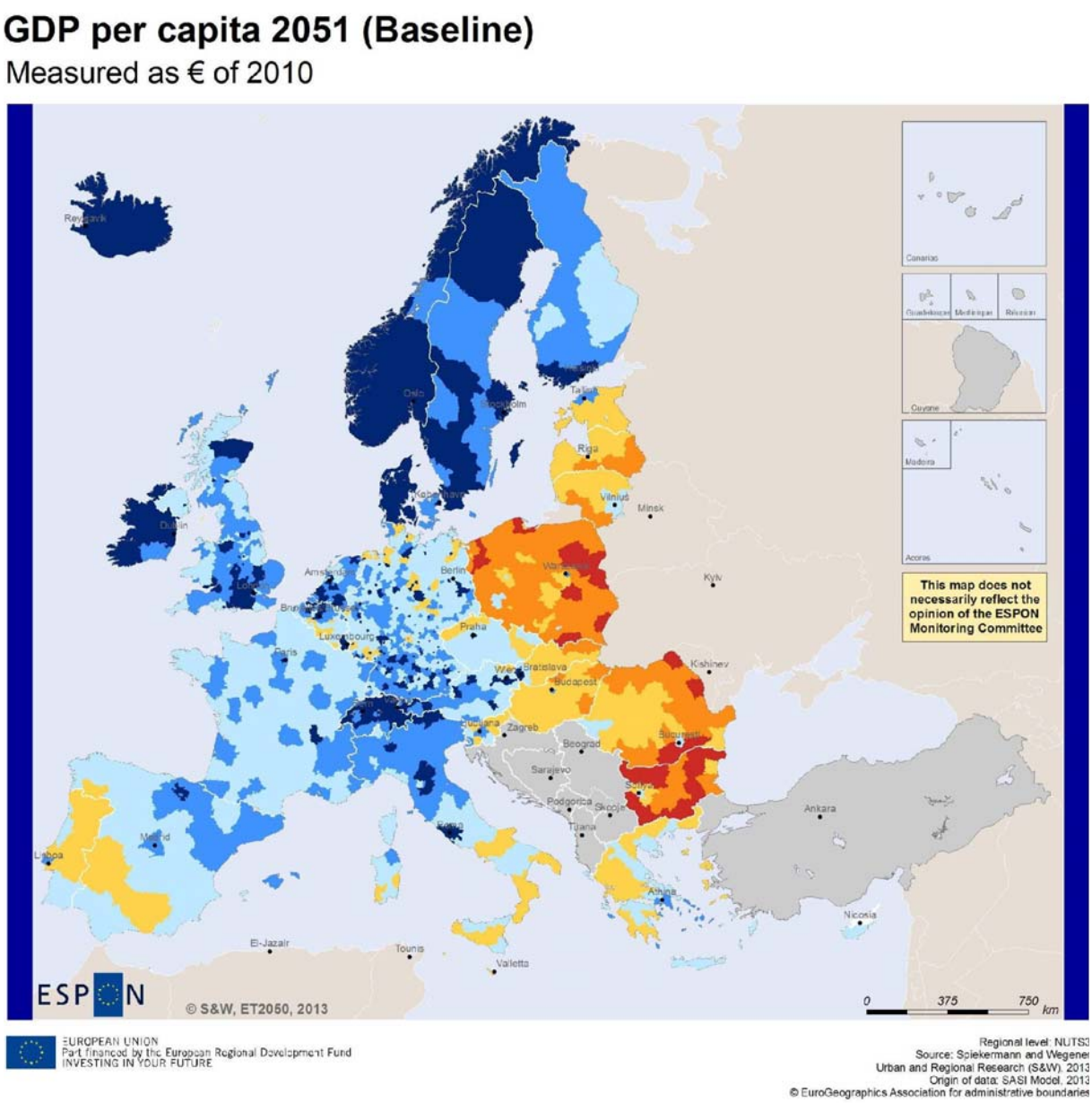


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Figure 6-5 SASI Baseline Scenario: GDP per capita (1,000 € of 2010) in 2051

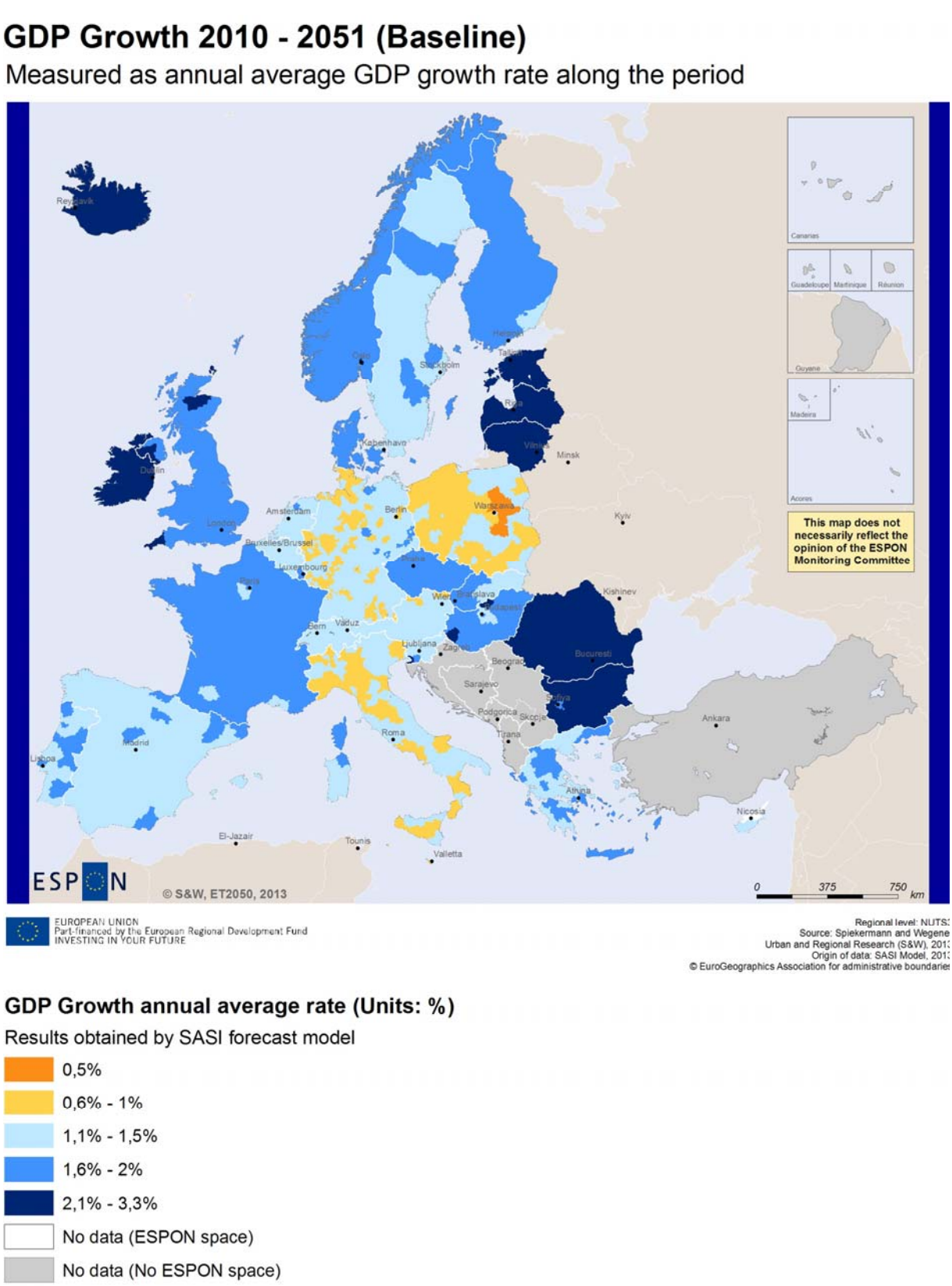


Figure 6-6 SASI Baseline Scenario: Average annual change of GDP per capita 2011-2051 (%)

The next three maps in show how GDP per capita in the three exploratory scenarios deviates from the Baseline Scenario in the year 2051. The three maps express the conceptual intention behind the three scenarios:

- The MEGAs Scenario A reinforces the already dominant position of the major metropolitan areas in the 'Pentagon' through GDP-oriented Structural Funds subsidies, high-speed oriented transport network improvements and better links between long-distance and local transport, such as better access to high-speed rail terminals. The new member states in eastern and southern Europe lose most compared with the Baseline Scenario, in the most severe cases up to 10%. The already dominant largest metropolitan areas and their immediate surroundings gain most, up to ten per cent compared with the Baseline Scenario. Whether this policy of making the strongest players even stronger will result in increased overall European growth, as the Lisbon strategy claims, will be discussed below.
- The Cities Scenario B emphasises the polycentric urban system of Europe already proposed as a desirable vision by the European Spatial Development Perspective of 1998/1999 and further articulated in the Territorial Agenda of 2007. It strengthens the position of large European cities by education-oriented Structural Funds subsidies, medium-speed oriented transport network improvements and better links between regional and local transport networks. This polycentricity orientation is clearly reflected in the results shown in the map: The major cities selected and their immediate hinterlands in both eastern and western Europe grow significantly faster than the remaining regions. However, the imbalance between the affluent western and northern regions in Europe and the disadvantaged regions in eastern and southern Europe which are not classified as major cities to be promoted remains. This imbalance is most visible in the growing disparity between the promoted capital and other large cities in the new member states in eastern Europe. It becomes apparent here that polycentricity at the European level tends to be in contradiction with polycentricity at the national or regional level. It will be asked below how the polycentric Cities Scenario B scores in terms of both competitiveness and territorial cohesion compared to the MEGAs Scenario A and the Regions Scenario C.
- The Regions Scenario C strengthens the still economically lagging regions in eastern and southern Europe and so clearly pursues the cohesion objective. As also in this scenario the allocation of Structural Funds subsidies follows the inverse exponential function of GDP per capita (as in the Base Scenario), the results are similar to the Baseline Scenario except that the promotion of rural and peripheral regions in the new member states in eastern Europe is stronger, as the number of eligible regions is smaller, 355 compared to the total of 1,290 EU regions in the Baseline Scenario. But nearly all C regions, except the MEGAs and large cities promoted in Scenarios A and B, benefit from the policies applied in the Regions Scenario C, though only little. Whether the scenario really scores better in terms of cohesion will be discussed below.

What the three difference maps do not show is whether spatial development in Europe in the next decades will lead to further convergence of economic conditions or, after the recent economic crisis, to political fragmentation and economic divergence.

This is analysed by the two most common indicators of spatial cohesion, the coefficient of variation and the Gini index. Both indices measure the degree of disparities between objects of observation, in this case 1,347 NUTS-3 regions: the higher the indicator values, the greater are the disparities.

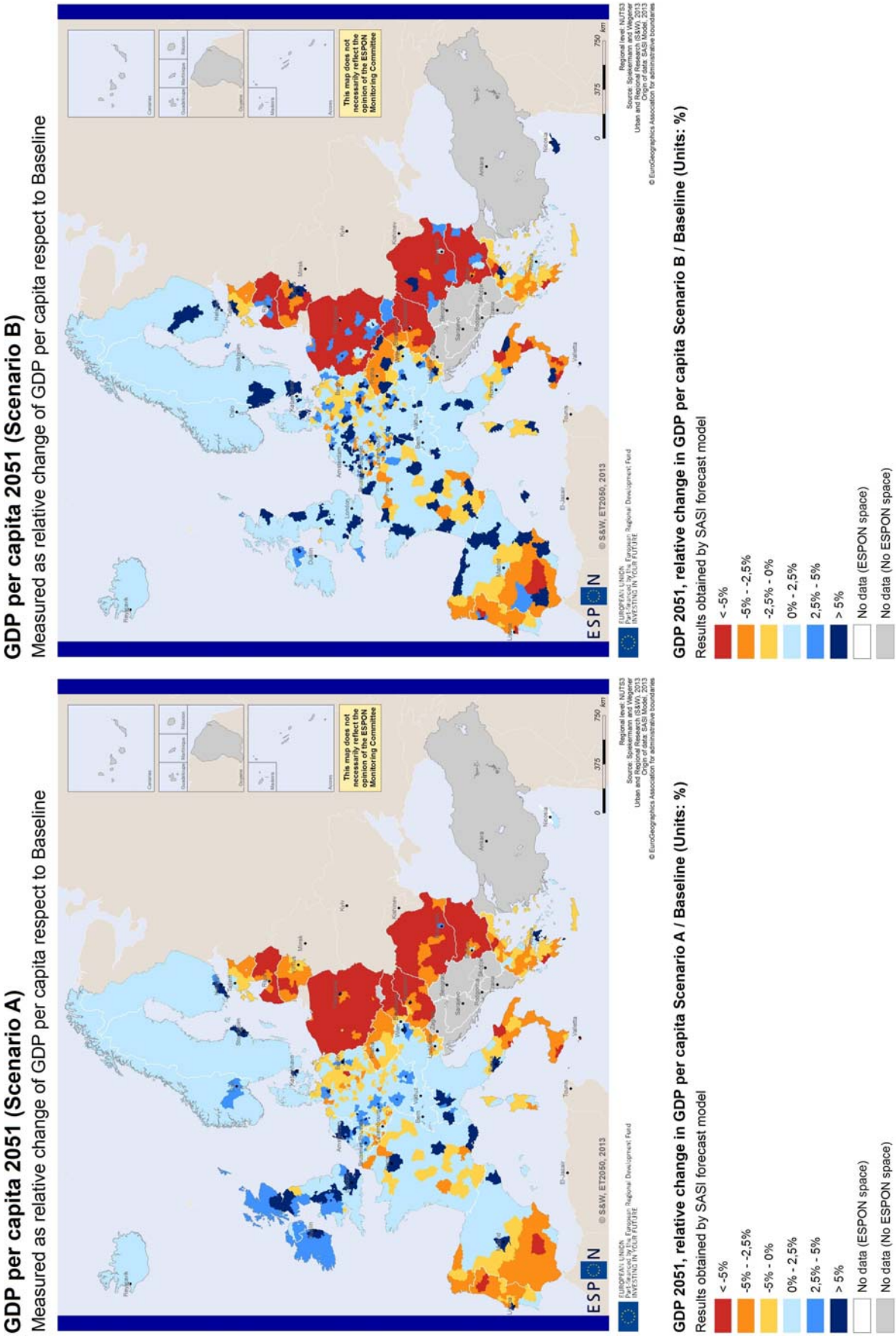


Figure 6-7 SASI Scenarios A and B: Difference in GDP per capita to Baseline in 2051 (%)

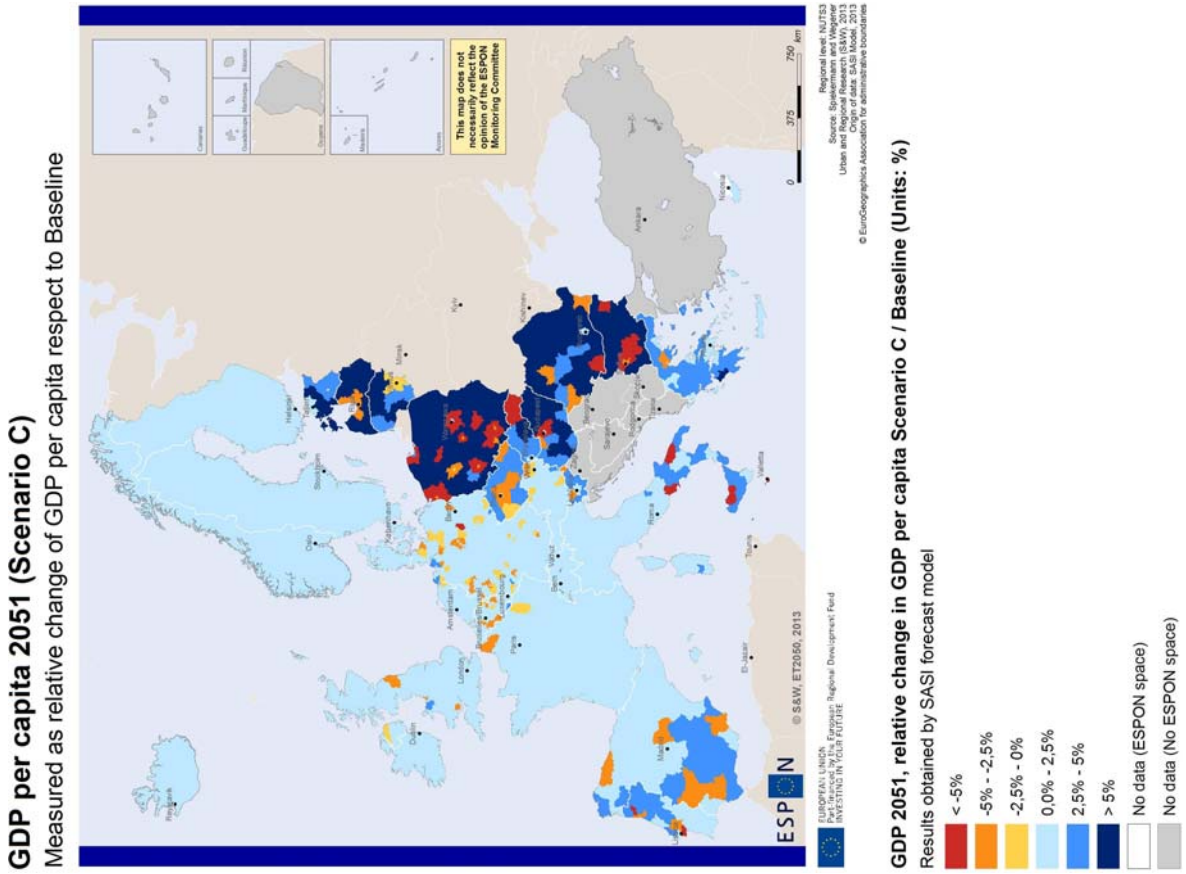


Figure 6-8 SASI Scenario C: Difference in GDP per capita to Baseline in 2051 (%)

Next shows that according to the SASI model even after the economic crisis convergence in economic development between regions in Europe will continue after the recovery from the economic crisis, though more slowly than before the crisis.

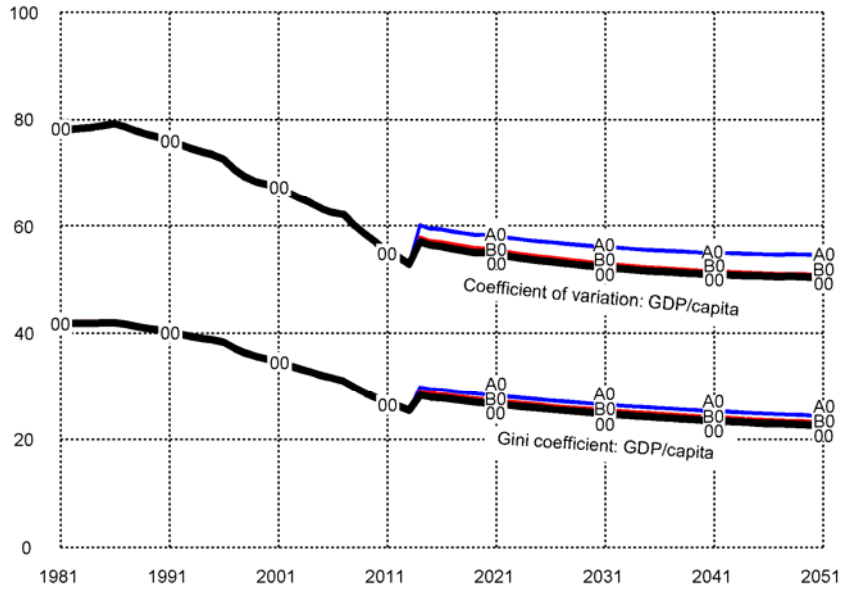


Figure 6-9 Cohesion indicators: GDP per capita

The reason is that in most new member states in Eastern Europe technology, i.e. labour productivity, may continue to catch up with that in the more advanced member states in western and northern Europe, although not as fast as in the years 1991-2011 after the fall of the Iron Curtain. Convergence continues in all scenarios (the line of the Regions Scenario C0 is hidden behind the black line of the Baseline Scenario). As to be expected, convergence is weakest in the MEGAs Scenario A.

To summarise, next table shows the development of GDP and GDP per capita over the different time periods between 1981 and 2051 for all four scenarios. It is apparent that after the decline due to the economic crisis, the MEGAs Scenario A produces the highest generative effects as public investment is concentrated in the largest metropolitan areas with the highest productivity. As expected, the Regions Scenario scores last as subsidies are directed primarily at peripheral regions with low productivity. The Cities Scenario B takes a middle position. The differences between the scenarios seems small in percentage terms. However, if only subsidies are considered, they amount to between 400 and 1,000 Euro per capita annually in 2051 – not a bad multiplier effect if the total Structural Funds of 90 billion or 180 Euro per capita annually are considered. .

Period	GDP				GDP per capita			
	Base	A	B	C	Base	A	B	C
1981-2008	+2.22	+2.22	+2.22	+2.22	+1.94	+1.94	+1.94	+1.94
2008-2013	–0.39	–0.39	–0.39	–0.39	–0.84	–0.84	–0.84	–0.84
2013-2031	+1.60	+1.72	+1.66	+1.62	+1.22	+1.33	+1.28	+1.24
2031-2051	+1.39	+1.41	+1.40	+1.39	+1.51	+1.54	+1.53	+1.52

Figure 6-10 Development by period: average annual change (%)

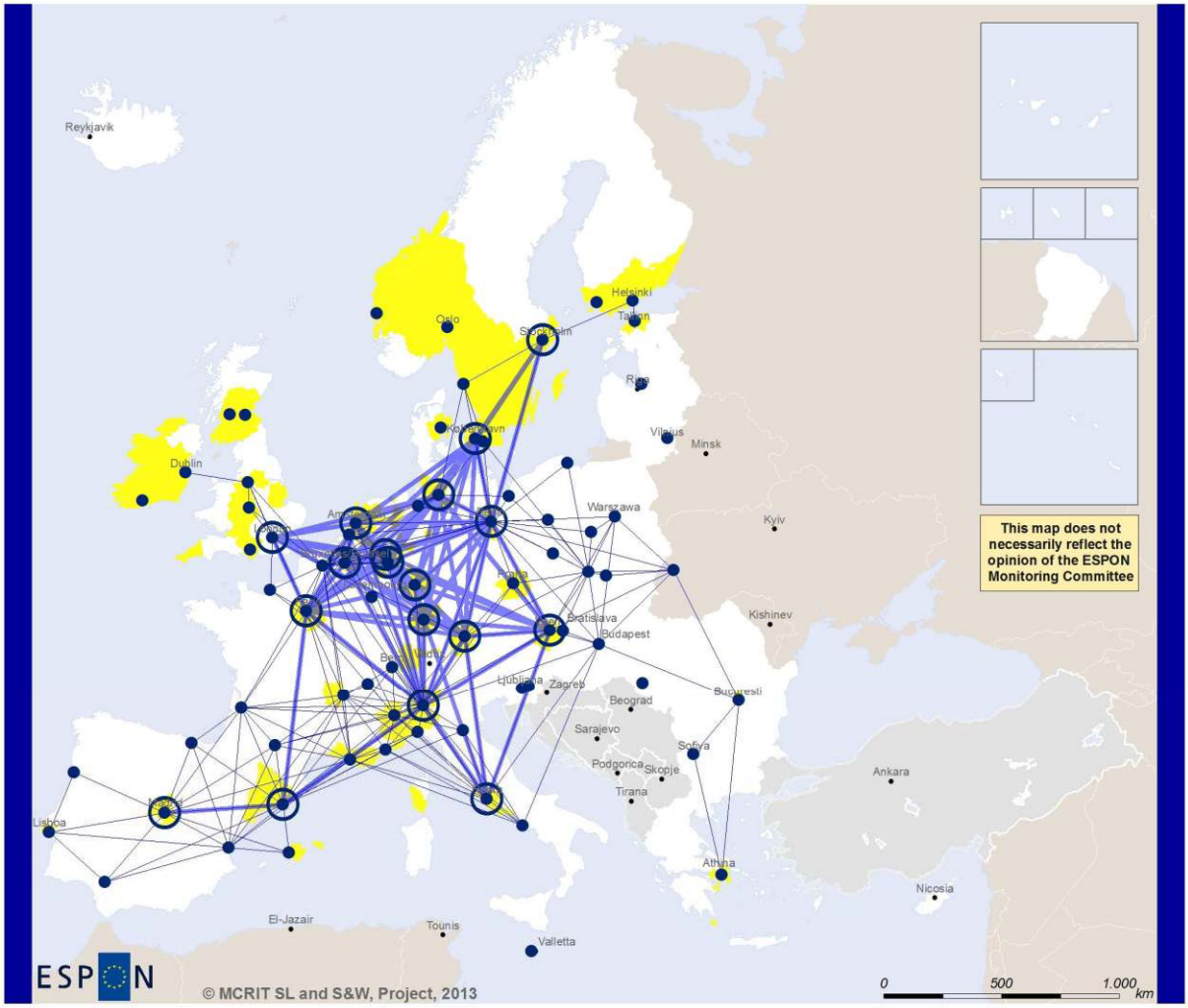
6.5 Conclusions

The simulations of 2050 scenarios by SASI support the hypothesis that the forces moving towards economic convergence are powerful and robust, despite the lasting effects of the present crisis, and will remain in effect. However, they will not be strong enough to close the gap between economic performance of the economically lagging new member states in eastern Europe. According to the simulations the MEGAs Scenario A performs best in terms of competitiveness and economic growth, whereas the Cities and Regions Scenarios A and B perform better in terms of territorial cohesion.

However, the scenarios presented so far differ only in two types of policies, EU regional policy subsidies and transport policies, with the framework conditions kept the same as in the Baseline Scenario. But there are other possible futures that may have a significant impact on the performance of the European spatial system. It will be the task of the forthcoming work to find out whether the impacts of the framework conditions and policies examined so far will be the same under significantly changed framework conditions and policies. This analysis will be carried out together with MULTIPOLES land-use forecast, further emphasising the territorial cohesion dimension of 2050 scenarios.

Next schemes illustrates some territorial cohesion implications of the 2050 scenarios.

Illustration of Scenario A



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Regional level: NUTS 3
Source: MCRIT, 2013
Origin of data: SASI model, 2013
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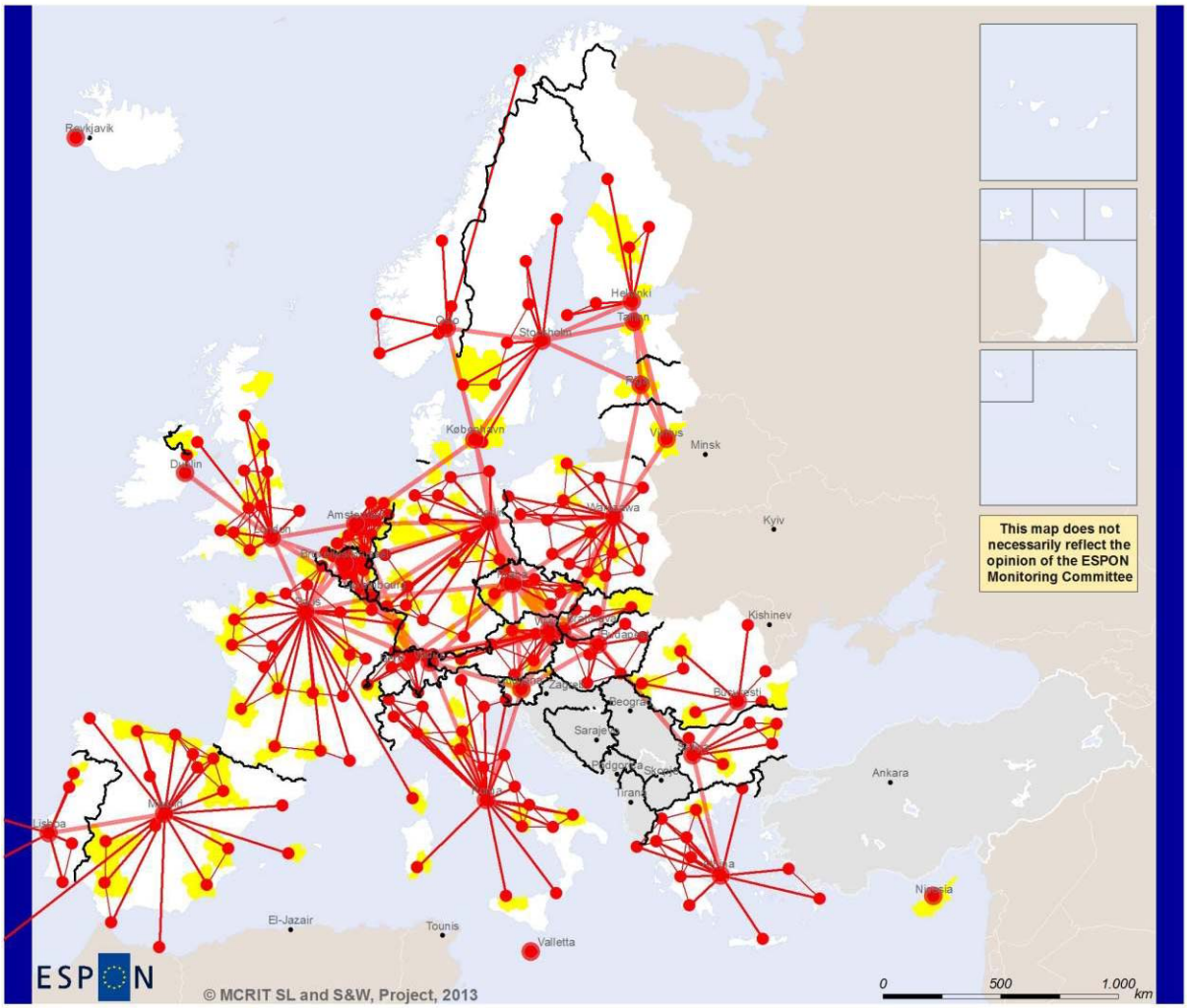
Illustration of Scenario A

Based on results obtained by SASI forecast model (2050)

- MEGA category 1
- MEGAS
- MEGA (category 1)-MEGA (category 1) links and length < 850 km
- All MEGAS- all MEGAS links and length <850 km (where population origin and population destination/length >5000)
- Relative increases in GDP 2051 per capita Scenario A/Baseline average over 50 (100=EU31 ave)
- No data (No ESPON space)

Figure 6-11 Illustration of Scenario A "Megas"

Illustration of Scenario B



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Regional level: NUTS 3
Source: MCRIT, 2013
Origin of data: SASI model, 2013
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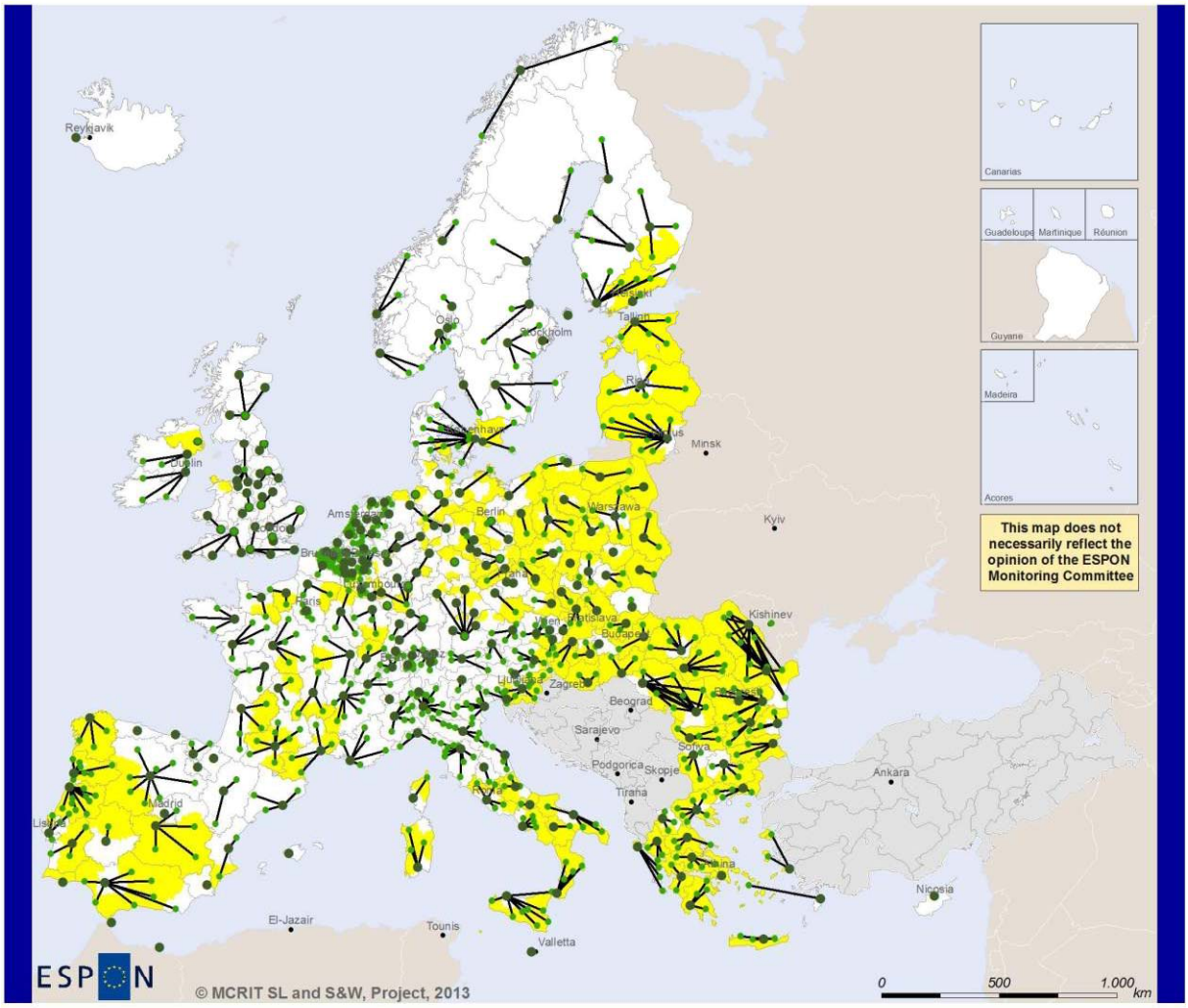
Illustration of Scenario B

Based on results obtained by SASI forecast model (2050)

- Capital NUTS0
- Capital NUTS2 (NUTS1 only Germany and United Kingdom)
- NUTS0 boundaries
- NUTS0-NUTS0 links and length <650km
- NUTS0-NUTS2 links intra NUTS0 (except Germany and United Kingdom)
- NUTS0-NUTS1 links intra NUTS0 (only Germany and United Kingdom)
- NUTS2-NUTS2 links intra NUTS0 and length <200km (except Germany and United Kingdom)
- NUTS1-NUTS1 links intra NUTS0 and length <200km (only Germany and United Kingdom)
- Relative increases in GDP 2051 per capita Scenario B/Baseline average over 100 (100=EU31 ave)
- No data (No ESPON space)

Figure 6-12 Illustration of Scenario B "Cities"

Illustration of Scenario C



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Regional level: NUTS 3
Source: MCRIT, 2013
Origin of data: SASI model, 2013
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Illustration of Scenario C

Based on results obtained by SASI forecast model (2050)

- Capital NUTS 2
- Capital NUTS 1 (only Germany and United Kingdom)
- Capital NUTS 3 (except Germany and United Kingdom)
- NUTS1-NUTS2 links intra NUTS2 (only Germany and United Kingdom)
- NUTS2-NUTS3 intra NUTS2 links (except Germany and United Kingdom)
- Relative increases in GDP 2051 per capita Scenario C/Baseline average over 100 (100=EU31 ave)
- No data (No ESPON space)
- NUTS2 Boundaries

Figure 6-13 Illustration of Scenario C "Regions"

6.6 Next Steps

To explore whether the ranking of the scenarios will change if the framework of spatial development changes or additional policies are implemented, exploratory scenarios will be simulated so far will be combined with different framework conditions and policies:

1 *Economic decline*: Globalisation and growth of emerging economies lead to real decline of the European economy.

2 *Technology advance*: New advances in labour productivity and transport technology result in significant reductions in production and transport costs.

3 *Energy/climate*: Rising energy costs and greenhouse gas emission taxes lead to strong increases of production and transport costs.

Next table shows the exploratory scenarios A-C simulated so far and their *variants A1-C3* at different spatial scales.

Spatial orientation of the scenarios	Framework conditions and policies			
	As in the Baseline Scenario	1 Economic decline	2 Technology advance	3 Energy/ climate
Promotion of metropolitan areas	A	A1	A2	A3
Promotion of large European cities	B	B1	B2	B3
Promotion of peripheral regions	C	C1	C2	C3

Figure 6-14 Exploratory scenarios and their variants

Efforts will be made to improve the comparability of the scenarios simulated with SASI with the scenarios simulated with the other models by further adjusting the assumed framework conditions and policies modelled.

In addition the impacts of the scenarios on polycentricity at the European and national scale will be examined using the index of polycentricity developed in ESPON 1.1.1 and ESPON 1.1.3.

7. Conclusions and Policy questions

The conclusions and policy-questions presented in this chapter will be further analysed by SASI, as well as by METRONAMICA, for the 2050 scenarios, in order to support the discussions on Territorial Cohesion and European Territorial Vision.

First, a synthesis of modelling forecasts by sectors is presented. Then, a number of policy questions related to the Social and Economic Cohesion are discussed, and alternative Cohesion policy reforms introduced.

7.1 Synthesis of main trends by sectors

Present State of Europe in the world Trends

- From 1990s the World has experienced accelerated changes in terms of demographic growth (+12% between 2000 and 2010), information and communication technologies and information flows, integration of global financial systems, exponential increase of global trade (50% increase between 2000 and 2010), emergency of Asian economies (27% global GDP increase between 2000 and 2010), increasing oil prices and growing environmental concerns.

- While economic disparities at world level have been reduced (GINI index 0'66 in 2000 to 0,63 in 2008), internal social disparities within developed and emerging countries have increased.

- The economic gap between European countries and the rest of the World has been reduced since mid seventies (from 37% of Global GDP in 1970 to 28% in 2010), because of the lower economic growth in Europe, and the outsourcing of American and European industrial corporations mostly to export-oriented Asian economies still with very low salaries. This diminishing share of the world economy by European countries does not imply any absolute reduction but even exponential growth in many indicators, such as trade, tourism or intercontinental freight and passenger traffic.

- The European countries economies, in their way out of the crisis, are increasingly focused to increase exports with the rest of the world. In this sense, European economies may follow increasingly different globalisation patterns (e.g. UK closely linked to Commonwealth countries and USA, Spain to Latino America, Germany to China…). Extra-European trade may grow faster than intra-European trade, and catching-up development processes (e.g. Southern European countries in late 1980s and early 1990s, Eastern European countries in 200s…) may dramatically change.

Demographic Trends by MULTIPOLES

- European population growth will continue to grow in the Baseline scenario towards long-term stabilisation. No shrinking envisaged. Total population of 31 European countries will grow from 514 million in 2010 to 530 million in 2030 (less than predicted by EUROPOP 2010) and 539 million in 2050 (in line with EUROPOP).

- Future life expectancy has been underestimated in previous forecasts. Life expectancy observed in Europe in 2010 (77 for men and 83 for women; Eurostat data) were higher than forecasted in the EUROPOP 2010 Eurostat's projection and in DEMIFER's scenarios. Ageing is universal across Europe. Percentage of population 65+ over population on working age increases in Europe from 26% in 2010 to 40% in 2030. This will require complete rethinking of the spatial planning to adapt it to a large number of people with partial or full disability.

- Total cumulated migration between NUTS2 in Europe (internal and external) up to 20 million migrants between 2010 and 2030. High migration scenario A considers up to 21.4 million migrants, while low migration scenario C considers 18.1 million.

- Rural-urban migration and depopulation of many rural areas is expected. Despite an overall small increase in population, many regions are declining, especially in Eastern countries and some remote peripheral areas, mainly as a result of the intra-Europe emigration.

- Population growth is likely to happen in Western Europe and in regions with large urban agglomerations. Population growth is generated by immigration coupled with relatively high fertility.

- The re-population of rural areas with high life quality standards can be important in attractive areas like the Mediterranean coast or touristy areas of France and Italy, or Spain.

- Even on pro-family and pro-natalist policy scenarios like Scenario C, the number of births in the ESPON area is predicted to decrease. This is related to population ageing and the related decrease in the number of women in the fertile age.

- The decreasing number of births, combined with an increasing number of deaths results in decreasing natural change in most scenarios. Only pro-fertility scenario C is able to postpone negative natural increases (more deaths than births) until 2020.

- With a negative natural change, the growing extra-European migration will constitute a key balancing factor of population dynamics. Low fertility scenarios assumed high migrations (A and B) while the high fertility scenario C is a low migration scenario, providing all scenarios similar demographic figures by 2030 (528 million in Scenario A, 530 million in Scenario B, 532 million in Scenario C, 530 million in Baseline)

- The differences in the speed of ageing (expressed as the percentage change of ODR in the 2010-2030 period) between the exploratory scenarios and the Baseline generally follow the migration pattern assumed in the exploratory scenarios. High migration assumptions tend to slow down the speed of ODR increases.

- The result of substantially higher fertility assumed in Scenario C is hardly visible in ageing dynamics, as in 2030 too little time will have passed for most of children born between 2010 and 2030 to join the labour force. The impact of high fertility can be more important towards 2050.

Economic Trends by MASST3, up tp 2030

- The average GDP growth rate up to 2030 in the Baseline is of 1.89% (1.88 in Western Countries, 1.93 in Eastern Countries) which is slightly lower than the long run trend for Europe, because of the slow coming out of the crisis.

- GDP growth is positive in all European regions, with the exception of a very limited number of regions in Southern Europe, where the recovery after the crisis is not able to overcome the negative effects of the crisis in the first years of the period 2011-2030.

- GDP per capita growth for the largest macro-regions in Europe will continue to grow, but disparities will increase. For the 2010-2030 period, according to MULTIPOLES and MASST forecasts, out of the 132 regions below GDP per capita average in 2010, 84 are expected to experience further regression and only 54 are expected to progress positively.

- Total employment growth rate increases across Europe by 1.58% yearly between 2010 and 2030 (1.53 in Western Countries, 1.93 in Eastern Countries). Employment grows at a sustained rate in Europe meaning that large part of the recovery from the crisis comes from job creation. Part of the recovery, however, also comes from productivity gains, as signalled by the larger increase of GDP with respect to employment (1.89% for GDP against 1.58% for employment). Employment led growth noticed in some peripheral regions (Poland, Southern

Italy, Spain) where employment growth rate are high even in the presence of reduced GDP growth rates, meaning lower salaries. Productivity led growth is particularly present in Western and Northern countries which show a low employment growth rate, even in the presence of high GDP growth rates.

- In Eastern Countries, despite the negative population growth rates labour force is made available from active population leaving the agricultural sector (if Eastern countries' contribution of agriculture to total GDP decreased from 11% in the 1990 to 6% in the 2008, it is still higher than western countries', which is around 2,4% in 2008) as well as from unemployed people returning to work.

- An equilibrated increase of both manufacturing and service activities characterises Western countries. This suggests that a process of reindustrialization will take place in these countries.

- Decrease in off-shoring processes, especially towards Eastern countries which will increasingly suffer from the constant erosion of their relative advantage in low labour cost

- Productivity gains are limited in New 12 countries mainly for two main reasons: i) traditional reconversion from agriculture to manufacturing activities is more contained than during the 1990s (the share of agriculture reached 6% of total GDP, and therefore the more contained shifts to industrial activities generate more limited productivity gains than before); ii) New 12 countries are characterised by a shift of employment from manufacturing to services, evidencing a clear new stage of development from industry to services; however, this industrial reconversion does not bring with it gains in productivity, being the new services low-value added services, like commerce.

- The higher expansion of growth in the B scenario (2.31% yearly GDP growth, respect to 1.89% in Baseline) can be explained by the higher and more efficient exploitation in this scenario of territorial capital elements, of local specificities, present in both large and second rank cities that allows local economies to achieve higher competitiveness. The weak presence of equilibrated and efficient urban systems in the Eastern countries may explain why these area registers very similar growth rates between the A and the B scenarios, being both the result of growth based on efficient first rank cities.

- The low-growth Scenario C shows the advantage of Eastern European countries with respect to the Baseline, confirming that when cohesion policies are reinforced, their effect is visible. However, this scenario performs worse than all others, a result that underlines the importance of a "competitiveness" driven attitude, and at the same time reminds the relatively lower effect of cohesion policies when they are not accompanied by an endogenous effort in moving towards competitiveness. The two combined aspects, cohesion policies from one side, and local competitiveness from the other, can probably be the best recipe for growth.

Economic Trends by SASI, up to 2050

- According to SASI model, convergence in economic development between regions in Europe will continue after the recovery from the economic crisis, though more slowly than before the crisis, mostly due to labour productivity in Eastern Europe continuing to catch up with that in the more advanced member states in western and northern Europe, although not as fast as in the decades of 1990s and 2000s.

- According to SASI, in the Baseline Scenario the total GDP of the ESPON Space (EU31) is assumed to grow between 2010 and 2050 from €13,158 billion to €23,268 billion (of 2010), on average 1.44% annually (so less that the growth expected by MASST3 up to 2030).

- By 2050 there will still exist a significant gap in income between the prosperous old EU member states in western and northern Europe and the new member states in Eastern Europe, but

also in parts of Portugal, Spain, southern Italy and Greece, even though these regions will on average more than double their GDP per capita in these forty years.

- In the Baseline 2050, regions with the highest growth rates will be in the Baltic States and in Romania and Bulgaria. This is due to the highest growth in productivity expected in these countries and the allocation of Structural Funds. Despite its low GDP per capita, Polish regions grow less because they have shown lower productivity growth before 2006. Noteworthy are the high average annual growth rates in Ireland and Iceland despite their deep recessions in the course of the economic crisis.

- The pattern of GDP per capita in the Western and Northern Europe remains more or less as today with higher GDP per capita in the economically more successful metropolitan areas and capital cities and the traditional high values in Switzerland, Luxembourg and the north-European countries.

- In terms of GDP growth, the Scenario A produces the highest generative effects as public investment is concentrated in the largest metropolitan areas with the highest productivity, while the Regions Scenario C scores last as subsidies are directed primarily at peripheral regions with low productivity. The Cities Scenario B takes a middle position. The differences between the scenarios seem small in %, but if only subsidies are considered, they amount to between 400 and 1,000 Euro per capita annually in 2051 – not a bad multiplier effect if the total Structural Funds of 180 Euro per capita annually are considered.

Transport Trends

- High accessibility to intercontinental flights will mostly be available around core airports in Europe (London, Paris, Amsterdam and Frankfurt, or Madrid) as a global hubs. Several European capitals (Rome, Warsaw, Praha, Wien, Copenhagen, Stockholm, or Berlin), and large metropolitan areas (Milano, Nice/Marseille, Barcelona) will play a complementary role, while small regional airports will grow because of specific purposes (e.g. low-cost carriers, tourism, corporative flights…).

- Freight accessibility to extra-EU markets will be dominated, still as today, by Northern European ports, mostly by Rotterdam, Hamburg, Antwerp and Bremen, with the significant contribution of Felixtowe, the Hague and Zeebrugge. Limited growth of Mediterranean ports, especially Barcelona, Valencia and Genoa, not much other ports like Algeciras, Gioia-Tauro, Marsaxlock (Malta), Athens.

- The connexion between Second-Tier Cities and regions to main global hubs become a critical development condition. While more networked-like structures may emerge at European scale, increase hub-spoke hierarchical configurations emerge at global scale.

- Accessibility measured as the accessible population weighted by the time of reaching this population always improves when new infrastructure is built, excepts in regions where population declines. When considering the cost of using infrastructure, accessibility measured as accessible population within a limited travel budget does not increase everywhere. When higher travel costs associated to new transport infrastructure are not compensated by travel time savings, this may lower the accessibility in certain regions.

- The number of trips between NUTS3 in Europe increases in all scenarios between 2010 and 2030, between 61% in Scenario C and 86% in Scenario A. The largest body of inter-NUTS3 trips remains the trips due to personal affairs (private trips), followed by trips for holydays.

- Long distance mobility in Europe is expected to grow from 2010 to 2030 in all scenarios, between 32% (Scenario C) and 39% (Baseline 2030). All scenarios result in less overall passen-

ger·kilometres than the Baseline in 2030. The fact that the total number of trips inter NUTS3 increase much faster than the total passenger•kilometres indicates that trips tend to be shorter for all scenarios in 2030 than in 2010.

- Road will remain the main mode for passenger transport in Europe (between 62% and 70% in 2030 compared to 67% in 2010), but some degree of modal shift can be achieved depending on the policies applied. Rail has the highest growth potential in the Scenario C “Regions”, up to 12% in 2030 compared to 6% in 2010, but also the Scenario B “Cities” provides for moderate rail modal share increases, whereas Scenario A causes rail share to decrease by one half.

- Total travel time increases in Baseline 2030 by 41.7% against Baseline 2010, about +7% more than the increase of total trip kilometres (39.0%). This implies that the overall transport system is slower in 2030 than in 2010, for the Baseline. Scenarios B and C maintain approximately the same speeds as Baseline 2010, meaning that the total number of hours spent in travelling in Europe increases just at the same rhythm as the number of passenger•kilometres travelled (0.7% speed increase in Scenario B, and 1.8% speed decrease in Scenario C). Only Scenario A shows a 32% average speed increase.

- All Scenarios to 2030 show a relative decline of transport emissions and fuel consumption in relation to 2010. This is mostly due to the increase in vehicle efficiency (reduced emission factors in 2030 in relation to 2010), and larger shares of non-conventionally fuelled vehicles in the future. Scenario C shows the largest gains in environment, and the fact that the scenario is successful in increasing the rail share translates onto a relative factor decline of the CO2 emissions in relation to the total fuel consumption.

Environment and Land-uses Trends

- The combined impact of economic crisis with reduced GDP growth, and decarbonisation (e.g. the use of more environmentally friendly energy sources, savings and efficiency gains) leads to a net reduction of CO2 emissions specially in more industrialised and populated regions, even if there is a reindustrialisation process.

- New residential land use will mostly be allocated on areas that were agricultural land before. Moreover, urban land use classes show a stronger dependency with other urban land uses in their allocation then agriculture, forest and natural vegetation

- South-Eastern Europe and Western Europe, inland water bodies will remain attractive for new residential development; in Mediterranean and Western Europe, marine water bodies will remain attractive for the allocation of new residential land uses.

- Agriculture shows the largest decline in surface area, especially in Western Europe, followed by the Mediterranean region. Conversion from agriculture to all other land uses is expected throughout Europe, while new agricultural locations can mainly be found on land previously occupied by forest and natural vegetation.

- Forested areas are expected to increase in the first years of the baseline scenario, mainly due to the growth of existing forests. The increasing demand for land slows-down in the future due to increased land use competition with further urbanization, an increasing demand for meat and dairy products and the need to maintain a sufficient agricultural production, together with an increasing demand for bio-energy crops, all while meeting ambitious environmental goals, such as the GAEC standards for permanent pastures, the nitrate and water framework directive and the biodiversity action plan BAP).

7.2 Questions concerning Cohesion policies

The paramount question investigated in the future of social and economic cohesion in Europe in the coming decades. Next graphic displays the Gini coefficient for European regions in the 1980-2010 and 2010-2050 as forecasted by MASST3 and SASI.

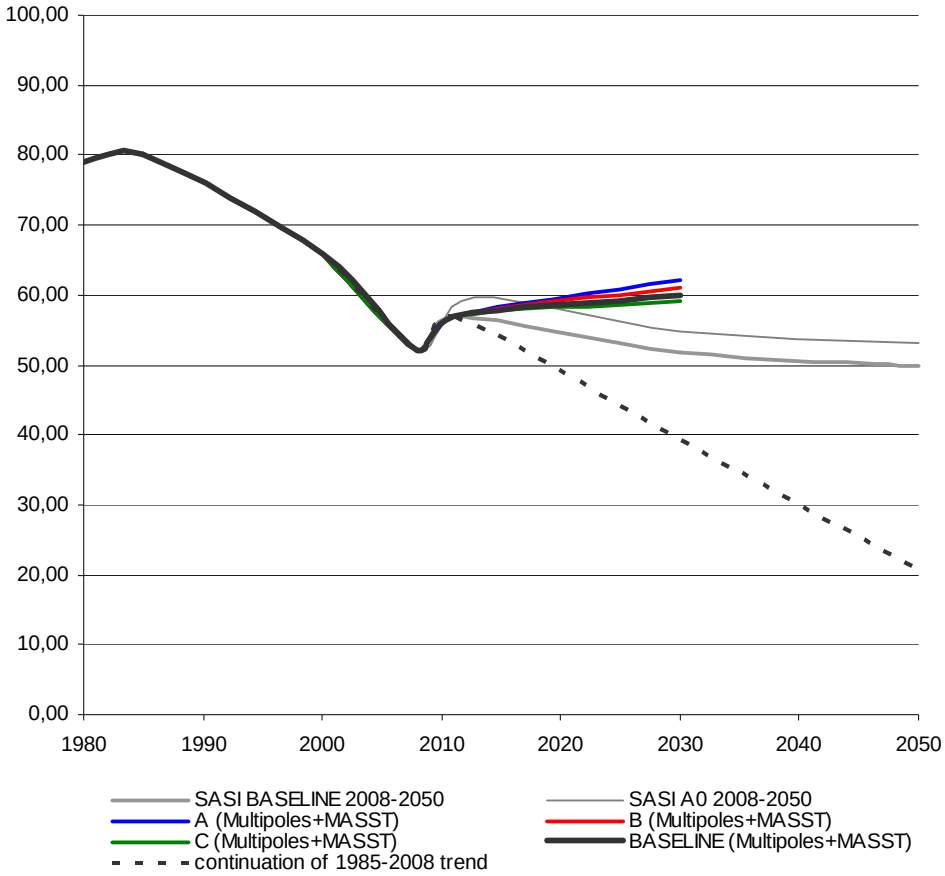


Figure 7-1 Cohesion indicators: Coefficient of Variation of GDP per capita. Source: MASST3, and SASI.

While MASST3 forecast slightly growing disparities for all A, B and C scenarios, up to 2030, SASI forecast a continuous but slow convergence for all scenarios, with moderate average economic growth, lower than MASST3. Both forecasts indicate therefore a change in the previous growth patterns.

Economic growth rates by SASI does not change much by scenarios, in average values, indicating that the alternative allocation of Structural and Cohesion funds, and differences in terms of intra-European accessibility (the policies being changed in the A0, B0 and C0 scenarios), may favour alternative regional redistribution of growth without changing the overall average growth.

Differences in MASST3 between scenarios are higher, since A, B and C involve different assumptions on monetary and fiscal policies. While accessibility (in terms of global connections, in MASST3) and Structural and Cohesion funds alternative allocations, produce marginal changes in the average growth, monetary and fiscal policies (e.g. debt reduction targets) results in changes up to 10% in annual GDP growth.

Alternative Reforms of the Cohesion Policy under discussion

The need to reform Cohesion policies was considered necessary by many experts and reports even before the current crisis [25].

- The first radical reform was proposed by André Sapir[26]. It was focused on reorganising Structural and Cohesion funds into three funds: a growth fund, a convergence fund and a restructuring fund. Eligibility for each kind of spending would be based on separate criteria. This would imply a major cut in agricultural spending and the devolution of spending for rural policy to the Member States. Along with changes in expenditures and revenues, the Sapir Report recommends changes in budgetary procedures, including the devolution of some responsibility for budget execution to actors other than the Commission.
- In the Lisbon Treaty, the concept of "Territorial Cohesion" was included together with Social and Economic Cohesion. With the adoption of the Territorial Agenda in Leipzig in May 2007 by the informal meeting of the EU ministers responsible for spatial planning and regional development the Commission prepared the Green Paper on Territorial Cohesion that launched a debate on Territorial Cohesion. Policy responses to these may lie in action on three fronts: concentration, connection and cooperation, the three key strategies of the place-based approach also advocated by the World Bank.
- In April 2009 a report developed by Frabizio Barca was published (*An Agenda for a Reformed Cohesion Policy*) taking in board the Territorial Cohesion approach. The Barca report describes as a most evident weakness of Cohesion policies a deficit in strategic planning as well as in developing a place-based territorial perspective There is some criticism in the Barca report concerning the impact of Cohesion policies in the previous Programming periods. It is recognised that the macro-economic impact was not demonstrated, and that a "policy-learning system" was not been much developed. Most of the Barca report ten pillars are focused on governance and institutional issues. According to the report, one of the main purposes of Cohesion policy is not redistribution but to trigger institutional change and to break inefficiencies.

Broadly speaking, building from all these debates, at least three radical policy reforms (not necessarily exclusive) should be further discussed, each one in line with the aims of the three Exploratory scenarios:

- A first alternative could be **renationalisation of Cohesion policies**, focusing EU role to establish and monitor common fiscal regulations and managing financial re-balancing transfers between countries, as well as promoting the quality of public administrations at local, regional and national level. European Structural and Cohesion funds as such will be replaced by sectorial programs of clearly strategic common interests such as strategic

[25] According to Andreas P. Kyriacou, in The Impact of EU structural funds on regional disparities within member states, a large body of work has analyzed the impact of the structural funds on the growth of regional GDP as well as regional and national convergence across Europe (see, Gripaios and Bishop, 2008 and Mohl and Hagen 2010 for reviews of the literature). In general, one cannot speak of a solid consensus in the empirical contributions: Some studies report a positive impact on regional growth (Becker et al 2010a, Dall'erba 2005, Mohl and Hagen 2010, Ramajo et al 2008). Others find no effects in terms of regional convergence (Esposti and Bussoletti 2008, Dall'erba and Le Gallo 2008). Still others find that structural spending improves national economic convergence across the EU (Beugelsdijk and Eijffinger, 2005). Andreas P. Kyriacou find that the structural funds have reduced within-country regional disparities over the period under examination. Moreover, our empirical results suggest that beyond some level of transfer intensity (approximately 1.5% of country GDP), the positive impact of structural funds is potentially reversed something which has implications for the desirable allocation of the funds across countries.

[26] An Agenda for a Growing Europe. Making the EU Economic System Deliver, Report of an Independent High-Level Study Group established on the initiative of the President of the European Commission. Chairman of the Group André Sapir,Members: Philippe Aghion, Giuseppe Bertola, Martin Hellwig, Jean Pisani-Ferry, Dariusz Rosati, José Viñals, Helen Wallace. (July 2003)

infrastructure, research and development, environmental protection, safety or security. Specific financing for projects could be channelled through the EIB.

- A second alternative for Cohesion policy reform may lead to refocusing and **strengthening the role of EC to achieve a territorial integration of sectorial policies at EU level, leading to an executive European Spatial Development policy**. In this case an "European Territorial Agency" is needed to cooperate with regions with geographic specificities and also with interregional cross-border zones like the Baltic or the Danube, and urban renewal projects on neighbourhoods with increasing conflicts could be promoted. Sectoral funds with direct territorial impact (e.g. Agriculture, Transport) will be integrated together with Cohesion funds.
- A third alternative for Cohesion policies reform could be introducing a **regionalised place-based approach** with local and regional institutions and special-purpose local institutions developing integrated territorial development strategies, with more innovative and flexible spending and more effective multi-level governance to coordinate sectorial policies at different scales. Transfers allocated to less developed regions may largely increase. The role of EC will be to become a centre of competence, and specialised knowledge resources and skills at the Commission should be strengthened to promote more effective support in policy development to less developed local, regional and national governments. Strong *conditionalities* will be applied to guarantee the efficiency and transparency of national and regional administrations being net recipients of European transfers..

8. Territorial Policy Assessment

Approach

The application of TIA to assess territorial impact of 2030 and 2050 scenarios is considered an essential part to give structure and provide knowledge support to the participatory process with ESPON MC and DG Regio intended at defining the 2050 Vision.

It involves defining the criteria (or "impact fields") and the weights (attached to each criterion/impact field) to be considered in the evaluation of scenarios, and identifying the relevant indicators needed. Criteria and respective weights have been determined through a participatory procedure involving all the TPG experts and the ESPON CU and MC, held between December 2012 and February 2013.

In terms of impact indicators, most of the necessary inputs to the TIA model are provided by the estimation and simulation procedures of the quantitative models and tools utilised in the project. Where this proves unfeasible, sets of complex indicators are provided built with statistical elaborations on the basis of group work and discussion inside the TPG.

Policy-relevant indicators are, in absence of more detailed data across the whole European territory, at NUTS2 level. TIA has already been successfully applied at NUTS2 level in the past for example in the frame of the ESPON ARTS project.

8.1 Weights of Impact fields considered under TIA

The definition of weights to compute aggregate impacts on macro-criteria has been a major milestone of the ET2050 project. It establishes from a policy point of view the criteria to evaluate the results of the Scenarios obtained through a scientific pathway.

This exercise was carried out based on inputs received during the participatory activities in the Paphos Workshop with ESPON MC (December 2012). The territorial impact fields were grouped in four mayor development fields together contributing to the overall welfare of Europe. The MC members were asked to indicate the relative importance of the impact fields within each of the four development fields, and to indicate the relative importance of each of the four mayor development fields in contributing to the overall welfare of Europe in 2050.

The findings are presented below:

Question n. 1

Please indicate what you think is the relative importance of the impact fields listed below in their contribution to the **economic development of Europe** in 2050.

Impact fields of Economy	Average value
GDP	25,4%
Employment (manufacturing + services)	28,7%
Innovation	19,3%
Tourism	8,4%
Accessibility	18,2%
	100%

Question n. 2

Please indicate what you think is the relative importance of the impact fields listed below in their contribution to the **social development of Europe** in 2050.

Impact fields of Society	Average value
Unemployment	33,8
Disposable income per capita	20,9
Road accidents	5,5
Risk of poverty	22,5
Net migration	17,3
	100%

Question n. 3

Please indicate what you think is the relative importance of the impact fields listed below in their contribution to the **environmental development of Europe** in 2050.

Impact fields of Environment	Average value
Land consumption	24,6
Emissions/pollutants in the air	27,7
Congestion	19,3
Flood hazard	15,2
Land erosion	13,2
	100%

Question n. 4

Please indicate what you think is the relative importance of the impact fields listed below in their contribution to the **territorial identity of Europe** in 2050.

Impact fields of Territorial identity	Average value
Landscape fragmentation	17,6
Creativity	20,0
Cultural heritage	25,5
Natural heritage	22,5
Multi-culturality	14,4
	100%

Question n. 5

Please indicate what you think is the relative importance of the four major development fields listed below in their contribution to the **overall welfare of Europe** in 2050.

Development fields	Average value
Economy – Smart growth policy objectives	28,4
Society – Inclusive growth policy objectives	26,8
Environment – Sustainable growth policy objectives	25,2

Territorial Identity policy objectives	19,6
	100%

8.2 TIA Expectations for Baseline and Explorative Scenarios

The most likely ranking of the pure spatial scenarios with respect to the major European goals competitiveness, cohesion and sustainability could be, as initial assumptions:

Scenario	Spatial Development Policy orientation	Expected Ranking with respect to major goals		
		Competitiveness (Smart Growth)	Cohesion (Inclusive Growth)	Sustainability (Sustainable Growth)
A Scenario "FLOWS"	Promotion of efficient transport and communication networks and competitive nodes and cross border corridors at European scale, as well as links to NC.	2on	4th	3th
B Scenario "CITIES"	Promotion of socially inclusive large capital cities	3th	2on	4th
C Scenario "REGIONS"	Promotion of endogenous potentials in small and medium size towns in self-sufficient regions	4th	3rd	2nd
VISION	Virtuous Balance among three policy orientations. Open Endogenous Development. Networks of medium size and large cities.	1st	1st	1st

Figure 8-1 Expectations on TIA scoring for ET2050 scenarios

In relation to TA2020 priorities:

VISION	Flows // MEGAs // Metapolis	Cities // FUAs // Metropolis	Regions // SM Cities // Ecopolis
Polycentric and balanced territorial development	Low	Very High	High
Integrated development in cities, rural and urban regions	Very Low	Low	Very High
Territorial integration in cross-border transnational functional regions	High	Low	Low
Global competitiveness of the regions based on strong economies	Very High	High	Low
Improving territorial connectivity for individuals, communities and enterprises	Very High	Very High	Low
Managing and connecting ecological landscape and cultural values of regions	Very Low	Very Low	Very High

Figure 8-2 Expectations on TA2020 priorities' scoring for ET2050 scenarios

ET2050 Exploratory scenarios were ranked in relation to the EU2020 goals of Competitiveness, Cohesion and Sustainability. MC Members were asked to adjust the proposed ranking for each of these goals in relation to the way they imagined each of the Scenarios.

No major changes were introduced and scenario rankings were maintained as follows:

Scenario	Spatial Development Policy orientation	Expected Ranking with respect to major goals		
		Competitiveness (Smart Growth)	Cohesion (Inclusive Growth)	Sustainability (Sustainable Growth)
A Scenario "FLOWS"	Promotion of efficient transport and communication corridors and competitive nodes at European and Global scale.	2nd	4th	3rd
B Scenario "CITIES"	Promotion of socially inclusive large capital cities balancing economic growth and environmental sustainability	3rd	2nd	4th
C Scenario "REGIONS"	Promotion of endogenous potentials in small and medium size towns in self-sufficient regions	4th	3rd	2nd
VISION	Virtuous Balance among three policy orientations. Open Endogenous Development. Networks of medium size and large cities.	1st	1st	1st

9. European Territorial Vision 2050

The final goal of ET2050 is developing scenarios with territorial dimensions up to 2050 in order to support a debate on the European Territorial Vision, and the European Spatial Development Perspective (ESDP).

In this respect, the *Global Europe 2050* report by EC (DG Research and Innovation), already presented a positive "**European Renaissance**" vision integrating the visions on the Roadmaps on Energy, Transport and Post-carbon Cities. According to the Europe Renaissance vision, Europe, forty years after the present crisis, has fulfil its original dream[27], becoming *an attractive and open society, with high quality of life and active aging, smart investments in local and global infrastructure supporting a knowledge-based economy. Europe is close to achieve its political Union and is playing a leadership role at World level. This scenario corresponds to a polycentric European territory, with sustainable cities, smart mobility and zero emissions, fulfilling the goals on energy efficiency and use of renewal sources.*

9.1 Path towards the Territorial Vision: Issues at Stake

Introduction

This section of the Interim report is dedicated to a preliminary work led by IGEAT to grasp a set of issues and clues from the existing literature and the participatory plan that could support the future conception of the Vision.

Therefore, this section put forwards some key issues and trends that shall be used in the future development of the Vision as a toolbox for further thought on this matter or a basis for further debates and discussions on the content of the Vision itself. This constitutes therefore mainly *food for thought*.

Another important point about this work is its main focus on the issue of embedding the future Vision for Europe in the European territory itself with its disparities in terms of governance models and strategies, territories, socio-economic issues, inequalities, planning values, etc. Such a concentration on Visions developed at a macro-regional scale has induced that we did not integrate in our synthesis issues related to the future of European governance as well as issues related to Europe in the world. These topics will be treated separately in the next steps of the work on the Vision.

Our preparation of the vision building process has been built upon a three-dimensional perspective:

- **Building a working method for a *grounded* Vision**, i.e. a Vision that is based on how several macro-regions in Europe envision themselves in a near future;
- **Synthesizing existing macro-regional Visions in order to grasp the key territorial issues** that should be discussed during the Vision building process[28];
- **Preparing the ground for a generation of the Vision** out of the exploratory scenarios, the participatory plan and the synthesis of the visions considered in our synthesis.

[27] According to Jeremy Rifkin, Europe has become the new "city upomn a hill" . The world is looking this grand new experiment in transnational governance, hoping it might provide some much needed guidance on where humanity ought to be heading in a globalisation world. The European Dream with its emphasis on inclusivity, diversity, quality of life, sustainability, universal human rights and the rights of nature and peace is increasingly attractive to a generation anxious to be globally connected and locally embedded (*The European Dream*, 2004)

[28] Further development on the macro-regional Visions can be found out in Annex … of this Second Interim Report.

A working method for a *grounded* Vision

IGEAT developed a specific working method to prepare the Vision design process as a first step to the writing of the Vision itself. It defines how the Vision interacts with the rest of the project. Based on earlier versions of working tools used in the project, it involves a set of adaptations and an improvement of the relations between the various parts of the project and, specifically, how they are supposed to feed the Vision.

We started from the project specification figuring the Vision as paramount in the broad design of the project, with a superposition of a politically-driven layer and of a scientifically-driven layer. We identified that in this version, the method leading to the conception of the Vision remains unclear, especially in its relation with the rest of the project and in the specific methods used to design it.

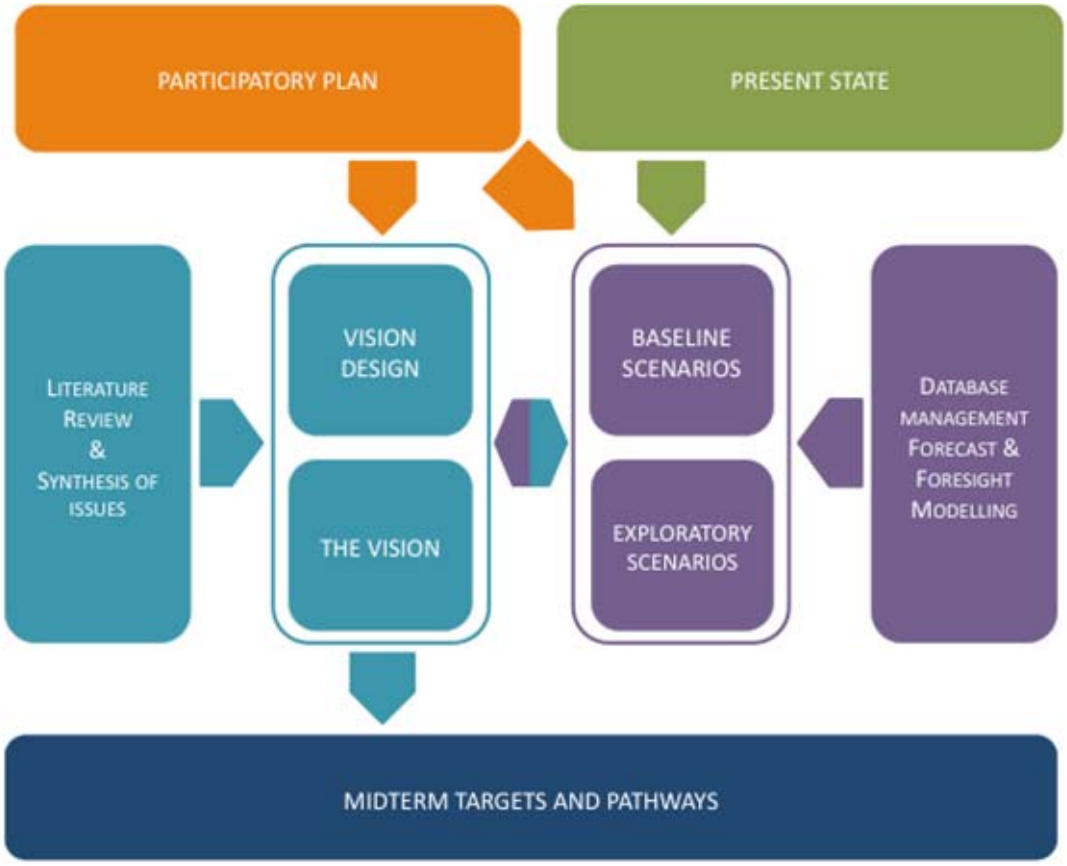


Figure 9-1 Path towards the ET2050 Territorial Vision

Therefore, we developed a reflection oriented towards the integration of the preparatory work of the Vision and, especially, on how this part interacts with both the participation plan and the exploratory scenarios, those latter being quantitatively informed.

The product of our reflection involves a concentration on a definition of the Vision as an attempt to integrate three poles: the already existing territorial visions for Europe and its territories (literature review), the participation plan led during the first year of the project and the exploratory scenarios which are currently under development.

Such a reengineering of the working structure involves a specific consideration of both the work led to feed the content of the Vision, a process based on both a qualitative and politically-driven perspective (literature review, participatory plan) and on a quantitative perspective based on a scientifically-driven approach developed through the modeling work and the exploratory scenarios.

A synthesis of existing macro-regional Visions

A very first step of our work on the Vision was the management of how the Vision should be *grounded* in European territorial specificities. Such an ambition has been reached by focusing on how various European macro-regions already envision themselves in the future by reflecting and producing policy documents defining pathways for their future development. In Europe, many documents of that nature were produced in the last decade, in a period of economic growth where optimistic views on the future were supported. This is of importance in the context of this report as the Vision should be envisaged as an optimistic view, a dream of the future of Europe, even though it is based on scenarios that are, in a context of economic crisis, far less optimistic.

To build up this very first step, we have used a set of sources that are illustrated by the figure above. This figure helps to show how specific macro-regions of Europe define their own future. This gives an overview of many important issues that are related, at first, to *territorial* ones, which are at the core of the Vision design process.

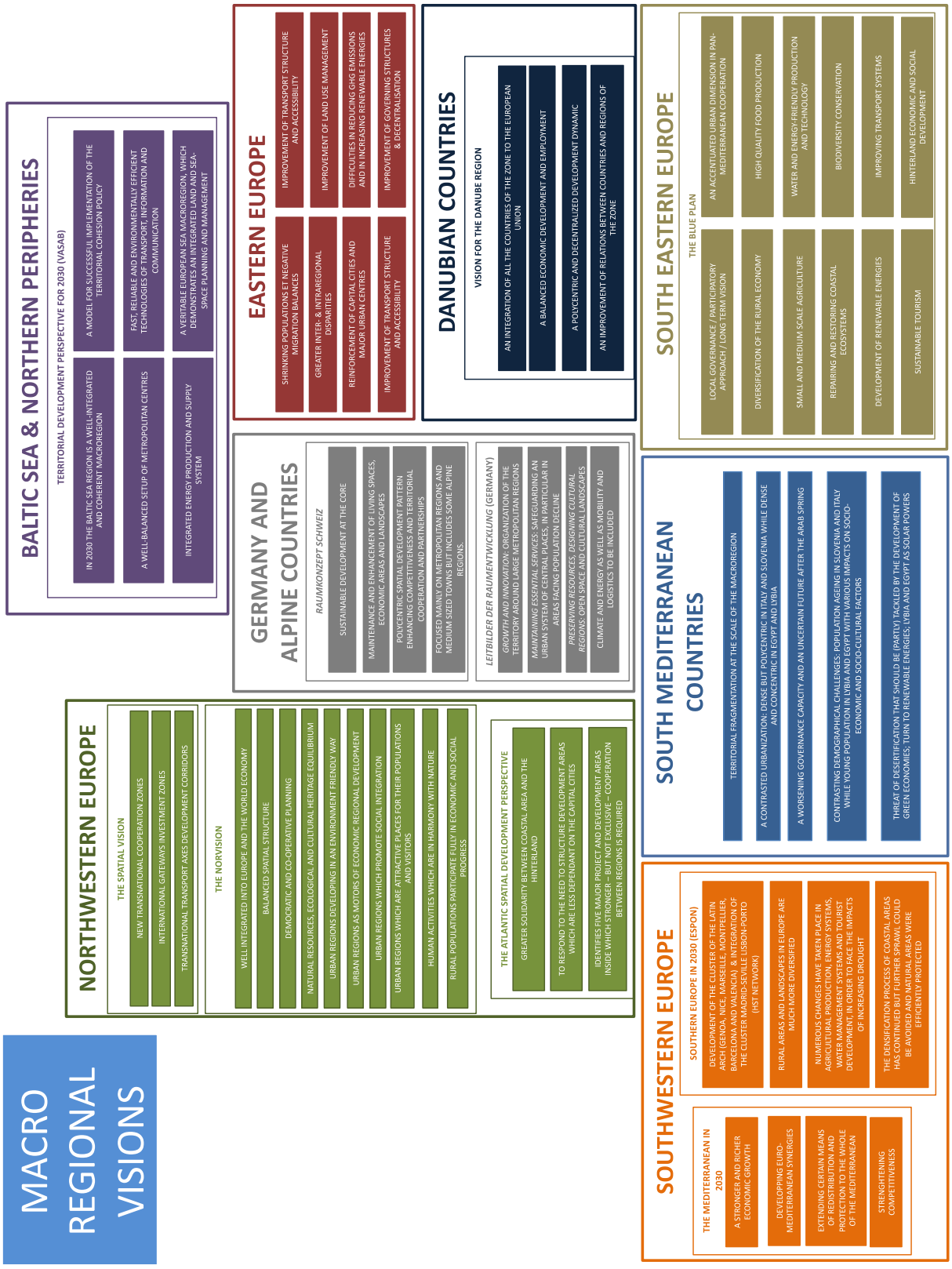


Figure 9-2 ET2050 Macro-regional Visions

For some parts of Europe where that kinds of documents could not be found out, we specify a set of strengths, weaknesses, opportunities and threats that are largely admitted as crucial issues for

the future of the region considered. Sectoral issues such as the future transformation of the economy as well as the environmental and demographic challenges have also been taken into account and integrated in the definition of the key issues for the development of the Vision. The results of this review, figured below, are of three different natures:

- **The Vision should be based on a set of common values for the future development of Europe**: such as cooperation between European regions; a polycentric territorial development aiming at the equilibrium of the broad European territory; a strongly interconnected territory; economic growth; a sustainable development; the reinforcement of local democracy, the development of a European governance that takes into account local specificites.
- **The Vision should integrate various kinds of territorial entities** (e.g. urban Europe, rural Europe and coastal Europe) facing specific common issues in their future development, as well as their interactions and interconnections in order to define territorial entities reflecting the European future economic, social and ecological dynamics;
- **The Vision should integrate a governance perspective that manages the constant evolution and transformation of the European territories.** The impact of climate change, energy scarcity, ageing population and economic transformations should be integrated in the instruments and tools that will be further developed to manage the development of European territories. Transformations in the maritime and coastal equilibrium, ecological, social and economic disequilibrium between Northern and Southern Europe and between Western and Eastern Europe should be take in account as well.

Combined to the Participatory Plan, this work has also contributed to pinpoints common and new issues and trends that should feed the Vision building process. Indeed, the participatory plan has provided important perspectives on how the future of Europe is envisaged and imagined by stakeholders involved in the European policies. The elements gathered include both shared values, most of all being common with the once identified in the literature review. Free-minded and innovative perspectives also emerged that could feed suggestions for the development of innovative perspectives and directions in the Vision. The participatory plan gives perspectives on the future of Europe that are of territorial, political, ecological, economic and societal natures:

1. **At a territorial level**, the Vision should integrate various kinds of governance structures set up to manage territories of different natures; enhance the importance of territorial cohesion and of a balanced development of the European territories; cities should be envisaged as a central place for the future of European development based on inclusive policies; a model of Europolis could be promoted in this perspective.
2. **At a political level**, the Vision should integrates various dimensions: its shared character remains crucial for its ability to master future policies and directions in economic development; therefore, an efficient and multilevel governance should be correctly mastered and organized as well; in this perspective, strengthening the rule of law on the European territory appears of a crucial importance for the correct implementation of European policies; politics should be organized at an urban scale; contrasts between a “Rurban” Western Europe and an Urban Eastern Europe might reinforce over the next decades and should be managed.
3. **At an ecological level**, the Vision should integrate the concept of a “resilient” Europe, i.e. a Europe that masters its ecological footprint; sustainable growth emerges as a key for tackling the future development of Europe but the directions to follow are not consensual; many topics appear central such as “Europe restores its Environment”, the reduction of the demand and resource consumption while sustaining the current levels of life quality or the plebiscite of a transition from an Industrial Age to an Ecological Age by the mean of an

inclusive, incremental and coherent development. Energy appears, therefore, at the forefront of many policy project with no consensus on the way to follow: energy efficiency, free energy for everybody, energy self-sufficient Europe, cities with net nil energy balance, decentralised renewable energy production, new ways of storing energy are key topics emphasized as central issues for the future development of Europe.

4. **At an economic level**, the Vision should entails various directions for economic development linked to the political, territorial and ecological trends identified: economic recovery and international competitiveness are pointed out for the future European economic development; in the current crisis context, many insist on the importance of a human scale production, of socially responsible companies, of a non-dependent Europe, of the re-development of local production by, for example, 3D printing; some emphasize also a new conception of economy especially of the inclusion of all costs of production of goods and services in the fixation of prices.

5. **At a societal level**, the Vision should include in its conception three main dimensions: demographical trends coupling an aging and culturally diversified population; a rising search for an improved quality of life entailing a redefinition of key concepts around slow society or another perspective on growth; culturally, emerge topics such as a search for improved aesthetics of the European landscapes, a new food culture as well as a non religious society

A prepared ground for generating the Vision from the participation plan and the exploratory scenarios

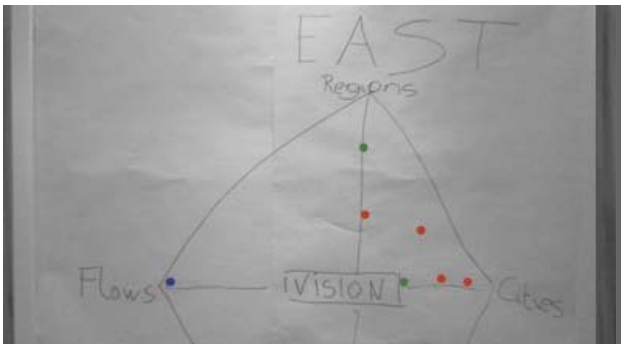
On account of this, our suggestion for the elaboration of the Vision is threefold:

- **A choice should be made on the *status* of the Vision itself:** envisioning Europe involves that a choice should be made on the combination of values and priorities orienting the pathway that should be followed. Defining a target within the room of maneuver defined in the Terms of Reference will be at the core of the Vision conception process. Following the method that we have developed, this means that how the results of the exploratory scenarios, the literature review and the participation plan will be combined to conceive a specific Vision for the territorial future of Europe should be clarified. Our suggestion is that, following the consensus on the necessity of a sustainable development for Europe, a Vision that makes possible such a perspective should be promoted and developed. Envisioning Europe therefore supposes that a specific language to talk about the future of Europe needs to be elaborated with clear definitions of the core concepts. As indicated, the management and the organization of specific territorial entities sustaining such a development perspective should be expanded and improved.
- **The future of the European territory should be clearly defined bearing in mind two configurations:** envisioning the future of Europe is a matter of territories and of spatial entities. The diversity of territorial configurations throughout Europe should be tackled and future disparities in the organization of regions and macro-regions should be anticipated and managed. Envisioning Europe through a specific territorial model should be done by taking into account national and subnational governance cultures while promoting a possible European model of territorial development.
- **The future dynamics of the newly defined European territoriality should be modeled in order to set up relevant governance structures:** encouraging and supporting a model of territorial development supposes a clear vision of the kinds of governance structures that could be developed to manage the various issues identified as structuring patterns of development as well as the various risks involves by the development model chosen.

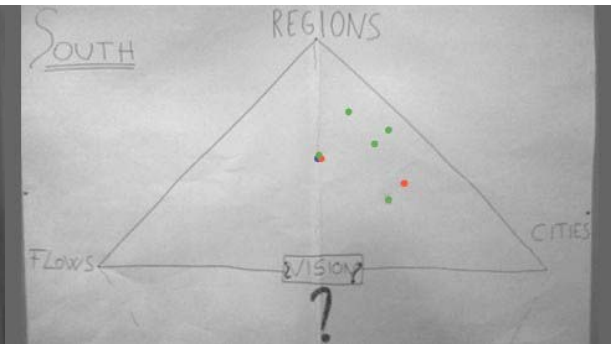
9.2 ESPON MC Workshop. December 2012

MC Members were asked to place their own ideal territorial VISION for Europe in 2050 in between the discussed ET2050 Scenarios. This exercise was done by placing a colored sticker within the ET2050 PS Scenario Kite. The choice of the color represents the preference for one or another scenario (blue for flows, red for cities, green for regions). Visions are ideologically closer to one or another scenario in relation to their relative positioning within the kite.

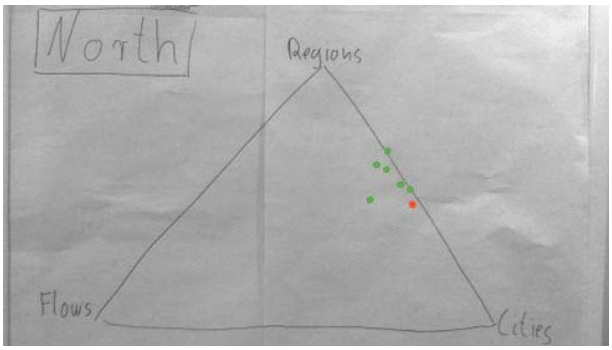
Results are shown below.



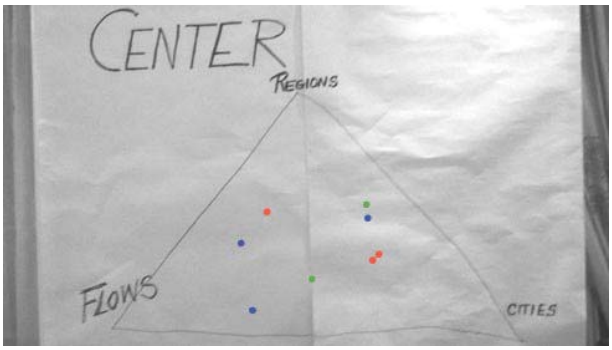
VISIONS of <u>Eastern European</u> MC Members



VISIONS of <u>Southern European</u> MC Members

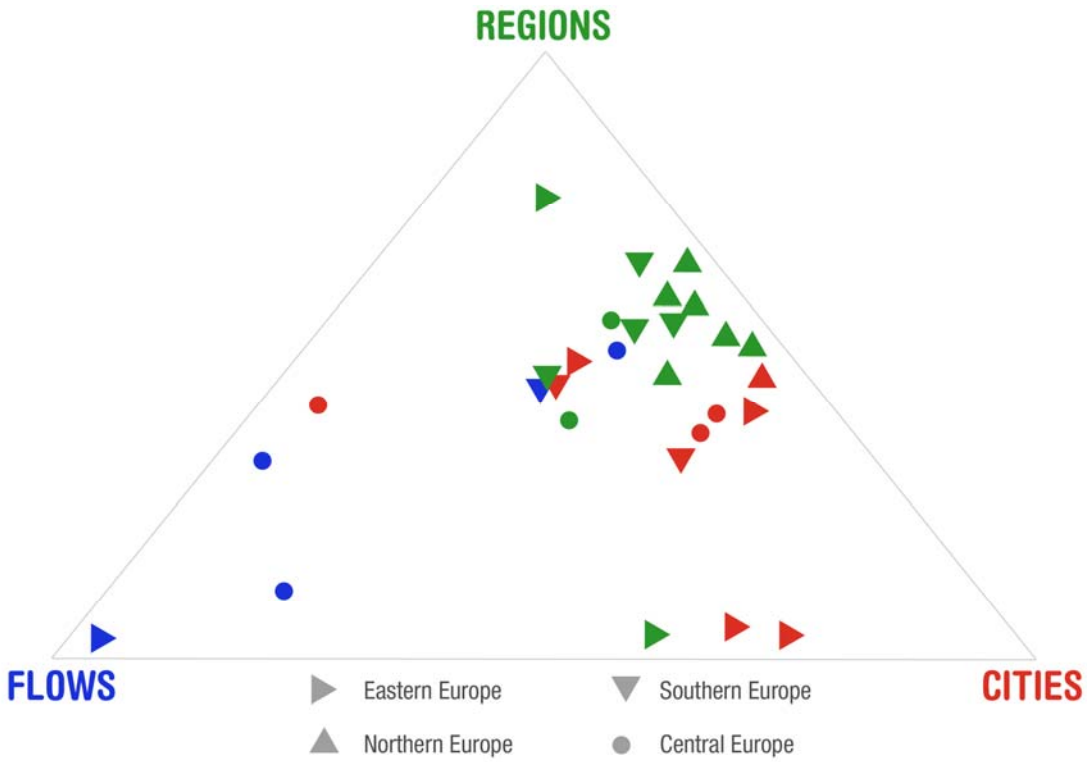


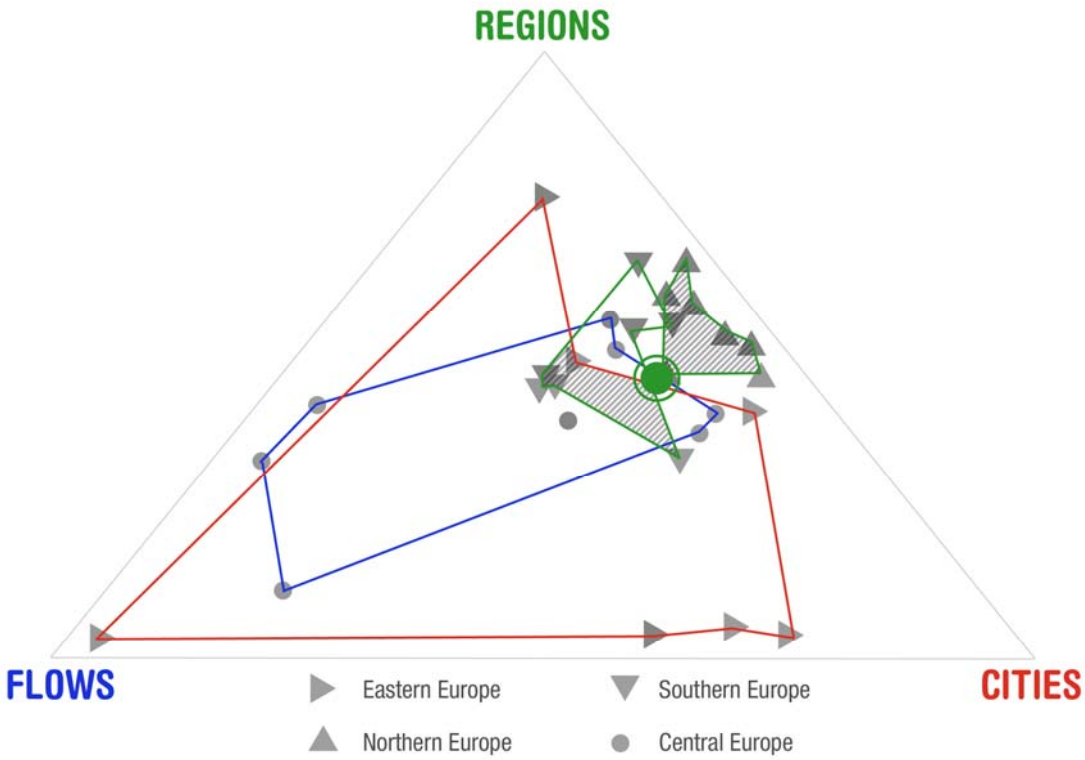
VISIONS of <u>Northern European</u> MC Members



VISIONS of <u>Central European</u> MC Members

The overall resulting picture of the exercise is presented in the first figure, while central values and contours to all responses by macro-region are presented in the second figure:




REGIONS
FLOWS
CITIES
Eastern Europe
Southern Europe
Northern Europe
Central Europe

10. Participatory Roadmap

10.1 Participatory Activities

Since the first interim report, several participatory activities have been taking place, as illustrated in the schedule infra, and the database of stakeholders has been completed. The phase 1 of Participatory plan (Parp), which was focusing on raising awareness of stakeholders about the ET 2050 project, and gathering their preliminary inputs to be taken into account in the elaboration of scenarios and Vision design process, was ending in January 2013. A first synthesis was provided in the first interim report, and a second synthesis, mainly using interviews with several Commission DGs, was produced by mid January 2013. (see Annex 6 to Second Interim report, Disc Note 41 "Report on Consultations of EU Bodies (v170113)" from http://www.et2050.eu/).

The 2nd phase of Parp began in March 2013, with a first presentation of results from baseline scenario to the Monitoring Committee, and will follow during 2013 (see schedule infra), on the basis of the material presented in this second interim report and its annexes, as well as a draft territorial Vision which will be produced for mid September 2013.

10.2 Activities implemented and related groups of stakeholders

A report on the first round of the Participatory Process (ParP) consultations was included in Chapter 2 of the First Interim Report of the ET 2050 project. Further consultations ('second round') took place between June 2012 and January 2013, as planned in the approved first Interim Report. This involved:

- To elaborate a survey distributed to participants of ESPON open seminar (June 2012, Aalborg, mainly groups 4 and 2) (synthesis available at ET2050 website as Disc Note 35 "Alborg scientific workshop qualitative comments (version 08-01-13)".
- To elaborate of a survey for the Monitoring Committee (group 1), and the implementation of a related workshop with the MC (28 September 2012), (synthesis ET2050 website as Disc Note 36 "Outcome of the 1st consultation of the MC about the Vision (version 12-11-12)". A second workshop with MC members (group 1) took place during ESPON seminar in Paphos (3 December 2012), (ET2050 website, Disc Note 40 "")
- To update and complete the database of contacts, mainly with stakeholders from group 3 and to send in October 2012 a "courtesy mail" to various stakeholders of Group 3 (private stakeholders), inviting them to take part in the second round of consultations: stakeholders from group 3 who expressed their interest in taking part in the consultations were first contacted by email. The ET 2050 presentation leaflet of the project (see 1st interim report, Annex ParP1 at www.et2050.eu) was attached to the invitation message, as well as a short questionnaire used for all the consultations (see first interim report). Nevertheless, only a very few of stakeholders from this group responded, which did not allow a synthesis at this stage.
- To carry on, in autumn-winter 2012, several bilateral interviews with representatives of Commission DGs (group 2): the main aim was to gather relevant information about the possible future of EU policies. Therefore interviews were organised with officials of various European Commission Directorates-General. An interview took place at the following DGs of the EC: DG REGIO (25th Oct.), DG MOVE (6th Nov.), Secretariat General (6th Nov.), DG RTD R&I (13th Nov.), DG ENV (16th Nov.), DG MARE (30th Nov.), DG AGRI (14th Dec.). To encourage free speech, it was agreed with the interviewees that they would remain anonymous.

They were asked to answer two main questions:

1. In an ideal world, how should the EU policy which your DG is responsible for evolve until 2050? (“the long-term policy scenario of your dreams”)
2. In the real world, what is, in your view, the most likely evolution of this policy until 2050 ? (“the long-term policy scenario you realistically anticipate”).

Apart from these two questions, the interviewees were also encouraged to address other issues of their choice, for example their comments about the ET 2050 work. The report in annex 6 synthesizes the outcome of these interviews, supplemented as appropriate by extra material drawn from these strategies / documents.

Furthermore, contacts were made with European Parliament (September 2012 and February 2013), Committee of the Regions (December 2012) and EESC (November 2012). Consultations will take place in the second phase of Parp (see schedule infra).

10.3 **Participatory Plan Update**

Phase 2 of ParP will adopt a different approach. The main objective is to gather input from the monitoring Committee members and from main EU stakeholders in the field of territorial development, in order to help to elaborate the Territorial Vision (TV). Another, related objective, is to build a sense of ownership of those stakeholders, and mainly of the Monitoring Committee members, for the Territorial Vision.

This involves presenting outcomes from ET 2050, based on the second interim report. The scenarios and first element of a territorial Vision will be presented to a large audience, including EU institutions, decision makers at different levels, and scientific experts.

The purpose will be twofold:

- Testing the relevance of the scenarios, focusing on elements to be used for the Territorial Vision;
- Testing a first draft Territorial Vision, to be delivered mid September, and collect relevant inputs which could help to elaborate further the Territorial Vision.

Since phase 2 will have the second IR as main basis, it should start around May/June 2013.

A first workshop with MC was nevertheless already taking place on Baseline scenario (14 March 2013), as well as a small group meeting (policy maker face to face consultation) with D Huebner, (EU Parliament, REGI president).

The complete list of achieved and foreseen activities involving stakeholder participation is detailed in Annex 0 of this Second Interim Report.

11. Innovative Visualisation

11.1 Website

Resources for participation are being developed aiming to disseminate project ongoing works and activities in a communicative, user-friendly manner, exploiting different media and facilitating interaction with potential participants in the process. The paramount aim is to generate interest for the project during the process of participation (for the stakeholders) and to increase the awareness of wider audiences once the project is over.

The ET2050 website has continued to be both an important tool to internally coordinate the work of the consortium, and to maintain an open platform for both communication and dissemination. In this direction, the website has kept being updated periodically to include the latest project activities, reference documents, and available materials for dissemination.

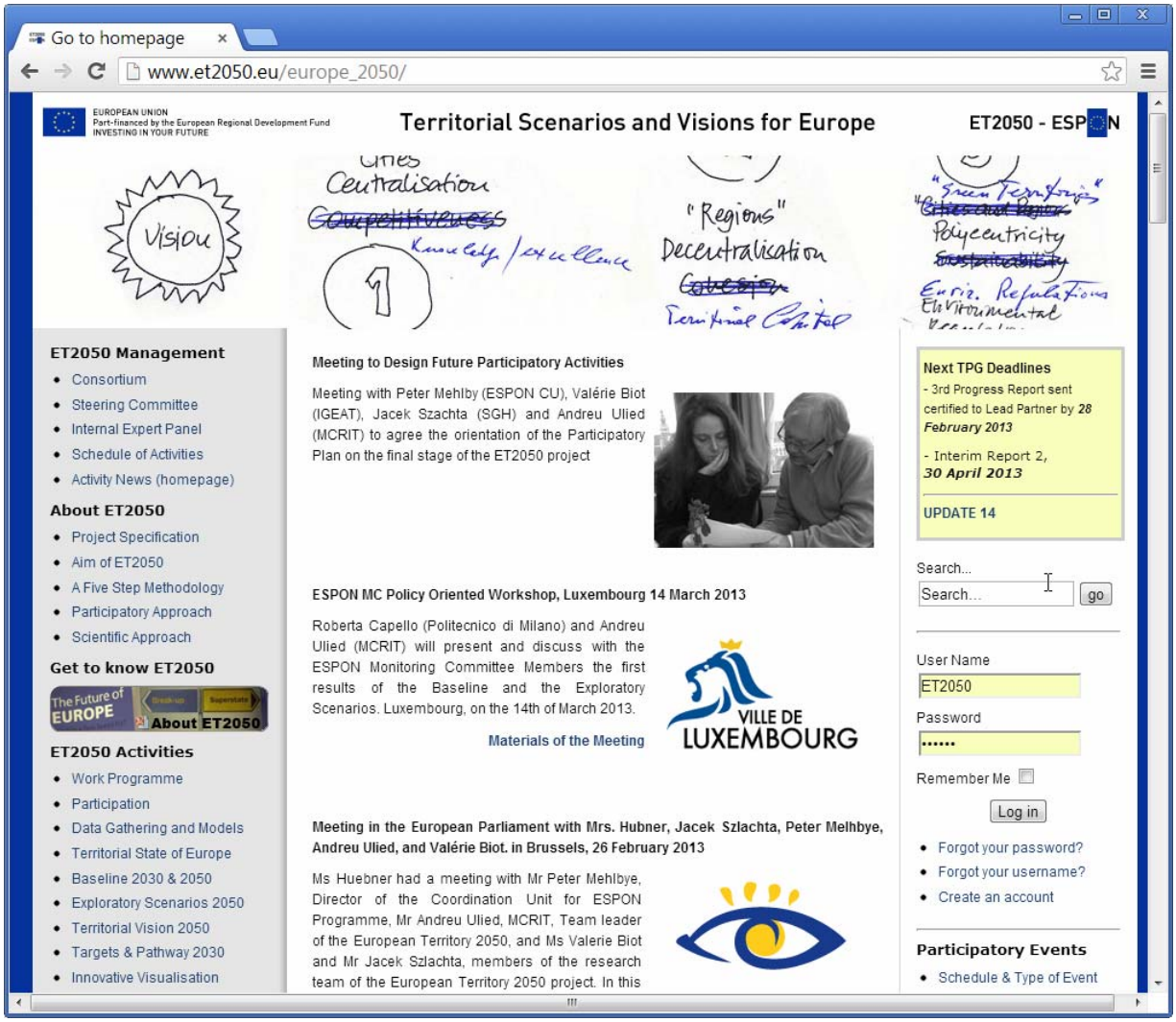


Figure 11-1 ET2050 homepage (www.et2050.eu)

11.2 Map Design Criteria

The criteria applied in the ESPON SIESTA project has been adapted to the needs of the ESPON ET2050 project.

The maps show the static data of each indicator. The data represented are ranked in 4 to 6 classes and presented as choropleth, where areas of NUTS0, NUTS1, NUTS2 or NUTS3 are patterned in proportion to the measurement of the statistical variable being displayed on the map. In these maps, data are represented in two variations of colours, a colour to represent negative values and the other to represent positive values.

The formats of maps (colours and ramps or data classification) are summarized below.

- **1 Title:** Description of data represented, year, scenario name (Style: Arial Bold, Size 18)
- **2 Subtitle**: Units used (Style: Arial, Size 15)
- **3 Map format:** Standard ESPON layout format
- **4 Legend:** ramps and data classification

The following colour ramps have been used for the mapping of the several ET2050 indicators:

Indicators represented	Colours ramp	Data classification method
Population and migration	Orange – Green	Equal Interval in 5 classes
Ageing	Orange - Brown	Equal Interval in 5 classes
GDP	Orange – Blue	Equal Interval in 6 classes
Employment	Yellow – Purple	Equal Interval in 4 classes
Accessibility	Green - Purple	Equal Interval in 5 classes
CO2 Emissions	Green – Red	Equal Interval in 5 classes

Figure 11-2 ET2050 Maps Design Criteria (www.et2050.eu)

11.3 Youtube/Vimeo Channel

A Vimeo channel has been opened to store multimedia materials produced by the ET2050 project.

A first video has been to produced to illustrate of the spirit of the different ET2050 scenarios, and presented to the ESPON MC in the Paphos Policy Workshop, to begin the discussion of the session. The movie depicted features of 3 alternative scenarios and the vision, along with extracts of interventions by key thinkers that provided narratives to the succession of images.

The individual interventions of the reference thinkers are also available at the Vimeo channel.

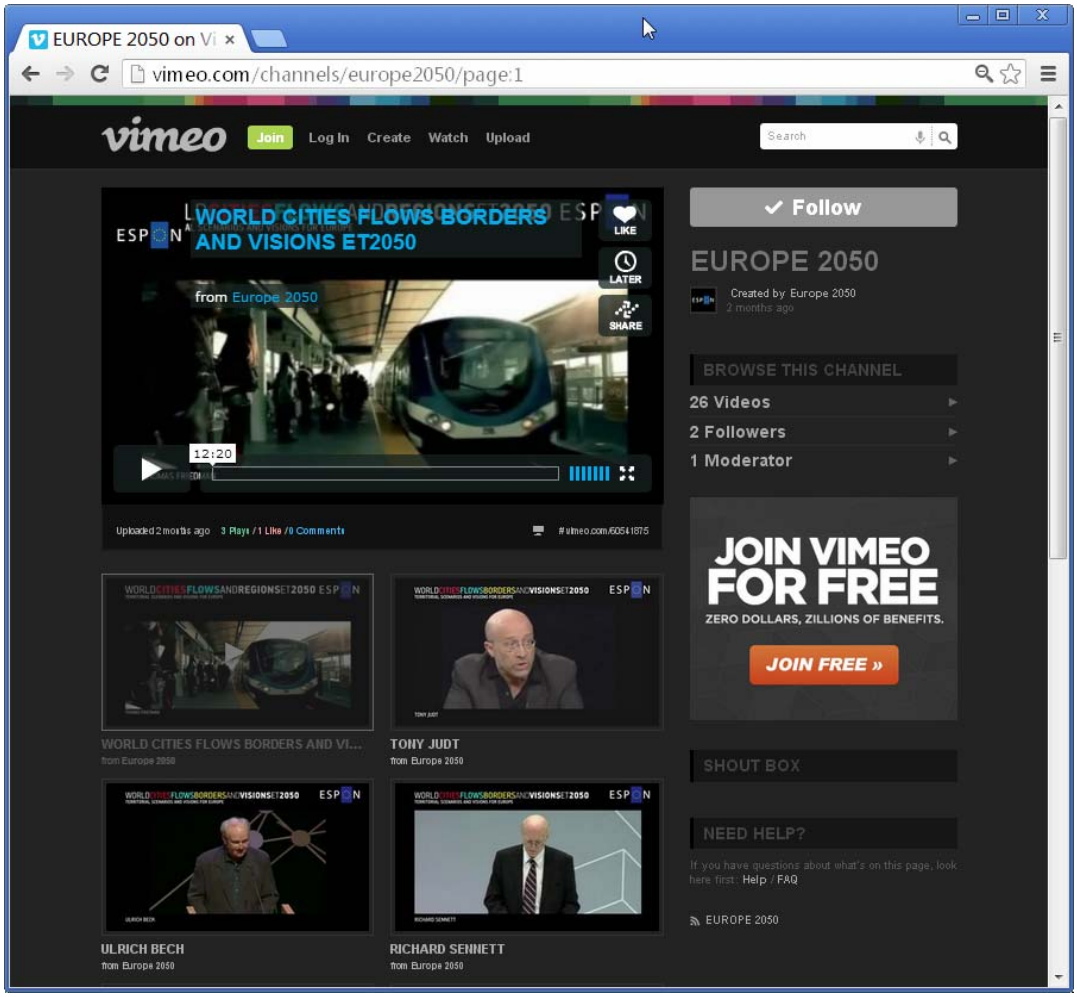


Figure 11-3 Vimeo channel for ET2050 (http://vimeo.com/channels/europe2050)

www.espon.eu

The ESPON 2013 Programme is part-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland. It shall support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory.