INTERIM
TERRITORIAL COHESION REPORT

(Preliminary results of ESPON and EU Commission studies)

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SUMMARY

Introduction

This report summarises the first results of the studies on territorial and urban development initiated by the **European Spatial Planning Observatory Network** (ESPON) and the European Commission's Directorate-General for Regional Policy. Some of these results were referred to in the Third Report on Economic and Social Cohesion which the Commission adopted on 18 February 2004.

This report offers provisional analyses which will be expanded as work progresses, particularly through ESPON.

The report starts with a survey of the Union's territory against the background of enlargement, looking at the main imbalances (population distribution, relative wealth and permanent handicaps) at appropriate levels of analysis and with a view to polycentric development. The second part analyses how territories rank in terms of factors of competitiveness by looking at the situations regarding research and innovation and access to transport, ICT and energy networks, since these determine the territorial imbalances identified in the previous chapter. At the same time, it looks at the main ways the Union provides assistance in those fields, both in terms of sectoral policies and through regional policy and the Structural Funds.

Territorial cohesion and polycentrism

Territorial cohesion, meaning the balanced distribution of human activities across the Union, is complementary to economic and social cohesion. Hence it translates the goal of sustainable and balanced development assigned to the Union (Article 2 of the Treaty) into territorial terms. Territorial cohesion includes fair access for citizens and economic operators to Services of General Economic Interest (SGEI), irrespective of the territory to which they belong (Article 16 of the Treaty).

In order to promote territorial cohesion, in 1999 the ministers responsible for spatial planning adopted the European Spatial Development Perspective (ESDP), one of whose guidelines is the promotion of polycentrism in the European Union. At Community level this means establishing development centres which are an alternative to the pentagon where half the wealth and 40% of the population are concentrated on 18% of its territory. At national and regional level, polycentrism means the promotion of complementary and interdependent networks of towns as alternatives to the large metropolises or capital cities, and of small and medium-sized towns which can help integrate the countryside.

Territorial imbalances in the enlarged Union

Imbalances between the centre and the periphery

Territorial imbalances in the enlarged Union will be substantial and quite varied in nature. There will be greater differences between the periphery and the centre in terms of population, wealth, access to the GIS, transport, energy, telecommunications and the information society, research and capacity for innovation.

With regard to demographics, there is a shift of population from east to west, with the exception of some parts of the north-western Iberian Peninsula, central France, parts of Scotland and Sardinia. Exceptions in eastern Europe include northern Poland, the regions of Slovakia bordering on Ukraine and Slovenia, the Budapest region, Cyprus and Malta.

By contrast, in GDP terms, the main cities of Poland and the capital regions of the ten accession countries are enjoying a higher level of growth than the present Union, although they are still well below the Community average. London, Spain, Italy, Ireland and some regions of Finland also have a high level of growth in GDP compared with the enlarged Union as a whole.

Urban areas

As regards the configuration of urban systems, the contrast between the central area of the pentagon and the urban areas on the periphery is striking. A large number of the large metropolitan centres (MEGAs) in the central area play an important role at European and/or international level and contribute to the competitiveness of the pentagon as an area for global integration. Competitive MEGAs exist in the periphery but they are isolated from their hinterland and not integrated into urban systems. 45 potential MEGAs have been detected, which could, with appropriate policies, become centres for sustainable development, constituting an alternative to the pentagon and so contributing to polycentrism in Europe. This is especially true of Lyon, Marseille, Birmingham, Manchester, Glasgow, Valencia, Bologne etc., which are surrounded by urban areas and which could act as the motor of development for their region.

At a smaller scale, gaps between towns in the centre and those in the periphery and gaps between areas within the same town are large. Levels of education, research and high-quality services are higher in the cities of the centre, but they also suffer from environmental problems and criminality. These problems, linked to those of social exclusion and unemployment, are concentrated within specific urban neighbourhoods. In a good number of cities, the highest unemployment rate by neighbourhood is between 3 and 5 times that of the lowest. By way of example, in Marseille the rate for the highest area is 58%, compared to 20% in the city centre.

Very considerable and complex changes have taken place in the relationship between cities and the countryside, ranging from the suburbanisation of the countryside to the complete isolation of the most thinly populated areas. This means that a variety of policies must be used to promote partnerships between town and country which take account of the problems of depopulation, integration and access in rural areas and the bolstering of economic activities in rural areas by building on their potential and natural assets.

Regions with geographic handicaps

Some areas of the Union have specific problems. These include the mountain areas, islands and the most remote regions, most of which are also islands or mountainous and which are handicapped by being far from the Union's institutional decision-making centres and markets.

The most peripheral mountain areas such as the Nordic regions and the mountain areas of Scotland, Northern Ireland and southern Spain show continuous population loss, lack of diversification of their economies and rising unemployment rates. The most extreme situations in terms of population are clearly the sub-arctic regions of Finland and Sweden, such as Kainuu (4.2 hab/km2), Laponie (2.1 hab/km2), Norbotten (2.6 hab/km2) et Jämtland (2.6 hab/km2).

Regarding the islands, the main handicaps are found in islands where a minimum population threshold, 3,000/4,000 habitants, is not reached. These islands, experiencing a declining population, see their access to physical and social infrastructures and other general services becoming worse.

The problem of market access and integration into their economic surroundings is clearly more pressing in the ultra-peripheral regions, where the unemployment rate can reach up to a third of the active population and the GDP/cap is in some cases less than 50% of the Community average.

The main forms of assistance for these areas comprise improving the factors of competitiveness, the diversification of economic activities, on occasion the improvement of environmental conditions and generally improving access.

Improving the factors of competitiveness to promote territorial cohesion

After looking at the main imbalances in the Union as regards the distribution of population and wealth and the geographical handicaps affecting certain areas, the report analyses the territorial imbalances which constitute *factors of competitiveness,* and which could correct the imbalances considered in the first part.

Research and Innovation

The *research and innovation* indicators show a high degree of concentration in the northern half of Europe as regards expenditure on research financed by both the public sector and companies, whether applied to human resources, tertiary training or employment in R&D and advanced technologies. Some regions in the future Member States, particularly those around the capitals, have research indicators which are more favourable than those in the regions currently eligible under Objective 1. R&D expenditure in the Prague region represented 2.5% of GDP/cap, 2% in Budapest, while it was less than 1% in all regions of Greece, Spain and Portugal.

However, as in the EUR-15, there are considerable differences within those countries, between the capital regions and the other regions; research and technology centres are concentrated in the capitals and a few other large cities.

The framework programmes for research have added considerable value in some areas, particularly in terms of innovation capacity, the development of innovation networks, the integration of new technologies and the creation of a partnership between cities and between firms and universities. Unfortunately, the Objective 1 regions have benefited only slightly from this programme and their participation is not in proportion to their population or GDP. However, the situation appears to be improving from the sixth framework programme, particularly with greater participation by certain regions of Greece, Lisbon and Ireland as a whole.

In the areas eligible under both Objectives 1 and 2, the Structural Funds have been the main instrument for expanding capacity for research and innovation in the least-favoured regions. Assistance from the Funds has become increasingly diversified and investment in re-

search infrastructure is accompanied by measures for the business environment, advice and projects for innovation and cooperation among small firms.

Accessibility

Transport

As regards accessibility in terms of means of transport, substantial gaps have been found between the centre and the periphery as regards both road and rail transport.

The indicator of potential accessibility by road shows three circles on the map of Europe: the centre circle which has an accessibility greater than the EUR-27 average, the intermediary circle between 100% and 40% of the average, and the peripheral circle with accessibility below 40% of the average. A number of peripheral areas (the Nordic regions, southern Greece, the west of Ireland) have an accessibility below 10% of the average, while some central areas of Luxembourg, Belgium and western Germany have an accessibility oftwice the average.

The indicator of potential accessibility by rail provides a greater distinction between centre and periphery. Regional disparities increase considerably and accessibility decreases relative to road transport in Greece, Romania, Bulgaria, Spain (except areas linked by the Seville-Madrid high-speed train), southern and central Italy and northern Denmark.

Air transport can improve access for certain major cities in outlying areas but does not help the situation in their hinterland. Connections between secondary networks and the trans-European networks are very poor both in peripheral areas and in some central and rural areas lying within the pentagon.

The analysis of the impact of investment in transport and of that planned for the TENs over the next 15 years shows substantial improvements in access and positive effects on production in the outlying regions and those eligible under Objective 1.

Telecommunications

Provision of telecommunications resources shows territorial differences far more marked than those affecting traditional transport infrastructure. There are substantial delays in the introduction and use of the internet by households and firms in certain regions. With the exception of the Nordic regions, broad-band networks are in very short supply outside the pentagon, particularly in medium-sized towns, rural areas and those which are sparsely populated.

It is precisely in the field of telecommunications that assistance from public funds is becoming essential if territorial imbalances in access to the information society are not to be aggravated. Analysis of investment in telecommunications demonstrates very positive effects, in terms of accessibility as well as economic growth, for disadvantaged regions and rural areas, thereby reducing their isolation.

Energy

Despite some mismatches in supply and demand, access to energy suffers from no major inequalities. Similarly, the liberalisation of this sector has not generated territorial inequalities as regards access, since the cost of energy is not a major component of production costs. However, the efficiency of energy consumption per unit of production and the introduction of energy from renewable sources is lagging behind to some extent in the new Member States and in most of the Objective 1 regions.

Conclusions

This preliminary analysis of territorial disparities in the Union demonstrates the need for coordination among the various Community policies which have a territorial impact and between those and national policies. The aim of territorial cohesion therefore presupposes the establishment of cooperation in both horizontal terms (between policies) and vertical terms (between operators and authorities at different geographical levels). It should become a general concern, integrating the territorial dimension into the design and implementation of Community and national policies.

The Structural Funds should concentrate on a number of areas of assistance to promote territorial cohesion and improve regional competitiveness, while improving access to outlying and rural areas and those which are thinly populated. The regional programming of the Structural Funds should also ensure that rural areas are integrated into the regional economy and partnerships between town and country.

Investment by the Structural Funds should therefore concentrate on the development of the trans-European networks (Objective 1) and the secondary networks (Objective 2). Telecommunications infrastructure and assistance for innovation and research are made all the more necessary by the need to reduce the gaps between the centre and the periphery and between towns and rural areas and to ensure equal access to information and knowledge. Promoting the use of energy from renewable sources and clean and sustainable transport should also become a priority to guarantee the environmental balance of the Union.

Introduction

A central aim of the EU, as set out in the Treaty (Article 2), is to achieve balanced and sustainable development, through the strengthening of economic and social cohesion. This implies a balanced territorial development that takes into account the important diversity of the territories within the European Union.

In the absence of corrective policies, the diversity of territories may easily lead to important disparities, often cumulative, in the physical and human capital endowment of those territories, ultimately resulting in significant divergences in terms of relative wealth, population densities and demographic flows which exacerbate the already divergent economic growth trends.

Several studies confirm that these imbalances can be observed at all scales of territorial analysis. At European level, the pentagon/periphery model still persist. Also, interactions between the urban and the rural sphere or the disparities existing within the urban sphere are too often disregarded at the intra-regional level. Furthermore, the geographical features of the territory, such as remoteness, altitude and slope, insularity, as well as population scarcity represent serious constraints leading to specific handicaps.

However, territorial cohesion represents an essential precondition for the economic and political success of the Community building process. In this regard, enlargement represents a specific challenge for territorial cohesion since it is redrawing the European map and it is adding further diversified territories (in terms of both development levels and capital endowments). Moreover, the economic convergence achieved by the new Member States has exacerbated internal asymmetries between the main urban centers, mostly the capital cities, and the remaining areas.

The first part of this report will therefore analyze the territorial imbalances characterizing the enlarged Community. A major focus of this part of the report will be on main urban poles, with regard to their economic and demographic roles and the phenomena of concentration together with the analysis of few polycentric development models. This section will also examine both intra-urban issues and the interactions between urban areas and their rural hinterlands. Areas with specific handicaps i.e. mountains, islands, outermost regions and scarcely populated areas will also be the subject of specific analyses.

Territorial disparities are often simply the reflection of strong inequalities in the endowment of these territories in terms of competitiveness factors which progressively lead to asymmetries in the distribution of physical and human capital. However, the Union can have a significant impact upon this developments through its structural instruments and its sectoral policies. In particular, services of general interest and the effective access to these is a determinant factor of territorial attractiveness and consequently of development prospects. It is in this respect that their role for territorial cohesion is emphasized in the Treaty.

Hence, the second part of the report is devoted to the examination of disparities in competitiveness factors, considering both R&D or innovation capacities, as well as access to transport, telecommunications or energy networks, and analyzing, where relevant, the impact of the related sectoral Community policies. The consequent conclusions should thus guide the implementation of the future cohesion policy, the reform of which is currently being debated.

Background studies of the report

This report is based on the major or provisional findings of the following studies:

- Studies launched by the Commission since 2001 and mainly: insular and outermost regions, mountainous areas, Urban Audit II.
- Studies undertaken by the European Spatial Planning Observatories Network (ESPON), representing the major part of this report. ESPON is a European network set up in Tampere under the European Spatial Development Perspective (ESPD), providing in-depth analysis of several territorial aspects. At this stage of the ESPON programme, final or well-advanced reports are available as the basis for several studies, addressing:
  (1) identification of relevant factors favoring a more polycentric European territory;
  (2) development of territorial indicators and typologies, to measure development trends and monitor the political aim of a more balanced EU territory;
  (3) development of tools for observing fundamental structural difficulties, as well as potential ones;
  (4) investigation of territorial impacts of European sectoral and structural policies, such as the Structural Funds;
  (5) development of other integrated tools in support of a balanced and polycentric territorial development, such as spatial scenarios for 2015 and 2030.

The ESPON studies are based on two key concepts relating to the balanced development of the European territory: territorial cohesion and polycentric development.

- **Territorial cohesion**: It is a necessary requirement of and complement to economic and social cohesion within the aim of sustainable development. Also, it is enshrined among the fundamental aims of the European Union, as reflected in the Treaty references:
- Art.2 of the Treaty establishes as central aim of the EU the promotion of balanced and sustainable development, which implies a balanced territorial development .
- Art. 16 acknowledges that services of general interest (SGI) should promote in particular social and territorial cohesion, in order to provide equal access to SGI to all citizens wherever they happen to live or work in the Union

Territorial cohesion has also been included in the draft European Constitution (Art. 3) in order to complement the objectives of social and economic cohesion.

The introduction of a territorial dimension of cohesion highlights the need to take into account, the diversity of the European continent in order to achieve the rich and complex meaning of cohesion. . Each territory has assets and faces constraints that development policies must assess and integrate to be efficient.

There is thus the need for a broader view of cohesion, encompassing many dimensions of territorial development and the associated interactions. In this sense, one major challenge is to improve the coordination of sectoral and development policies with territorial impacts. Another important challenge is to better integrate the European territories by reinforcing the cooperation and networking among them.

Polycentric development

With the aim of achieving a balanced and sustainable development of the European territory, the Ministers responsible for spatial planning introduced, in 1999, the principle of "Polycentric and balanced spatial development within the EU" into the European Spatial Development Perspective (ESDP). On a Europe-wide scale, this principle calls for towns and cities with sufficient population and economic size to interact directly with the main European and global decision-making centers and ensure greater integration within and between peripheral and central areas . Indeed, the ESDP holds that polycentric urban systems are more sustainable and more equitable than either monocentric urban systems or dispersed small settlements.

The implementation of a polycentric development model calls for a shift of current EU, national or local policies away from the centre-periphery thinking. Targeted support through EU structural policies, the creation of trans-national functional regions, support to specialised networks, the specialisation of urban areas, as well as institutional setting, transportation and communication links are important elements for achieving a more polycentric Europe.

The concept of polycentrism covers and must be analysed at three geographic levels:

At the European/transnational level, the main issue is to stimulate the development of regions beyond the "Pentagon" into becoming global integration zones that can compete as the pentagon at international level. A more polycentric structure, with several urban regions of European/global significance, can contribute to improving the competitiveness of Europe as well as to increasing cohesion between different territories. Zones of global economic integration offer high-quality global economic functions and services, which enable a high income level and a well-developed infrastructure. Important components of these zones are the internationally accessible metropolitan regions. These metropolitan regions are characterized by good accessibility, presence of enterprises' headquarters and international institutions, concentration of decision power, and a solid integration with global markets.

At the national/cross-border/interregional level, the challenge is to shift from the dominance of one (often capital) city to a more balanced network of cities, by improving economic performance and services through clusters/networks of neighbouring cities, and also coordinating national policies particularly across borders. This implies that higher-order services and minimum physical and social infrastructure need to be made readily available in all parts of the country in order to stimulate economic competitiveness and to improve territorial cohesion. In this respect, urban centers play an important role since they are responsible for large parts of economic activities. Hence, policies should focus on improving the competitiveness of neighbouring cities and urban functional areas (through clustering, networking, etc..), and on balancing the economically strongest regions and the rest of the urban structure. In mono-centric countries, this clearly implies a focus on the second tier of cities.

At the regional/local level, the challenge is to move from one or two dominant regional centers to several small and medium sized centers providing regional services, through strategic alliances between cities in regions, particularly where critical mass is lacking, and rural-urban partnerships by exploring common potential and joint development projects.

[Part I]
Territorial imbalances, interactions and new challenges in the context of enlargement

Territorial imbalances are numerous and significant in the European context. Their nature is very diverse and the forthcoming enlargement will increase them even further. Very important imbalances exist in the population density with extremes as high as 8778 inh/sqkm in Inner London and as low as 3.3. inh./sqkm in Oevre Norrland (Sweden). Numerous regions of the accession countries have a population density below the EU-15 average. Overall there is a great variety of spatial concentration, both in terms of population as well as economic wealth.

Further territorial diversity can be observed in the endowment of transport infrastructure of regions (roads, motorways, railways, airports and ports), leading to imbalances in connectivity and accessibility. In large parts of the accession countries, as well as in the northern periphery, the density of motorways and expressways (relative to population) is below 40% of EU-27 average, while high density (> 140% of EU-27 average) arises predominantly in the European core, as well as in a limited number of more peripheral zones (Spain, Latvia, eastern part of Bulgaria, central part of Greece).

As far as the knowledge society is concerned, the R&D potential as well as the progress of modern telecommunication technologies show very different levels and patterns among European regions, with a relative backwardness in a number of accession countries.

Territorial imbalances also exist in the structure of urban systems. European integration has favoured the growth of a large number of cities located in the central parts of Europe. On the other hand, competitiveness and attractiveness of the larger cities and particularly of the state capitals in peripheral countries and regions has also increased, but in a more isolated geographical context.

One problem for the 12 accession countries relates to their weak urban systems affected by poor inter-linkages and connections between their urban areas and the European Union which make polycentric territorial growth particularly difficult. This urban structure has deteriorated further as a consequence of the recent accelerated growth of their capital cities and at the expense of the other urban areas ultimately reproducing the model already observed in the peripheral countries of EU-15.

Within urban areas, very strong imbalances can be observed among the various agglomerations and conurbations. These imbalances are mostly significant particularly between cities and their surrounding urban areas.

Regarding the interdependence between urban and rural areas, a number of remote rural areas do not benefit enough from the stimulus generated by urban activity and are facing severe development constraints. There are therefore important territorial imbalances in urban-rural interactions, which is accentuated in the accession countries that have a rather modest tradition in the field of urban-rural relationships inherited from former regimes.

Finally, a number of regions face geographical handicaps, such as mountains, islands or outermost regions, while others are confronted with specific constraints such as very low population density or border areas with strong socio-economic discontinuities.

Territorial imbalances are therefore observed at various scales. Some have a rather permanent nature (regions with specific geographic handicaps), others have long-lasting character (imbalances in population density). Finally, disparities may arise in endowment of competitiveness factors such as education, research, accessibility to transport, and telecommunications which may be subject to changes, in particular when adequate policies are applied.

1. Imbalances in the European territory

1.1. Centre-periphery issues in the European context

Territorial imbalances between the centre and the periphery of Europe are the most striking feature of imbalances at European scale. As demonstrated in several studies on the successive enlargements of the European Communities/European Union, this process has reinforced the Centre. The ESDP recognised that there is currently only one outstanding larger geographical zone of global economic integration in the core area of the EU: the so-called "pentagon" delimited by London, Paris, Milan, Munich and Hamburg. This zone offers strong global economic functions and services, which ensure a high income level and a well developed infrastructure.

The centre-periphery imbalance can be observed in various fields. From a *demographic* perspective, regions with high population density prevail in the pentagon, such as Brussels (5932 inh./sqkm), Ile de France (912), Dusseldorf (995), Hamburg (2255), Zuid-Holland (1182), while regions and countries with a low population density are generally to be found in the periphery, such as Aragon (24.6), Castilla la Mancha (21.5), Corsica (30), Borders and Midlands in Ireland (29.7), Alentejo (19.5). The most extreme cases are the very low densities found in the Highlands and Islands (9.3) and in the northern periphery, such as Pohjois Suomi (4.3) or Oevre Norrland (3.3). This does not exclude that there are also regions with high population density in the European periphery, such as Campania (425), Attiki (906), Madrid (636), Bucharest (1238), Kibris Praha (2399), but these constitute isolated patches while in the pentagon they are the rule.

Centre-periphery imbalances are also very significant in terms of *accessibility*. The index of multimodal accessibility (relative to population) is three to four times higher in broad areas of the pentagon than in most of the peripheral regions. Examples are the differentials existing between Andalusia or Galicia on the one hand (roughly 50% of EU-27 average) and Baden-Wurttemberg and Zuid Holland on the other hand (roughly 150% of EU-27 average). A number of central regions (Brussels, Frankfurt, Amsterdam) even show values higher than 160% of EU-27 average while more peripheral and landlocked areas (Extremadura, Highlands, eastern Finland) have less than 40% of EU-27 average.

The picture is not very different if rail accessibility is considered. In this case, areas with low accessibility are more extended in Spain, Bulgaria and Romania. Only accessibility by air is the exception to a strict centre-periphery model, with a number of metropolitan regions in the periphery having satisfactory levels of accessibility thanks to the presence of large airports. It must be stressed that only accessibility in terms of transport of persons was taken into account. Accessibility in terms of trade and goods transport would show quite different results, with a stronger accentuation of peripherality as accessibility provided by air transport is marginal.

The territorial pattern of *R&D* functions also reveals important imbalances between central and peripheral regions. Strong territorial concentration at EU level is observed in the fields of R&D intensity, employment in high technology services and R&D infrastructure. For example, while the EU-15 average for R&D intensity, is 1.93%, the range of this figure varies between 4.5% for various German regions and around 0.77% for accession countries (excluding Malta).

The dominating importance of the pentagon in the European context could be confirmed in a number of other fields of territorial functions (cultural infrastructure, level of public transport networks, location of very large ports and airports etc.).

1.2. Changes in demographic and economic importance 1995-2000) [1]

The 1990s have witnessed important shifts in both the economic and demographic structure across Europe. Since for the time being a sufficient statistical observation of the ESPON/Eur29 space [2] is only available for the years between 1995-2000, conclusions for a long-term economic cycle are hardly possible. The contribution (in terms of change in both population and GDP shares) of each NUTS3 region to the total ESPON study area has been used as the basis of the analysis.

a) Changes in demographic weight

During the last half of the 1990s, there has been a sharp westward shift in population shares [3] along a dividing range from Trondheim in Norway via Copenhagen, Munich and Rome to Valetta in Malta (See Map 1). The westward drift has some exceptions, in particular due to depopulation tendencies in the north-western Iberian Peninsula, central France, parts of Scotland and Sardinia. Correspondingly the shift from Eastern Europe has several exceptions. In particular most capital regions display an increasing proportion of total ESPON study area population.

The territory of the EU15 clearly includes more regions with stronger relative increases in relation to total ESPON population than the accession and candidate countries. Within the Pentagon area the most homogeneous relative population gain was observed. London, the Netherlands, the north-western German and Denmark borders as well as the South of Norway, form an extended area of increasing population contribution, which ultimately aggravates the concentration problems of large urban areas. The whole of Ireland stands out as an exceptional increase to global European population.

Other sections of growing population are found in the coastal areas of the south-western European countries, such as along the entire coast of Portugal, the south-eastern coast of Spain (Costa del Sol) and France and along the French Atlantic coast. In Spain, the larger Madrid area is still strengthening its position to the detriment of many other inland areas as it is the case in Portugal and France.

In Sweden, large areas follow a decreasing trend with a clear monolithic [4] structure with Stockholm continuing to increase its contribution in population terms while the position of far-northern areas aggravates. Finland's increasing population contribution stems from several centers: the triangle Helsinki-Tampere-Turku and the Oulu region. More or less monolithic regions in the centre of Europe have increased their population (e.g. Berlin and its surroundings) as also occurred in Poland.

The three Baltic States suffered from significant population losses during the last decade and contributed less to the total ESPON population (an exception is found in the Taurage county). The contribution of the regions of Poland to the total EU29 population is varied. Regions on the Baltic Sea coast gain in proportion while many inner patches [5], especially the area from the south of Warsaw down to the Czech border, are losing significantly. Even the patches at the eastern and future external EU25 border to Belarus and Ukraine are following the decreasing trend. There are even some monoliths losing their weight, such as Warsaw, Posznan and Gdansk. However adjacent regions are counterbalancing the trend. The urban system extension of the pentagon from the EU-15 to the Czech Republic, Slovakia, Hungary and Slovenia largely forms an homogenous territory of relative loss. A Slovakian patch at the Ukrainian border displays the opposite trend, stretching over the Polish border regions into the proximity of Krakow. The loss of weight of the monolith of Budapest seems to be counterbalanced by its surrounding area, a pattern also observed in Poland. Slovenia is the only country in the enlargement area facing a modest relative population loss in all of its regions. Ljubljana is even improving its position in the ESPON study area.

Being part of the south-eastern declining territory stretching up to Hungary, Romania and Bulgaria are almost entirely losing in terms of demographic position,. However the patches at the eastern border seem to perform better, especially in Romania. It is here that the few regions with a relative population gain can be found, except for the Bulgarian capital of Sofia acting as a rising monolith in population terms.

Malta and Cyprus clearly succeeded in gaining population during the second half of the 90s with Cyprus being in the group of regions which heavily improved their positions.

(1) Cf. ESPON Project 1.1.3. "Options for spatially balanced developments in the enlargement of the European Union" (ODEN) led by The Royal Institute of Technology of Sweden (Division of urban Studies).

(2) ESPON space includes Eur27+Norway and Switzerland.

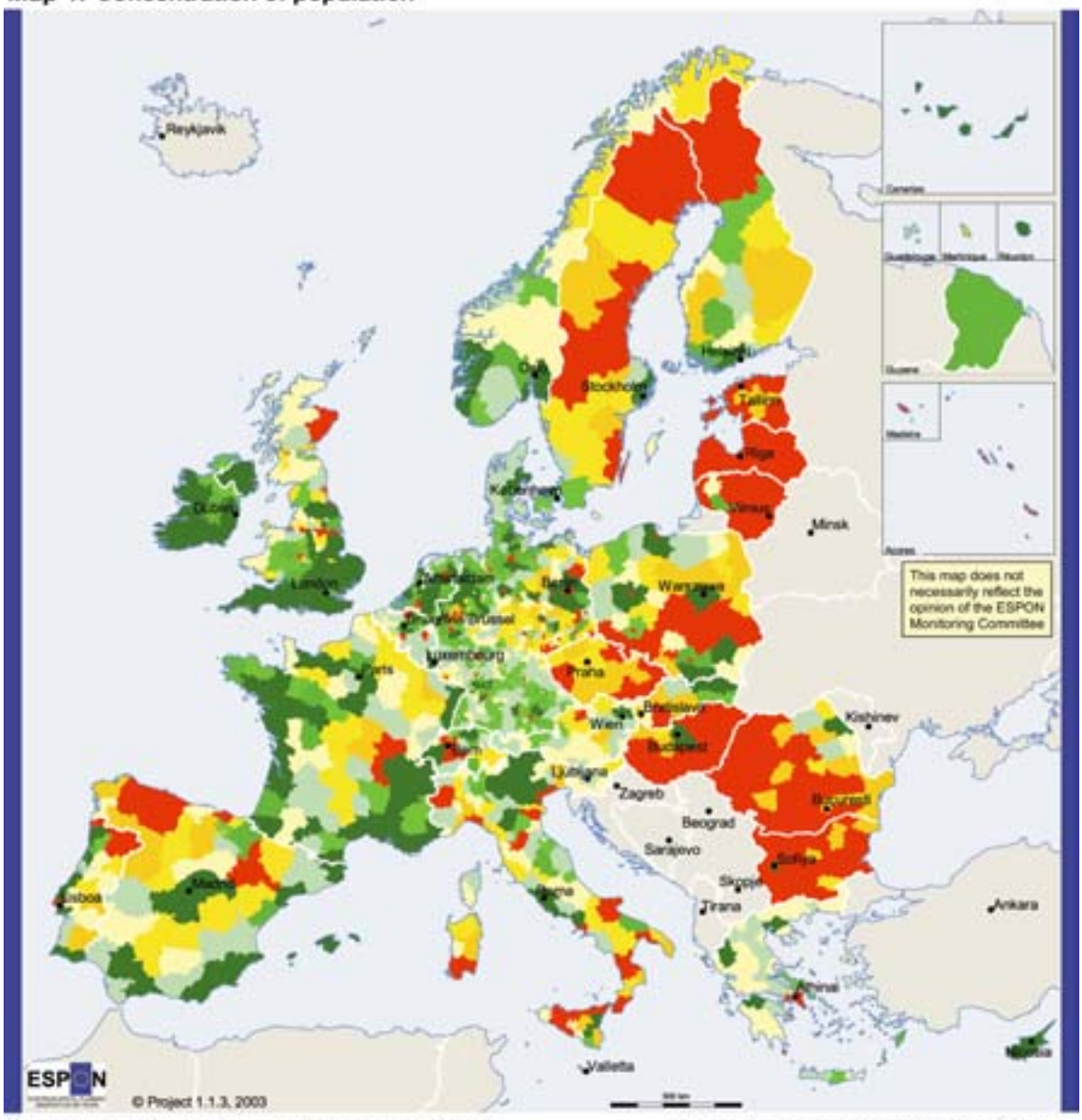
(3) Changes in population shares in Europe-29 population at NUTS 3 level (1995-2000).

(4) Monolith = region with European or national importance with increasing or decreasing contribution to the total, indicating a changing importance of a mono-centric regional system.

(5) Patches characterize a number of neighbouring regions within a country or in border regions with strongly diverse directions in their contributions to the total in an enlarged EU.

Summing up, the EU-15 has less problems, in demographic terms, than the accession countries. This is the main cause of the east-west shift observed. Main exceptions in the west are the north-western parts of the Iberian Peninsula, central France, parts of Scotland and Sardinia. These show a decreasing demographic pattern. Main exceptions in the eastern part, with an increasing demographic contribution, are the northern Polish regions, the Slovak border regions with Ukraine, Slovenia, the surroundings of Budapest, as well as Cyprus and Malta.

Map 1. Concentration of population



b) Changes in GDP weight

As against population, shifts in GDP show a decreasing contribution from Germany and Belgium to the European total, as well as from the whole of the French territory, with the exception of some of its coastal parts (See Map 2). Other major geographical areas characterised by a significant GDP loss are found in Scotland, especially in the city areas, and in Sweden except for the economic monocentre of Stockholm. Lappland and other Finnish areas on the eastern border also experienced a modest decline compared to strong gains in the Helsinki-Tampere-Turku triangle and Oulu. The South of England, Ireland, the Netherlands and the Spanish coastal areas are rapidly gaining weight in total ESPON GDP as it is also the case for their trend in population concentration. The contribution of almost all regions in Spain, Portugal, Italy and Norway to the overall ESPON-area economy show a rather polycentric development in terms of GDP gains. .growth.

Several regions of the three Baltic States have enjoyed significant economic growth and have hence increased their contribution to the total ESPON-area GDP level. However, this success is mainly based on growth in capital regions, without significant gains in other parts of the countries. This monocentric structure is especially evident in Latvia where the Latgale area has experienced the largest relative decline in income compared to all regions of the Baltic States. In Lithuania the growth area is extended around the capital of Vilnius but also the Lithuanian Baltic Sea coast could improve its contribution.

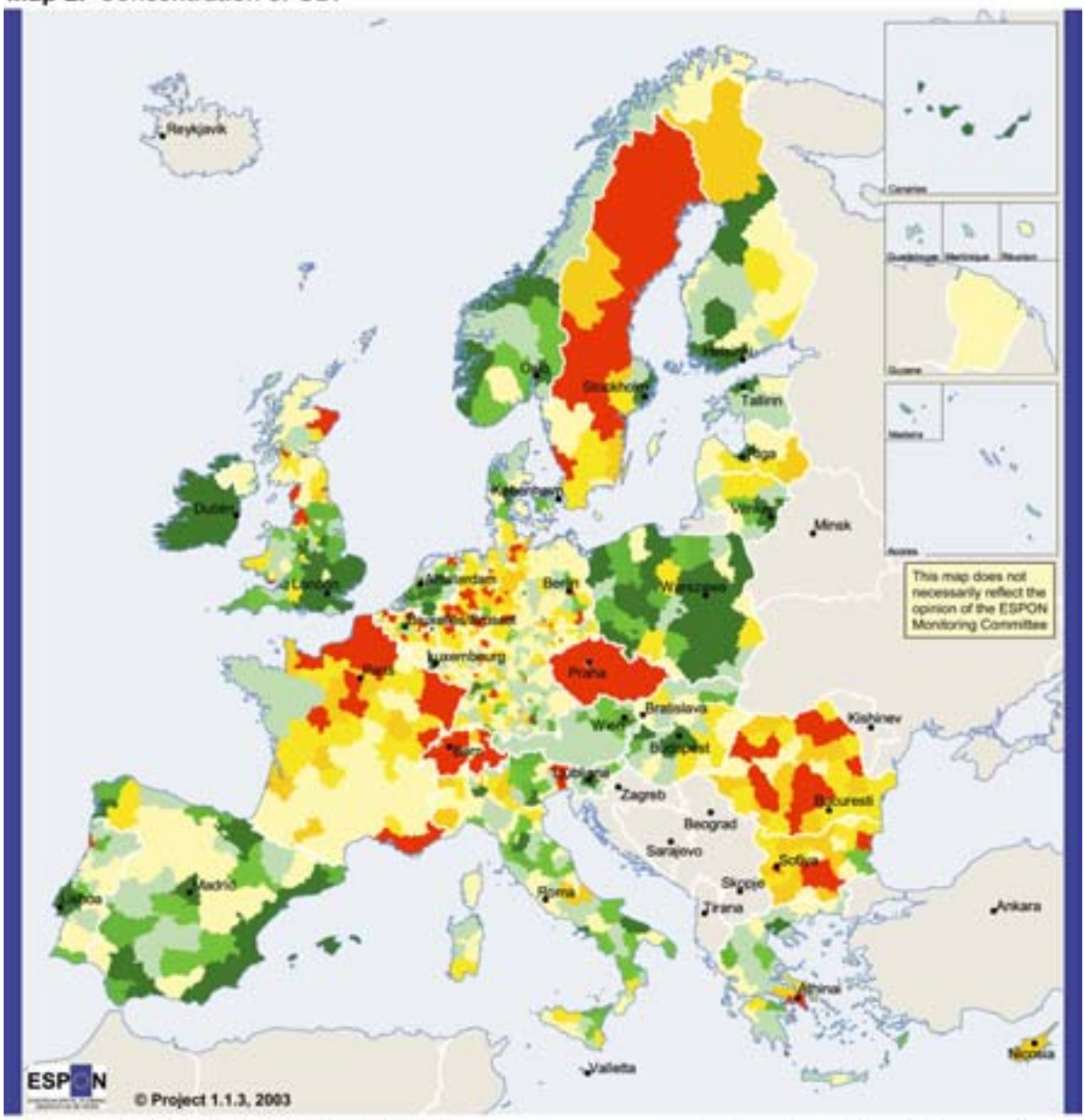
Poland's situation is significantly different from the situation of other countries of the enlargement area. In fact, in terms of wealth contribution to the total ESPON area it almost entirely represent a growing region. Major gains in Polish contribution were achieved not only thanks to the big city regions, but also thanks to the growth of virtually all any regions, and several different centres, including those along the German border and also some on the Belarusian and Ukrainian borders where, however, also some minor losses occurred,.. At the same time, two major growth areas seem to be currently developing in Poland, particularly along a North-South axis and centred around Poznan and Warsaw.

The Czech Republic, Slovakia and Hungary play different roles in terms of economic contribution. While the Czech territory faces dramatic losses in contribution except for the monolithic rise of Prague, a similar monocentric growth structure cannot be recognised in Slovakia and Hungary. These patches experienced minor losses and gains, but more balanced over their territories. In Slovakia, the gain is connected to the Polish North-South growth axis around Warsaw and hence it is situated on the Ukrainian border. In contrast, the Hungarian growing area is found on its Austrian border . Budapest, however, is strengthening its position in terms of wealth contribution, since it is the only area with strong relative wealth gains . The Slovenian patch is witnessing increasing wealth throughout the country. The centre of Ljubljana is leading this rise.

Romania and Bulgaria can be considerate as an economicly decreasing zone in ESPON terms. Varna, located on the Black Sea coast, is the only exception since it is still managing to gain economic weight in the ESPON space. Cyprus and Malta experienced differing trends in total GDP shares, with Malta gaining slightly while Cyprus faced a rather strong loss.

Summing up, the share of eastern countries in total GDP is increasing mainly due to strong contributions from large Polish areas and the EU10 (accession countries) capital regions. The eastern areas of Europe have experienced more monolithic growth relative to the ESPON area, especially in the three small Baltic countries and the Czech Republic. However, total shares of EU10 GDP in ESPON are still small compared to that of EU15. Besides the London-Netherlands patch, significant contributions to the total, outside the core, mainly came from Spain, Italy, Ireland, Denmark and some Finnish regions. The core of EU15 is consequently decreasing its strong contribution in terms of wealth in the ESPON area as for example in the case of Germany and France. The GDP share of Swedish regions is rapidly shrinking except for the monolithic growth of Stockholm.

Map 2. Concentration of GDP



Change in share of GDP relative to total EU29 GDP between 1995 and 2000, 1 unit = 0.001%

Relative gain	Relative loss
> 6.0	0 - -2.0
4.0 - 6.0	-2.0 - -4.0
2.0 - 4.0	-4.0 - -6.0
0 - 2.0	< -6.0

Origin of data: Eurostat, National Statistical Offices

Source: ESPON Database

1.3. The urban systems:

1.3.1. Concentration in capital cities and central conurbations; situation in accession countries ([6])

The description of the European urban system requires the identification of common criteria. In the choice of such criteria, functional criteria are, for many reasons, more appropriate than physical criteria (e.g. number of inhabitants, area). Thus, an attempt was made to find a common definition and delineation of Functional Urban Areas ([7]) (FUAs) at the level of EU-27+2 (EU27 + Norway and Switzerland). On the basis of this common definition, 1595 FUAs were identified in EU-27+2.

The analysis of these 1595 Functional Urban Areas confirmed that there is a dense urban structure in the central parts of Europe, stretching from the United Kingdom to the Netherlands, Belgium, western Germany and northern France, and continuing both westward of the Alps to include Italy, and eastward towards the Czech Republic, Southern Poland, Slovakia and Hungary. Countries further north and south are less populated and have less dense urban systems. This is especially true for Ireland, the northern areas of the UK, Norway, Sweden, Finland, Estonia, Latvia and Lithuania, but also for parts of Spain, Greece, Bulgaria and Romania.

In demographic terms, large FUAs (Map 3) are concentrated in the Pentagon, but there are extensions reaching down to Southern Italy and to Central and Eastern Europe, where there is a strong concentration of large urban agglomerations. In peripheral Europe most of the large urban agglomerations are more insular in character. For both private and public-sector investments, demographic characteristics constitute a fundamental element in determining the location of certain services and facilities.

The most crucial economic functions of FUAs are concentrated within the Pentagon:

- the capacity of influence of an urban system is not solely dependent upon its demographic weight, but also upon its economic attractiveness for private investors ([8]). Business headquarters locate in places with good accessibility and where they are close to business services. FUAs with significant decision-making functions remain highly concentrated in the Pentagon, and Stockholm is the only FUA outside the Pentagon that belongs to the group of most important FUA (see MEGA).
- the busiest transport nodes are to be found in the Pentagon. Not one accession country has a transport node of European significance.
- many industrial FUAs are exporting globally. Yet, even the smallest and the strongest FUAs are found in the Pentagon. Gross value added is often low in accession countries, except in capital regions and in Poland.

The knowledge function among FUAs is more balanced due to the location of universities within national educational systems throughout Europe. A similar pattern exists in the case of administrative functions which lead to strong hierarchies within national urban systems and where the capitals are the main nodes of the European administrative system. Tourism is concentrated in the Mediterranean coastal regions, showing a specific pattern of functional division of labour at EU level. At the same time, transport functions are mainly concentrated within the northern-most parts of central Europe.

A typology of FUAs (Map 4) has been elaborated according to their functional importance in the European context (population ([9]), transport ([10]), tourism ([11]), industry ([12]), knowledge ([13]), decision-making ([14]),

([6]) Cf. ESPON Project 1.1.1. "The role, specific situation and potentials of urban areas as nodes in a polycentric development" led by Nordregio and ESPON Project 1.1.3. "Options for spatially balanced developments in the enlargement of the European Union" (ODEN) led by The Royal Institute of Technology of Sweden (Division of urban Studies).

([7]) Most European countries have definitions of Functional Urban Areas or similar concepts, such as travel to-work-areas, commuting catchment areas, commuting zones or functional urban regions. The figures are in these cases built upon national statistics. However, Germany, Luxembourg, Belgium, the Czech Republic, Bulgaria and partly Spain and Portugal do lack an official definition. In these cases, the identification of FUAs was solely based on insights provided by national experts. The definitions used for identifying FUAs in each country are:
- FUA population over 50 000 inhabitants and urban core (agglomeration) with more than 15 000 inhabitants (i.e. excludes those artificially large 'urban' areas with minor urban core).
- Or FUA population more than 0,5% of national population and urban core (agglomeration) with more than 15 000 inhabitants (i.e. in less populated countries smaller FUAs were taken into account).
- Smaller FUAs were included if they had at least local importance in transport, knowledge or decision-making functions or regional importance in administrative, tourism or industrial functions.

([8]) The location of the headquarters of top European firms is an indicator of economic attractiveness.

([9]) Population over 50 000 inhabitants.

([10]) Airport with more than 50 000 passengers in 2000 or port with more than 20 000 TEU container traffic in 2001.

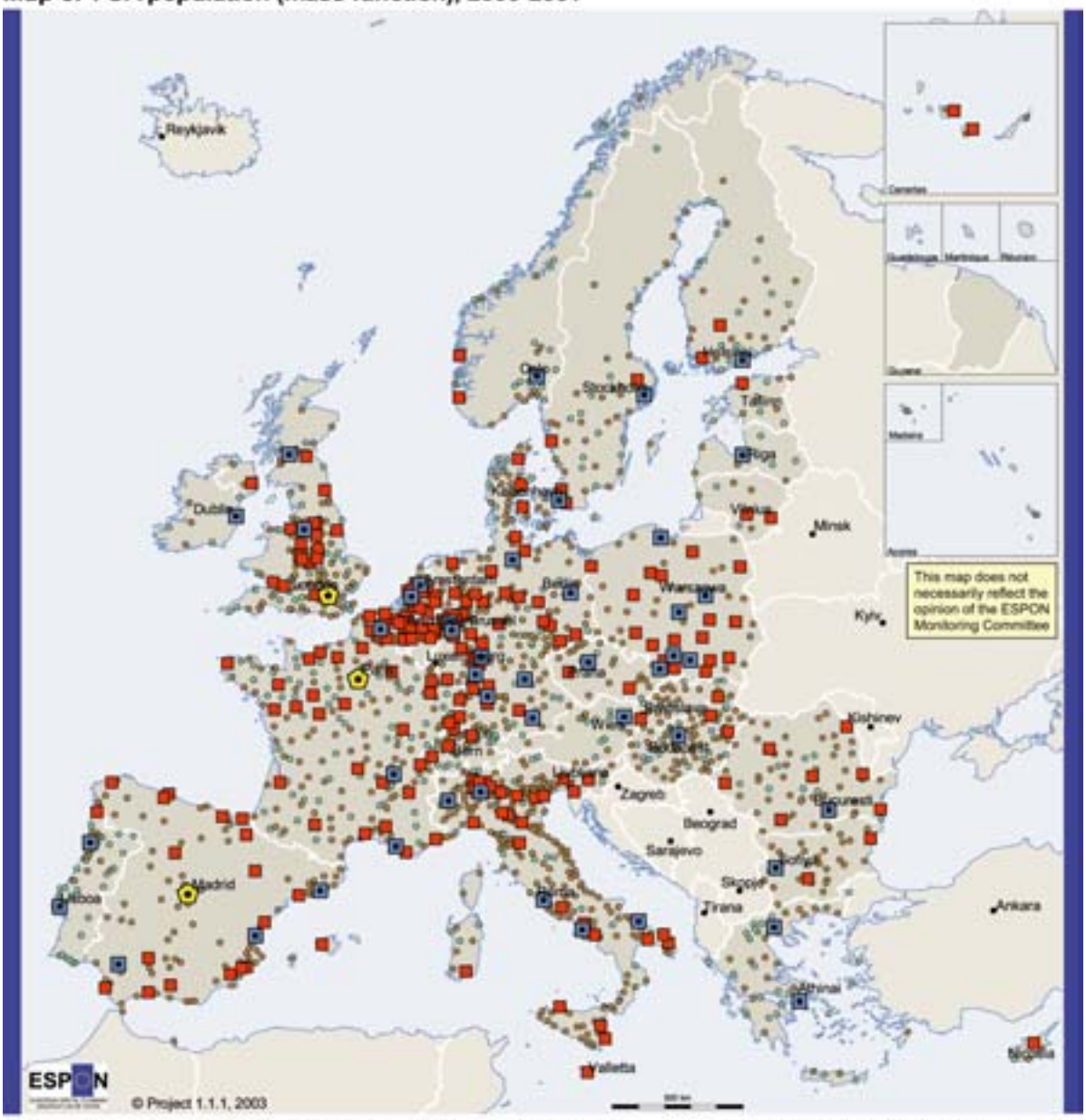
([11]) Number of beds in hotels or similar establishments in 2001.

([12]) Gross value added in industry in 2000.

([13]) Main location of universities and number of students.

([14]) Number of headquarters of top European firms.

Map 3. FUA population (mass function), 2000-2001



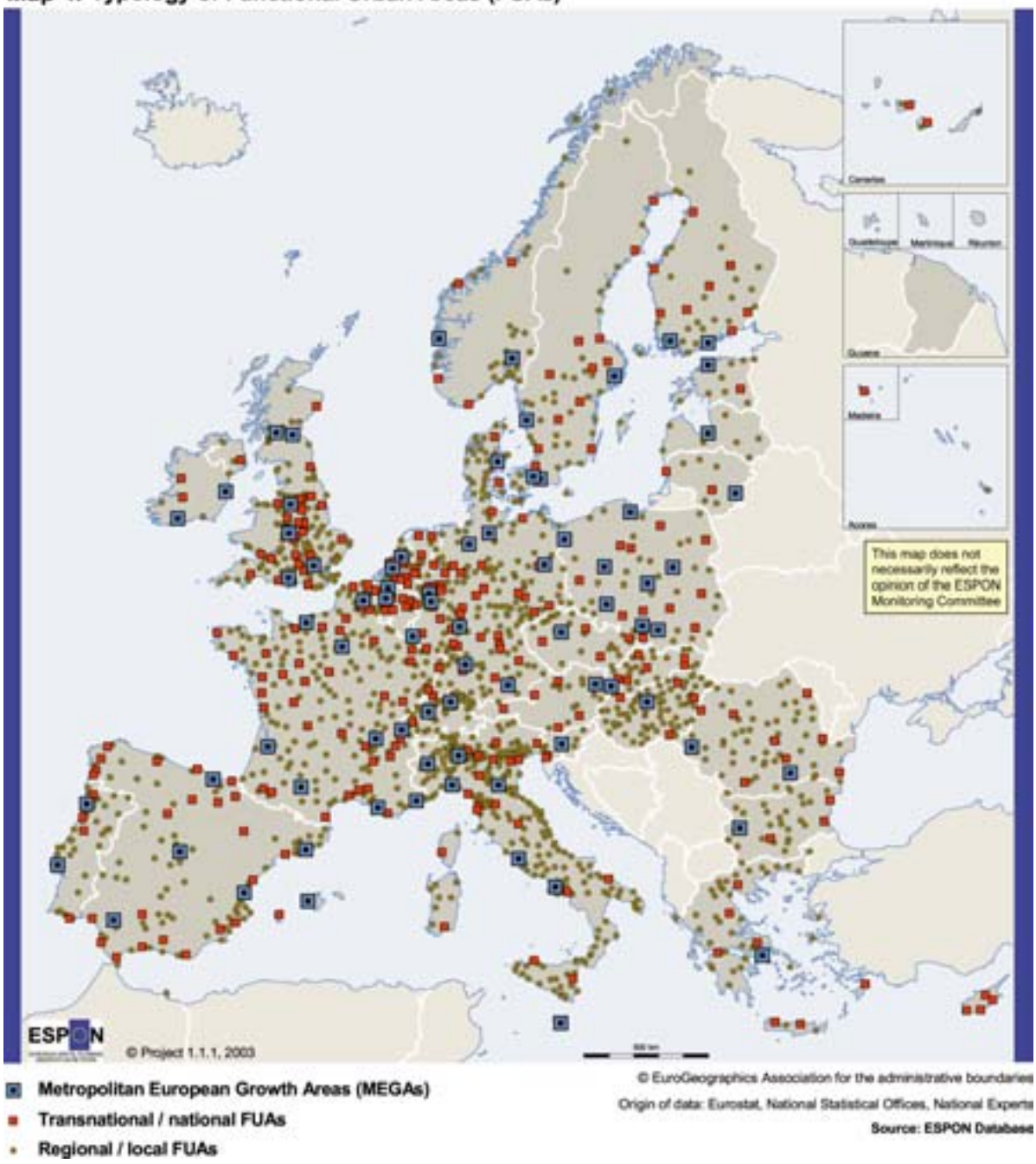
administration ([15]). Three categories of FUAs were identified, depending on their influence at the different geographical levels (see Map4 "Typology of Functional Urban Areas"):

– the Metropolitan European Growth Areas (MEGAs);
– the Transnational/National FUAs;
– the Regional/Local FUAs

These typologies simply represent a particular hypothesis, where all functional indicators are weighted equally. Other hypotheses with different weighting systems are also possible and will be investigated further.

([15]) Based on the national administrative systems, cities that are the administrative seat of the different levels, national capitals, province centres, regional centres etc.

Map 4. Typology of Functional Urban Areas (FUAs)



Among the 1,595 FUAs, 76 were categorised as MEGA. Most country capitals are included as MEGAs and 18 are located within the Pentagon. Only the six largest countries, in terms of population, have more than three MEGAs, and as many as 11 have only one.

The diversity of situations found in the accession countries with regard to the demographic evolution of FUAs (See Appendix 3) reflects the relative importance of various factors such as the general demographic evolution at national level, the re-conversion of the economy of large and medium-sized towns, the demographic de-concentration of large towns over the FUAs borders etc.

Monocentricity and polycentricity of urban systems in the accession countries	
Rather monocentric urban systems	**Rather polycentric urban systems**
Estonia: Tallinn (400 000 inh.) represents 29% of total population. Tartu (100 000 inh.) plays a national role. **Latvia**: Riga (760 000 inh.) represents 32% of total population. Daugavpils (110 000inh.) plays a national role **Lithuania**: Vilnius (540 000 inh.) represents 16% of total population. Kaunas (380 000 inh.) has a transnational/national role. **Hungary**: Budapest 1.78 million inh.) represents 17% of total population. Eight cities (Debrecen, Miskolc, Szeged, Pécs, Gyõr, Nyíregyháza, Kecskemét and Székesfehérvár) with a population of 100.000 to 210.000 inhabitants have a national role and a more or less important transnational role. **Slovenia:** Ljubljana (260.000 inh.) represents 13% of the total population. Maribor (90.000 inh.) could have a significant transnational role **Malta**: the whole territory of Malta constitutes a single urban region	**Poland:** Warsaw (1.610.000) represents only 4 % of total population. Eleven cities, in addition to Warsaw have a population in the range of 250.000 – 800.000 inhabitants. All these cities have an important national role. Seven of them have an important transnational role (Katowice, Wroclaw, Lódz, Gdansk, Kraków, Poznan and Szczecin), while the other three as well as some other less populated cities have a relatively less important transnational role. **Czech Republic**: Prague (1 180 000 inh.). Brno (380.000 inh.) and Ostrava (320.000 inh.) have an important national and transnational (nearly "European") role, while Plzen (170.000 inh.) and Olomouc (100.000 inh.) have a national role and a comparatively less important transnational role. **Slovak Republic**: Bratislava (430.000 inh.) represents 8% of the total population. Kosice (240.000), has a relatively important transnational / national role. **Romania**: Bucharest (1.920.000 inh.), represents 9% of the total population. There are, in addition to Bucharest, thirteen cities with a population in the range of 150.000 – 320.000 inhabitants which have a national role and, in most cases, a more or less important transnational role. **Bulgaria**: Sofia (1.100.000 inh.) represents 14% of the total population. Plovdiv (340.000) and Varna (310.000) have an important national and a moderate transnational role, while Burgas, Russe, Stara and Pleven (120.000 – 190.000) have a national role and a comparatively less important transnational role. **Cyprus**: Nicosia (200.000 inh.) represents 29% of the total population. There are three other relatively important cities on the island: Limassol, Larnaka .

Taking into account their potential in several sectors (economy, transport, higher education etc), Budapest and Prague undoubtedly have a considerable international role ("European cities"), Bratislava and Ljubljana have a considerable transnational/national role, while the other large poles have a more or less important transnational role. The four large cities in question are stronger and more integrated (internally) than it is the case for the three small Baltic countries and for Poland, Bulgaria and Romania.

Unlike most of the other candidate's FUAs, the links between these four cities and cities in the EU–15 countries are already important. In particular, Budapest and Prague already constitute powerful nodes of the Central European urban system and their role could be strengthened rapidly in the future. Bratislava and Lubljana, even though smaller, present a considerable degree of integration into the Central European urban system.

Considering the Central European Urban System at a wider scale, growth potential as well as the challenges of old industrial regions can be particularly identified in the central transnational macro-region of the accession countries enclosing the transnational territory between Warsaw (in the east), Poznan (and possibly Berlin in the west), Krakow, Saxony (Dresden),

Prague, Bratislava, Vienna and Budapest (in the south). This macro-region constitutes a specific transnational entity which includes most of the Central European growth poles and innovation potential (capital cities and surrounding areas) as well as the main old industrialised regions in the accession countries and regions undergoing structural change such as rural regions. This Triangle ([16]) constitutes indeed an agglomerate of major cities, with a potential development that could become in the near future a Global integration zone comparable to the European macro-region of North-West Europe.

1.3.2. Identification of development poles outside the core area and cooperation/networking as a means of counterbalancing the core concentration

The current European urban system is seen as monocentric, in the sense that there is only one major urbanised area with sufficient mass and economic potential to be integrated in the global economy. At the European level, the main issue is therefore to stimulate the development of regions beyond the Pentagon with the aim of making them global integration zones. A more polycentric structure, with several strong urban regions of European and global significance, can contribute to the competitiveness of Europe as well as to cohesion between different territories.

In order to further investigate the development potential of polycentric regions outside the pentagon, the 76 MEGAS ([17]) have been ranked. They were all allocated a score, according to four building blocks : mass criterion, competitiveness, connectivity and knowledge base (see Appendix 2). Strong MEGAs were identified in close proximity to other FUAs, as these are regions with potential for cooperation and functional specialisation. Other 45 MEGAS (potential+weak) should be reinforced in order to become potential counterbalancing regions to the pentagon (map 5).

The demographic evolution of MEGAs outside the pentagon is generally positive (See Table in Appendix 4) for those located in the EU-15, with significant population increase during the 1990s (with the exception of Dresden, Berlin and Barcelona): Copenhagen +7%; Malmö +8%; Lyon +9%, Marseille +13%, Bordeaux +11%, Athens +7%, Porto +5%, Lisbon + 7%, Madrid +10%, Stockholm + 11%; Edinburg +7%. MEGAs located in accession countries, in contrast, suffered from population decreases (except Bratislava + 2%): Sofia -4%; Prague -2%; Gdansk -2%; Krakow -1%; Katowice – 7%; Bucharest -7% . This may suggest that the catching up process outside the Pentagon has been stronger in the EU-15 than in the accession countries.

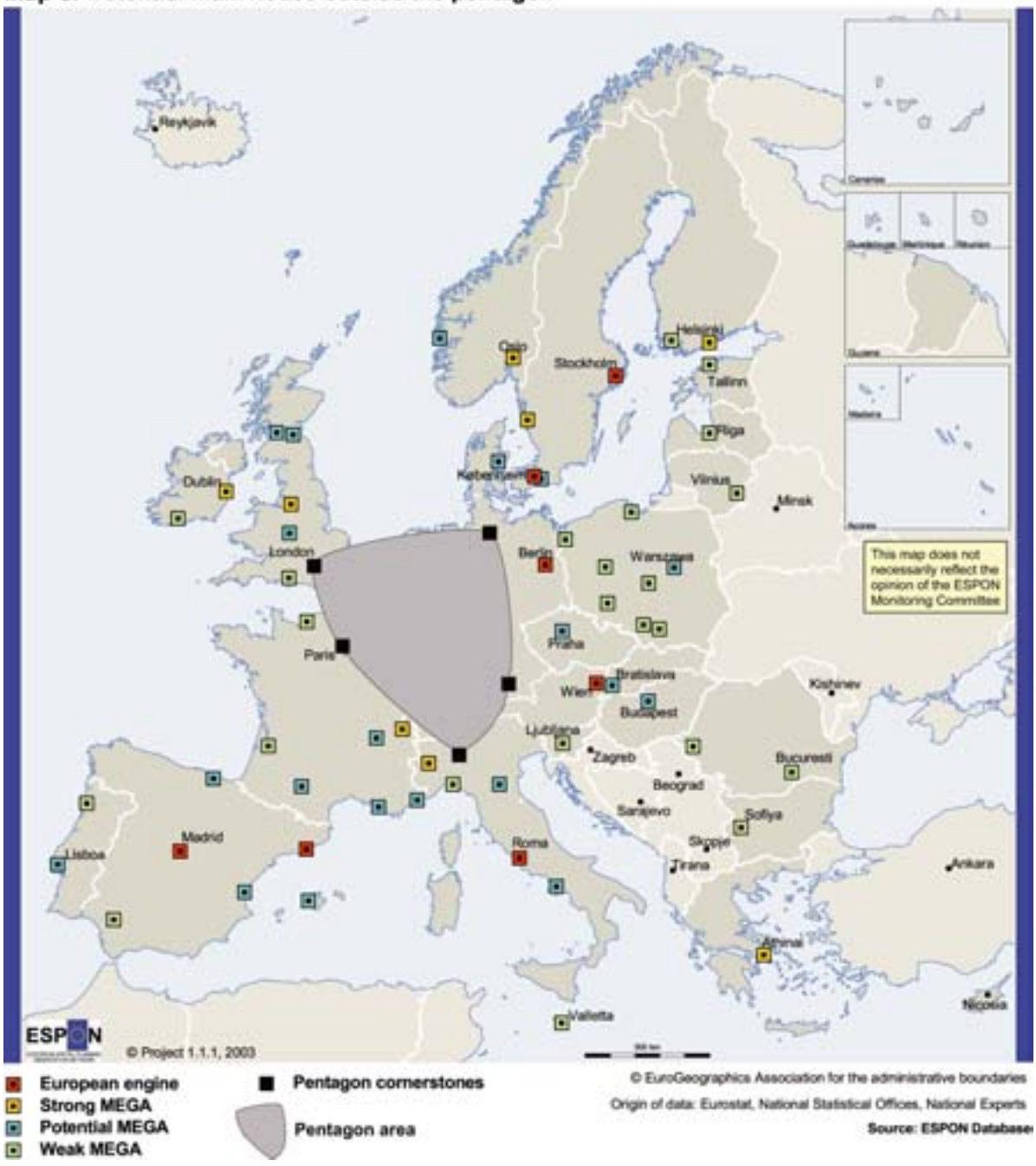
Taking these MEGAS and their surrounding FUAS together, possible polycentric counterweights to urban systems in the pentagon could be envisaged (see Appendix 4): Manchester together with Derby, Sheffield, Liverpool, Leeds, Tyneside-Newcastle-Gateshead Huddersfield or Lyon together with St Etienne, Chambery, Annecy, Grenoble, Valence, Geneva and Lausanne or Genoa together with La Spezia, Pisa, Florence, Livorno.

Summing up Chapter 1.3., the global distribution of the 1595 FUAs is – in the central parts of Europe in particular – a dense urban structure, as far as large FUAs with advanced economic functions are concerned. In peripheral Europe, most of the large agglomerations are more isolated. "Potential MEGAs" and "Weak MEGAs" are more numerous in peripheral regions, while Global Nodes and Strong MEGAs are dominating in the pentagon. In accession countries, numerous large agglomerations are facing population decline which creates a constraint for their catching up process. A fairly large number of MEGAs (45+ 4 capital cities) could act to counterbalance the pentagon if appropriate policies were applied. This is particularly true for those such as Lyon, Marseille, Birmingham, Manchester etc. which are surrounded by numerous other FUAs.

([16]) It has already been identified by Gorzelak in 1995 and quoted in the ESPON project 2.2.2 "pre-accession Aid Impact Analysis carried out by IRS, EPRC and CRT.

([17]) The strengths of the MEGAs are analysed on basis of their size (population and GDP), competitiveness (GDP per capita, head offices of top European companies), connectivity (air transport, accessibility) and knowledge basis (education level, R&D personnel share of total employment).

Map 5. Potential main nodes outside the pentagon



1.3.3. Social disparities between cities in the core and in the periphery; intra-urban disparities (Urban Audit) [18]

a) The divide between cities in the pentagon and in the wider periphery

On a first instance, the Urban Audit shows the impact on 65 pentagon cities and on 124 cities outside the pentagon of territorial disparities and concentration of population and wealth in the European Union (Eur 15).

Cities in the pentagon are leaders in innovation, growth and employment creation. Income and job opportunities in these cities attract many immigrants as well as the highly educated. However, the concentration of wealth and economic activity in these cities also has negative effects as they suffer from far higher levels of crime and pollution.

Some of the large cities in the periphery have managed to overcome the physical distance to the core of Europe through a combination of high quality services, proximity to a major airport and a highly educated workforce. For example, in Edinburgh and Helsinki respectively 29% and 28% of their residents have a university degree, while the Urban Audit average is only 17%. Such cities also attract more immigrants. The medium-sized cities in the periphery suffer the biggest disadvantages.

When it comes to the difference between the city and its larger urban zone, the cities outside Objective 1 regions almost always have a higher unemployment rate than their larger urban zone. For cities in Objective 1 regions this is the case for only 62% of cities. This shows that cities in Objective 1 regions function as motors of development and that in more affluent regions the unemployed are concentrated in urban neighbourhoods.

Environment

Summer smog (i.e. ozone warning days) follows the core-periphery pattern. On average, pentagon cities have 13 days a year with summer smog as opposed to 6.5 days in peripheral cities. Surprisingly, the size of the city does not seem to have an impact on the number of summer smog days: on average, large cities have virtually the same number of summer smog days as medium-sized cities have.

Crime

Despite lower unemployment, crime is concentrated in the pentagon. However, the size of the city also matters. In fact, both in the pentagon and in the periphery, crime rates are higher in large cities than in medium-sized cities. The number of recorded crimes per 1000 inh. amounted to 118 in large cities of the pentagon against 92 in large cities outside the pentagon. In medium-sized towns of the pentagon, it amounted to 109 against 69 in medium-sized towns outside the pentagon. As a result, the number of recorded crimes per capita is almost twice as high in large pentagon cities than in medium-sized cities in the periphery (118 against 69).

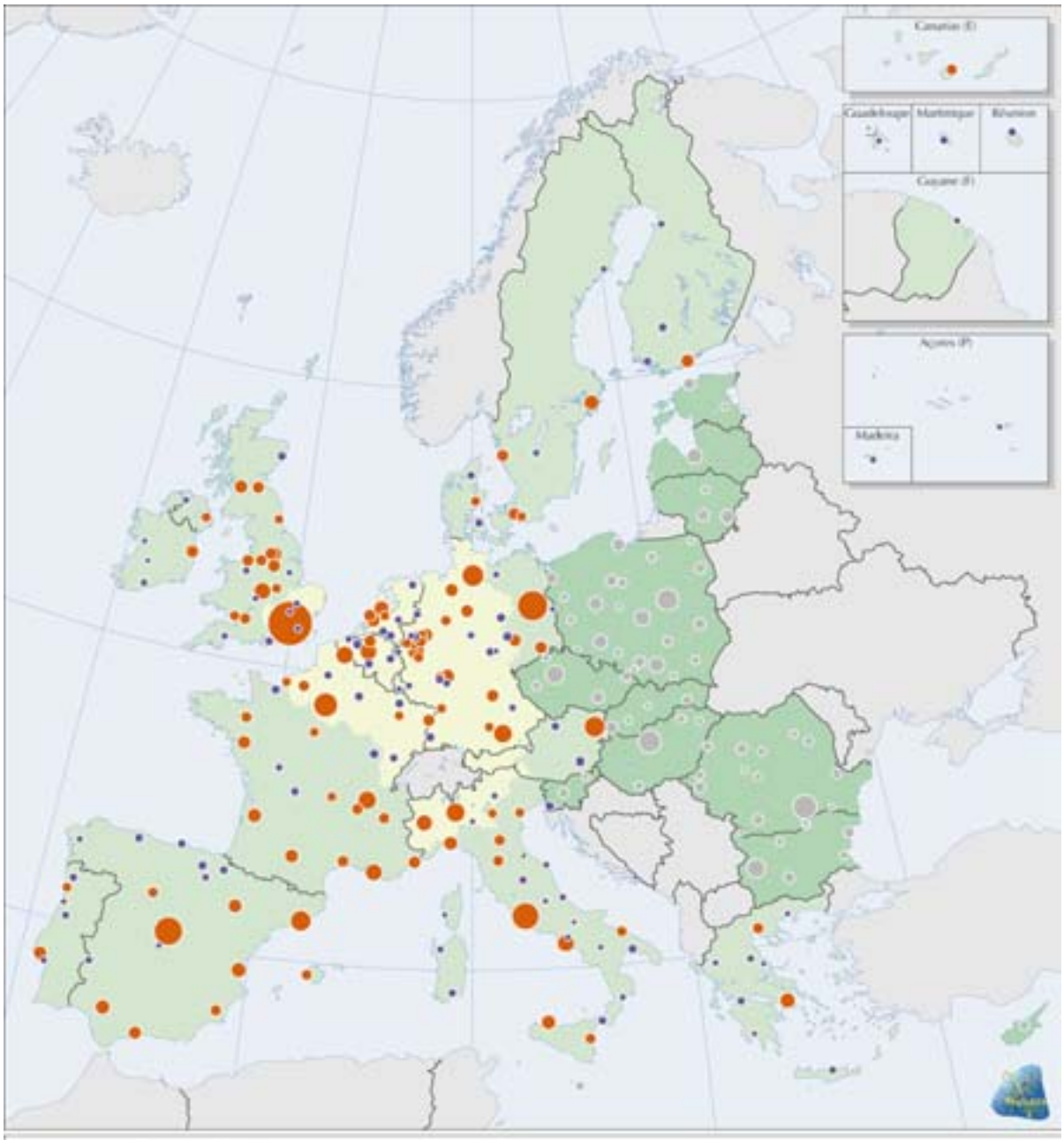
Large versus medium-sized towns

People with a university degree prefer to live in large cities. Of the 11 Member States reporting this trend, only in Germany do medium-sized cities have a significantly higher share of residents with a university degree than in large cities. In the other Member States, the share or residents with a university degree was often significantly higher in larger cities. For example, in Portugal the medium-sized cities had only 9% of residents with a university degree, while the two large cities had 16%. The preference of residents with a university degree for living in large cities will hinder medium-sized cities in their attempts to become a part of the knowledge economy.

The residents with only a secondary education do not prefer large cities. The large cities of only two of the eleven Member States (i.e. Greece and Portugal), have a high share of residents with only a secondary high school education.

The availability of jobs attracts foreigners to the large cities. In every Member States the share of foreigners is higher in the large cities than in the medium-sized cities. Overall, cities in Central and Northern Member States attract more foreigners. One striking aspect is that 80% of the foreigners come from outside of the EU. EU-citizens may have the freedom to move to all other Member States, but very few of them make use of this opportunity.

[18] The Urban Audit was launched by Directorate-General for Regional Policy and covers 258 large and medium-sized cities in the EU27 (Map 6). The cities were selected in collaboration with Eurostat, the national statistical offices and the cities. The selected cities are geographical dispersed and cover both large and medium-sized cities. The combined population of the 258 cities is 107 million inhabitants, it covers more than 20% of the EU27 population. This large sample ensures that the Urban Audit can provide extremely reliable information about the state of European cities today. Results presented here concern only EU-15; results about accession countries are forthcoming.



Map 6. Urban Audit Cities in core and periphery

EU15 core
EU15 periphery
accession candidates

medium sized cities of EU15
large cities (> 250000 inh.) of EU15
cities of accession candidates

population of administrative cities
(France: Communauté d'Agglomération)
2000000
250000

Sources: Urban Audit II, ESPON

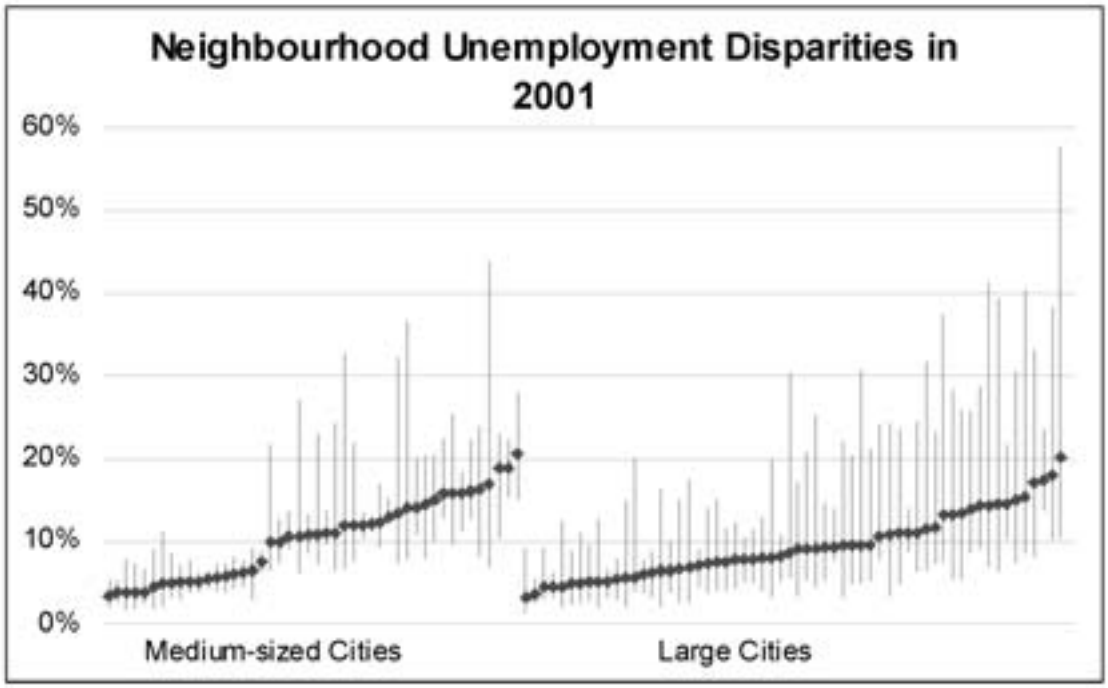
b) Intra-urban disparities

Urban deprivation is still a major issue for European cities and it touches cities of all sizes across the European Union territory. The Urban Audit Pilot Project ([19]) revealed that differences in unemployment rates were much greater within cities than between cities or regions. The Urban Audit confirmed the presence of large disparities between neighbourhoods in many cities: 40% of cities are faced with neighbourhoods where unemployment rates are more than double the unemployment level in the city as a whole. For example, in Marseille the neighbourhood with the highest unemployment has a rate of 58%, compared to a city average of 20%

The majority of large cities are confronted with neighbourhoods where the unemployment rate is at least double the city average; even in those with a low unemployment rate. In medium-sized cities, the concentration of unemployment is most prevalent in cities with an unemployment rate above 10%.

Comparing the neighbourhood in the United Kingdom, Germany and France ([20]), shows that the unemployment rates' disparities between the worst and best neighbourhood are far larger in France than in the UK and Germany. In Germany, the cities in the New Länder (in former East Germany) are easy to identify as they have a far higher unemployment level and stronger disparities between neighbourhoods. The UK has a national unemployment rate of 5%, which is significantly lower than in Germany or France ([21]) with respectively 8% and 12%. Nevertheless, many cities in the UK still have high concentration of unemployment in certain neighbourhoods, especially in the cities with an unemployment rate above the national average.

The difference between the best and worst neighbourhood unemployment rate shows the full scope of urban disparities. In 50% of the Urban Audit cities ([22]), the unemployment rate is more than three times higher in the worst neighbourhood compared to the best; in 20% it is even more than five times higher. In short, urban deprivation is still a major issue for European cities today.



([19]) The Urban Audit Pilot Project 1997-2000 tested the possibility of collecting comparable urban statistics for 58 large European cities. The project was a major success.

([20]) The figures for France are from 1999, when the national French unemployment rate was 12%. In 2001, the national unemployment was down to 9% as a result the neighbourhood disparities would probably also be smaller for that year, yet probably still larger than in the UK and Germany.

([21]) For France the 1999 unemployment rate is given to ensure comparability with the neighbourhood unemployment rates.

([22]) 105 cities reported neighbourhood unemployment rates for in 2001 in time to be included in this publication. The response rate for the final Urban Audit publication will be considerably higher.

Virtually all the cities in the urban audit have a large proportion of non-nationals, singles, residents with a university degree, the unemployed and the poor than in their larger urban zone. The overrepresentation of these groups in cities is a mixed blessing. On the one hand, the influx of foreigners, singles and individuals with a university degree has slowed down or reversed the process of population decline in many cities. On the other hand, the concentration of poverty and unemployment tends to reinforce patterns of social exclusion and crime in specific neighbourhoods.

The presence of a higher share of people with a university degree, who tend to have a higher income and be more mobile, indicates that cities still manage to attract highly selective residents. In contrast, people with only a secondary education, who tend to be less geographically mobile, are fairly evenly distributed across the city and their larger urban zone. There is one group, however, that still tends to leave the city: households with children under the age of 18. Many factors influence this trend, including the concentrations of crime and pollution and the high cost of housing.

Non-EU nationals tend to prefer large cities in Central and Northern Europe. In cities within the Objective 1 areas there are only few non-EU nationals. Cities in Objective 1 and 2 regions have respectively 3.2%, 5.2 % of non-EU nationals while cities outside those regions have a higher rate of 8.8%. Therefore, policies targeting immigrants will have to focus on the cities outside Objective 1 and 2 regions.

1.4. Conclusion

Territorial imbalances in the European context are manifold: infrastructure and related accessibility level, R&D potential and unbalanced structure of urban systems.. Enlargement contributes to the widening of a number of existing territorial imbalances, in particular in relation to different infrastructural endowments and the reinforcement of urban systems .

The fact that territorial imbalances exist at all geographic scales of analysis can be explained by considering the two extreme spatial levels.

At European level, the most significant disparity is found between the core (i.e. the pentagon) and various peripheral areas. In particular, this imbalance concerns the distribution of population and wealth as well as the endowment with infrastructure and R&D potential. Recent trends show some contradictory evolutions. While the concentration of population is growing in the western part of the EU-27+2, the concentration of wealth is growing more rapidly (in percentage) in various peripheral regions, particularly in a number of accession countries. It must however be stressed that this trend was observed only over a very short period of time (1995-2000).

Considering the European urban systems, a significant contrast between the pentagon and the other regions of EU-27+2 can be observed. A strong concentration of “global cities” and “European engines”, among the various MEGAs, is evident in the pentagon. Yet, the development of MEGAs outside the pentagon, likely to catch up, does not seem unrealistic if appropriate policies are applied, since a number of them show significant demographic development.

At the lowest scale, intra-urban disparities between the various neighbourhoods are generally intense. In a large number of cities, the unemployment rate is more than three times higher in the worst neighbourhood compared to the best.

2. Interactions and challenges between rural and urban areas, depopulation process and role of the rural development policy

2.1. Characteristics of growing urban-rural interdependence ([23])

According to the theory of urbanisation differential, all city systems ideally undergo various *phases* in their development, passing through a complete cycle of urbanisation (polarisation), polarisation reversal and counter-urbanisation. These various stages of urbanisation have been conceptualised in terms of *urbanisation* (population increase of the city's core), *suburbanisation* (increase of the ring, decrease of the core), *disurbanisation* (decrease of core and ring), and re-urbanisation (increase of core, decrease of ring). The major overall tendency of urbanisation in Europe is actually *counter-urbanisation*, i.e. a flow of people down the urban ladder from larger to smaller urban settings. This tendency actually underpins ESDP policy options (nr 19 and 21). However, important exceptions to the rule exist in several countries.

In the context of this global cycle, *various factors lead to growing urban-rural interdependence:*

- as an effect of suburbanisation, the division in town and countryside has either disappeared in many regions or it has become more blurred;
- industries are relocating from urban to rural settings on a large and global scale;
- R & D activities are increasingly located in attractive semi-rural/semi-urban environments in the proximity of large towns;
- agriculture is carried out in an increasingly industrialised fashion, which means that traditional environmental values connected to rural environments are disappearing;
- huge, bulky and land consuming activities are preferably located in places where land is comparatively cheap, i.e. semi-urban or, if possible, rural settings;
- even corporation headquarters are not necessarily situated in cities centres anymore.

Physical urban-rural relations are characterised by a certain degree of stability because the physical world cannot be rebuilt over night. Functional relations on the other hand can be changed over night, given the flexibility of the physical setting to house a multitude of various activities as well as the flexibility of various functions to adapt to various physical setting.

The SPESP Study ([24]) identified several categories of urban-rural relationships (which are presented in annex….)

Central place relationships are more traditional in character. However, these type of relationships are entrenched with new relationships between urban and rural areas and between urban centres and nodes within rural areas. The picture that emerges is characterised by complex centre-periphery dynamics. Although rural areas play a vital role in everyday life and in the modern economy, these areas are in many ways dependent upon economic activities and facilities located in cities and urban areas. The spatial and ecological footprint of urban areas extends well beyond the city limits. Although some crude forms of domination from the urban areas have disappeared, other softer forms of domination have emerged, such as the transformation of

([23]) Cf. ESPON Project 1.1.2. "Urban-rural relations in Europe" led by the Centre for Urban and Regional Studies of the Helsinki University of Technology.

([24]) Study Programme on European Spatial Planning. Synthesis report. 2000.

rural areas into consumption landscapes. In many ways the influx of urban activities, for instance ICT companies (information and communication technologies), and new dwellers brings a new dynamism to rural areas. On the other hand, this invasion and succession can push local people out of the housing and labour market. Redefining urban-rural relationships therefore demands new forms of urban-rural partnership.

Growing urban-rural interdependence is subject to various *driving forces:*

– a major, still relevant criterion for choosing location sites for different activities is the space requirement;

– the pronounced priority given to environmental quality in terms of pleasant living environment for employees and "a good address" for companies as well as good accessibility, since an increasingly important factor in deciding the location of new establishments is the supply of qualified labour;

– some of the existing features of urbanisation (or counter-urbanisation) are caused by overall trends related to development in technology, demographic change and globalisation of markets;

– the current high concentration of immigrants in large metropolitan areas in Europe, which could set in motion the next phase of counter-urbanisation.

A number of *consequences* also result from growing urban-rural interaction:

– the expansion of commuter catchment areas, brought about by the continuous improvement of traffic systems and which is one of the most striking trends with respect to urban-rural relationships;

– trends in the value of land. The increase of urban-rural integration causes high land use pressure and rising land prices in accessible areas, leading to longer commuting distances as people search for affordable housing in the rural areas. In the regions with high GDP per inhabitant the lifestyle choices of the population may add to the housing pressure in the rural areas – increasing the land use pressure further;

– the emergence of "rurban" lifestyles, indicating the merge between urban and rural lifestyles.

A large majority of regions represents the context within which both urban and rural environments and modes of life coexist. This statement is valid for the

Ongoing processes in urban-rural interdependence (national examples)	
Further demographic concentration in and around large urban units ; concentration of advanced economic functions in metropolitan areas and larger medium-sized towns (metropolisation)	Further demographic concentration in large urban units takes place in southern Italy, in Portugal and also in Finland. Helsinki, Tampere, Oulu and their neighbouring municipalities are the only true growth centres in the country. Forecasts indicate that Helsinki (together with Lisbon in Portugal) will be one of the fastest growing capital regions of Europe.
Deconcentration processes	The deconcentration process in Germany differs in the West and in the East. The West follows the trend of de-concentration and the rural regions record the highest population gains (process of re-industrialisation and residential preferences for low-density housing). In the East, only suburban rings of metropolitan areas have rising population figures whereas the big cities have the highest decrease. A similar deconcentration process can be observed in the urban regions of France and Northern Italy. In the Netherlands, deconcentration trends are contained by strict land-use control
Increase of population in remote rural areas	There are few examples of increases of the population in the remote rural areas. This happens however in the case of some accession countries. In Romania for example, part of the retired population, originating from the countryside, periodically or permanently return to their native villages to work the plots of land re-appropriated to them.

densely exploited centres of Europe as well as for the peripheral areas. It means that urban-rural relations are present - more or less - everywhere on the regional level. A relatively strong urban-rural integration can be found in most of Europe. The extent of peripheral areas with low urban integration is thus quite limited. The sphere of influence from the major cities covers also large areas outside of Pentagon. Parts of Nordic, Mediterranean, Atlantic and eastern European fringe areas lack major cities but in some of those areas a network of regional/local level cities exists instead.

A major migration trend in the central parts of Europe is the main feature related to rural areas. Suburbanisation is not only a characteristic of households with children, but increasingly so with regard to single-person households as well. The driving forces behind this are supposed to be twofold. One the one hand, the rural area is conceived as "close to nature". On the other hand, the rural context is associated with enhanced community spirit and social relations.

The variety of situations in urban-rural interdependence is however huge in Europe. This is related to the fact that various countries and/or regions are at different stages of the urbanisation cycle. In addition to this, other factors play an important part, such as inter-regional migration, the natural evolution of population, the economic specialisation of urban areas or the socio-economic transition processes taking place in the accession countries.

2.2. Territorial typology related to urban-rural interaction ([25]) (at regional level)

Urban-rural interactions are of strategic importance for regional and spatial development policies. They are however very diverse in nature and for this reason ex-

([25]) Cf. ESPON Project 1.1.2. "Urban-rural relations in Europe" led by the Centre for Urban and Regional Studies of the Helsinki University of Technology.

Territorial typology related to urban-rural interaction

High share of artificial surface only

1. **Urban, densely populated and high urban integration**: only the share of artificial surface above average, population density (and possibly share of FUA population) above average.

High share of artificial surface and agriculture or "wilderness"

2. **Urban-rural, densely populated and high urban integration**: share of artificial surface + other types of surface (agriculture or "wilderness") above average, population density (and possibly share of FUA population) above average.
3. **Urban-rural, not densely populated but high urban integration**: share of artificial surface + other types of surface (agriculture or "wilderness") above average, population density below average, share of FUA population above average
4. **Urban-peripheral, not densely populated and low urban integration**: share of artificial surface + other types of surface (agriculture or "wilderness") above average, population density below average, share of FUA population below average

High share of agriculture only or agriculture and "wilderness"

5. **Rural-urban, densely populated and high urban integration**: share of agricultural land (and possibly "wilderness") above average, population density (and possibly share of FUA population) above average.
6. **Rural-urban, not densely populated but high urban integration**: Share of agricultural land (and possibly "wilderness") above average, population density below average, share of FUA population above average
7. **Rural-peripheral, not densely populated and low urban integration**: Share of agricultural land (and possibly "wilderness") above average, population density below average, share of FUA population below average

High share of "wilderness" only

8. **Peripheral-urban, densely populated and high urban integration**: Only the share of "wilderness" above average, population density (and possibly share of urban population) above average.
9. **Peripheral-rural, not densely populated but high urban integration**: only the share of "wilderness" above average, population density below average, share of FUA population above average
10. **Peripheral, not densely populated and low urban integration**: only the share of "wilderness" above average, population density below average, share of FUA population below average

tremely difficult to map in any homogeneous way at European level. A typology of 10 groups is set up in the table below, using criteria related to land-use, population density and FUA population.

Another attempt has been made to elaborate a simpler typology and to divide the European territory into three classes according to the intensity of urban-rural interactions:

– Urban areas as well as peri-urban areas highly dependent on cities ([26]), regrouping the - categories: 1+2+5+8 of the upper table.
– Less densely populated areas with an important share of population dependent upon urban employment ([27]) regrouping the following categories: 3+6+9;
– Remote rural areas, far from cities with a low share of population dependent upon urban employment ([28]) regrouping the following categories: 4+7+10.

This regrouping corresponds in fact to the elimination of the distinction between the land uses "agriculture" and "wilderness" (which could be significant for structural policies).

2.3. Identification of areas with shrinking population ([29])

A major problem of economic and social cohesion are the remote rural areas, whose revitalisation is particularly difficult. Demographic factors play an important role in this issue. Long periods of out-migration of younger age groups have caused accelerated population ageing resulting now in global shrinking population. (general population trends).

The demographic analysis shows (See Map 7) that of the 133 most declining regions, as many as 64 regions are *German*, 18 regions are *Bulgarian*, 8 regions are part of *United Kingdom*, 6 regions are *Romanian* and 5 regions are *Portuguese*. The rest of the 18 countries are represented with 1-4 regions (Austria, Estonia, Spain, Finland, Greece, Hungary, Italy, Latvia, Netherlands, Poland, Sweden). The largest share of declining regions (50-100 percent) and affected populations (40-100 percent) are found in ten countries Latvia, Bulgaria, Hungary, Sweden, Romania, Czech Republic, Estonia, Finland, Lithuania and the Slovak Republic (in this order). The countries with extremely low fertility rates are Spain, Italy, Bulgaria, Slovenia, Hungary, the Czech Republic, Estonia and Latvia.

Basically, *three types of areas* in Europe are confronted with depopulation trends:

– *Urban areas*. In numerous cases, the cores of metropolitan areas and cities are loosing population, quite often to their surrounding areas. Where the process of regional polarisation is occurring, declining and growing areas exist side by side (for instance in Spain, Italy, East-Germany);
– *Industrial regions* characterized by a reconversion process. A number of them are to be found in the EU-15 (Asturias, Euskadi, Lorraine etc.), but the largest number is in the accession countries (Czech republic, Slovakia, southern Poland, Romania, Bulgaria etc).
– *Rural areas*. The most negative change is found in the least densely populated regions in France, Spain and Portugal, the northern and southern parts of Eastern Europe, and in peripheral regions of Sweden and Finland. In the Nordic countries, the less central regions have the most negative development. Examples of depopulation in sparsely populated areas are the Finnish regions of Itä Suomi (-2.5% between 1995 and 1999), the Swedish regions of Mellersta Norrland (-3%), Oevre Norrland (-1.9%), the Spanish regions of Aragon (-1%), Castilla Leon (-1.6%). Further details on issues of low populated areas are provided below.

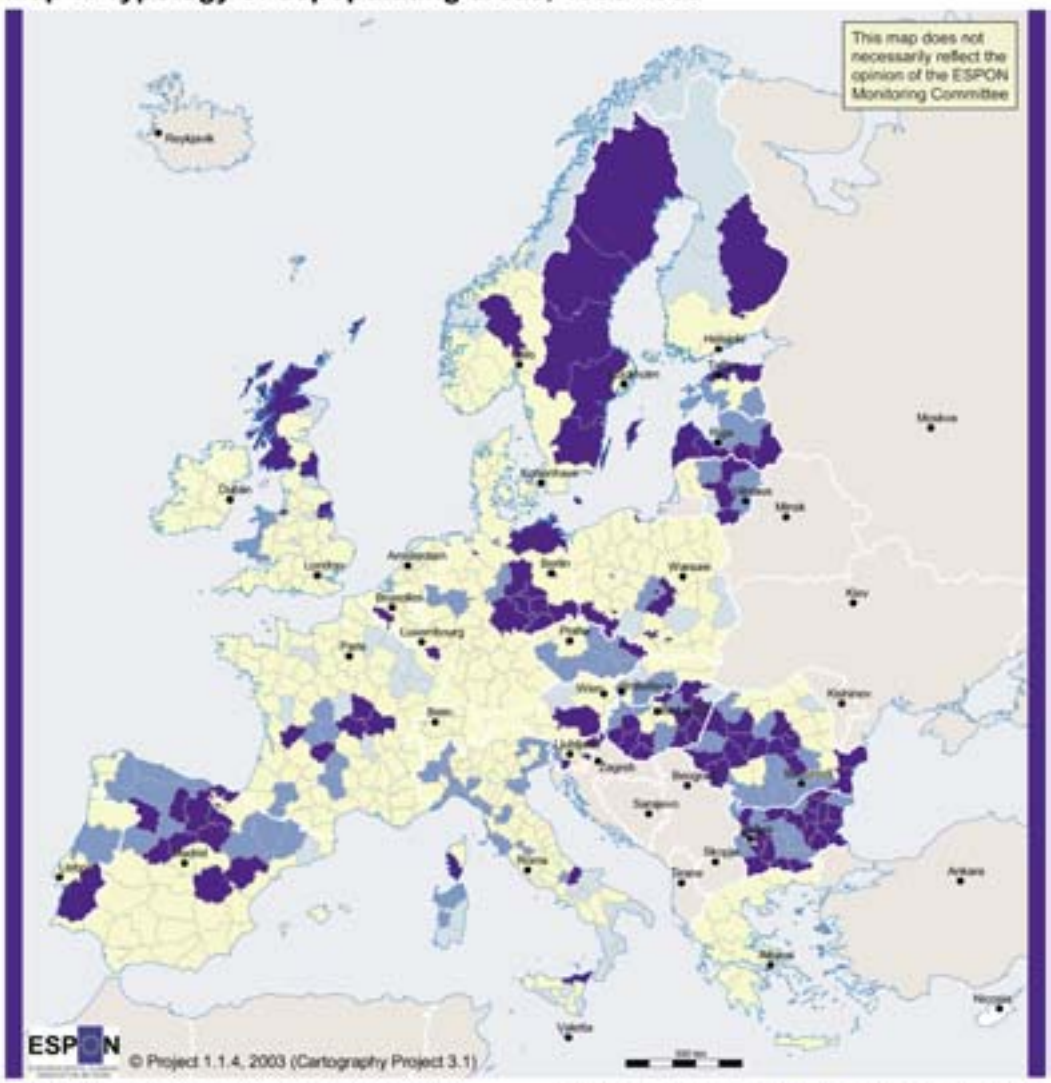
While low fertility rates and population ageing are main causes of depopulation trends in remote rural areas, the ability of these regions to attract and retain inhabitants is related to various factors, such as the improvement of accessibility, the endowment with public and private services and facilities, the enhancement of the natural and cultural heritage, the promotion of economic activities etc. Regional and spatial development policies should primarily address these issues and support the development of small and medium-sized urban centres likely to provide services, employment and amenities. The future regional development programmes will have particular tasks to fulfil in this field in order to increase the competitiveness of rural areas.

The role of the Rural Development Policy[30] should be emphasized. The least accessible regions received, on average, higher levels of support from Pillar 2 in recent

([26]) defined as areas with a population density and share of FUA population above average.
([27]) defined as areas with a population density below average and a share of FUA population above average.
([28]) defined as areas with a population density below average and a share of FUA population below average.
([29]) Cf ESPON project 1.1.4. "The spatial effects of demographic trends and migration" led by the Swedish Institute for Growth Policy Studies.

([30]) Cf. ESPON project 2.1.3. "The territorial impacts of CAP and Rural Development Policy" led by the Arkleton Centre for Rural Development Research; University of Aberdeen (UK)

Map 7. Typology of depopulating areas, 1996-1999



years. Less Favoured Areas (LFA) payments would tend to be higher in regions with lower per capita GDP and higher unemployment rates. Studies of LFA schemes in Austria, Ireland and Scotland do support the argument that such payments have helped to retain low income yielding sectors such as cattle and sheep in marginal areas, and therefore contributed to weaken depopulation trends.

Comparing the total support from Pillar 2 per Agricultural Working Unit (AWU) at regional level (Map 10) with GDP/head at regional level, shows clearly that there is no absolute correlation. While a number of regions with a GDP/head below 75% of EU-27 average receive more than 750€ per AWU (Asturias, parts of Castilla la Mancha and of Andalusia, Castilla y Leon, Alentejo, Algarve, Centro Portugal), other regions in this category receive less than 250€ per AWU (Campania, parts of Sicily). At the other extreme, some regions with a GDP/head higher than 125% of EU-27 average receive more than 2500€ per AWU (large parts of Sweden, Valle d'Aosta, parts of Western Austria) and a large number of regions with a GDP/head comprised between 100% and 125% of EU-27 average

receive more than 750€ per AWU (Bourgogne, Midi-Pyrénées, Rhône-Alpes, Piemonte, Lombardy, large parts of Austria, southern Germany, large parts of Belgium, south-eastern Finland). A number of them received even more than 2500€ per AWU (Limousin, Auvergne, northern and south-western Finland). There is therefore space for stronger orientation of rural development policies towards areas where strong development need exist.

Summing up Chapter 2, numerous processes are leading to increased urban-rural interdependence in Europe. Most of them are related to the spatial deconcentration of urban functions, in particular from metropolitan areas. There is however a great diversity of regional situations, depending upon the particular phase of the cities urbanisation cycle , but also upon numerous other variables. Consequently, policies addressing urban-rural relations must be diversified. These policies have to take into account differences in population density and degree of urban integration, the character of the region in terms of its urban centres, economic activities as well as its overall physical landscape and potential. Urban functions will be more and more in a position to provide dynamism to rural areas. Regional and spatial development policies as well as the rural Development Policy will have to use this opportunity more efficiently.

3. Regions with geographic handicaps and other constraints

3.1. Mountain areas

There are mountain areas in almost all parts of the continent and most of Europe's countries have at least some mountains. They are spread across the EU15, covering 1 323 thousand square km, i.e. 40% of the land area with a population of some 67 million, or around 18% of EU 15 population. In Acceding countries mountain areas represent more than 22% of the territory (241 thousand square km) and more than 18% of their population (about 22 million of inhabitants).

The northernmost EU 27 mountains are those in the Scottish Highlands and in Sweden while the southernmost ranges are found in the Mediterranean (i.e. southern Spain, Cyprus and Crete). European mountains also stretch towards the east with the Bulgarian mountain massifs and the Carpathians on the Czech-Polish border and Romania and the west (i.e. Portugal, Spain, Ireland and UK). On the other hand, while the longest chain is found in Scandinavia, the most famous and visited mountain area is situated in the very core of Europe (i.e. the Alps).

The study launched by the Commission, 'Mountain areas in Europe' covers EU 15, the accession countries and Romania, Bulgaria, Norway and Switzerland (See Map 8). To delineate mountain areas in a harmonised way several criteria set up, such as altitude (several intervals ranging from 2500m to 300m), slope (to include areas with minor altitudes but with steep slopes and strong local relief and exclude large plateaux) and harsh climatic conditions based on a climatic index, whereby parts of Northern Finland, Sweden and Norway are covered despite their moderate relief.

To describe this wide and large mountainous space and its economic and social characteristics, the level of analysis has to go into more detail and mountains were classified into massifs, as they are perceived and named at national and regional levels. Massifs consist of continuous or nearly continuous groups of mountainous municipalities ([31]).

Population in decline in many massifs

Mountain areas can be split into four spatial categories, i.e., massifs and three buffer rings (of 10, 20, and 50 km) in order to compare demographic patterns with lowlands. The average population density in massifs is around 50 inhabitants per Km^2, while in the three buffer rings, respectively 170, 184 and 160 inhabitants/$km^2$is always higher than in the lowlands. Transition areas to mountains offer special location advantages to people. Results also show that total population is generally still declining in mountain areas, though a number of massifs are now attractive territories for population settlements and business.

This is confirmed by the slightly smaller proportions of the young and slightly higher proportions of elderly population in mountain areas both in the EU 15 and in the Accession Countries.

Unemployment quite often higher in the periphery mountains

Unemployment tends to be higher in mountain areas which are the most peripheral, such as the northern parts of the Nordic countries, Scotland, Northern Ireland and the UK, the southern mountain ranges of Spain, Corsica, southern Italy and Sicily. Conversely unemployment is for the most part relatively low in mountain areas near to major industrial urban centres or which have such centres within their borders, such as the areas in Wales, the northern Apennines of Italy and along the northern and southern edges of the Alps in France, Germany and Italy. There are, however, exceptions, such as the Ardennes in Belgium and the Ore

([31]) The study operated with NUTS 5 regions.

mountains in the Czech Republic and Germany. which have higher unemployment values.

A slower trend of economic diversification

Though further research is required, the conclusions from the analyses which have been carried out suggest that economic diversification from agriculture to services tends to happen at a faster pace in lowland than in mountainous regions, that the existence of large cities in mountain areas or nearby give an important stimulus to industrial activity (or, alternatively, that the wealth of resources in mountain areas can lead to the development of large cities in their vicinity), and that service employment tends to be high in the more prosperous mountain areas, mainly in tourism (such as in the Alps) or in public services in sparsely populated areas (especially in Sweden and Finland).

The table "Mountain areas compared to lowlands in EU15 and accession countries" (Appendix 6) illustrates the socio-economic discrepancies between mountain areas and lowlands and therefore the handicap of mountains.

The relative situation among massifs

An index to classify massifs according to their social and economic capital has been developed. It encompasses the population change and density (high/low), the level of accessibility and the deviation of the employment structure from the average of the study area. The map 'Classification of massifs' displays the results for the five following groups of massifs:

- ***'The best preconditions':*** High access to markets, population growth, high population density (yellow)

This category corresponds to a group of mountain areas that, with the exception of a few small Portuguese mountain areas, are centrally positioned within Europe. They comprise major urban areas and are generally characterised by a relative economic dynamism.

Tertiary employment is most over-represented in the French Alps and in Swiss Mittelland. All other massifs in this category either have a strong primary sector (Bohemia, Swiss, German and Western Italian Alps) or major manufacturing activities (e.g. other western German mountain areas, Central and Eastern Italian Alps, England and Wales).

Proximity to markets has allowed these areas to develop a diversified economic basis, and to have a favourable demographic evolution. Most of these areas are positioned between major demographic and economic centres. The main threat is therefore that their high economic potential may lead to over-exploitation with corresponding environmental impacts.

- ***'High potential, negative population trends':*** High access to markets, high population density, but population decline (brown)

These mountain areas have not benefited from their proximity to markets in the same way as the previous category. Either nearby dominant cities have not contributed to growth in a wider territorial context (Catalan and Basque mountains) or the mountain area is badly integrated in nearby urban networks (e.g. French Ardennes, Polish and Czech Carpathians). Some of these areas have also been affected by industrial restructuring over the past decades. In the northern Apennines of Italy, low fertility rates at the national level contribute to this classification.

- ***'Low population density pockets near high population density areas':*** High access to markets and low density (green)

In these areas, topography has had a more pronounced effect on human settlements: they appear as low density "islands" close to high-density areas. The vast majority of these areas in close proximity to major urban centres experience population growth; the only exceptions are the Massif Central and Morvan in France. (It should be noted that demographic trends are not available for the Czech Republic and the UK).

- ***'Remote with low population densities':*** Low access to markets, primary sector over-represented (Blue and Purple)

One group of massifs in this category with low accessibility to markets has markedly higher proportion of employment in the primary sector than the European average value. These are typically rural massifs, generally with a low population density. There are great contrasts in population trends in these massifs between 1991 and 2001. In extremely peripheral areas of Sweden and Finland, as well as in all concerned Iberian massifs except Serra Algarvia in Portugal and the Iberian System in Spain, populations have decreased. In contrast, all Irish and Greek massifs falling into this category have experienced population increases.

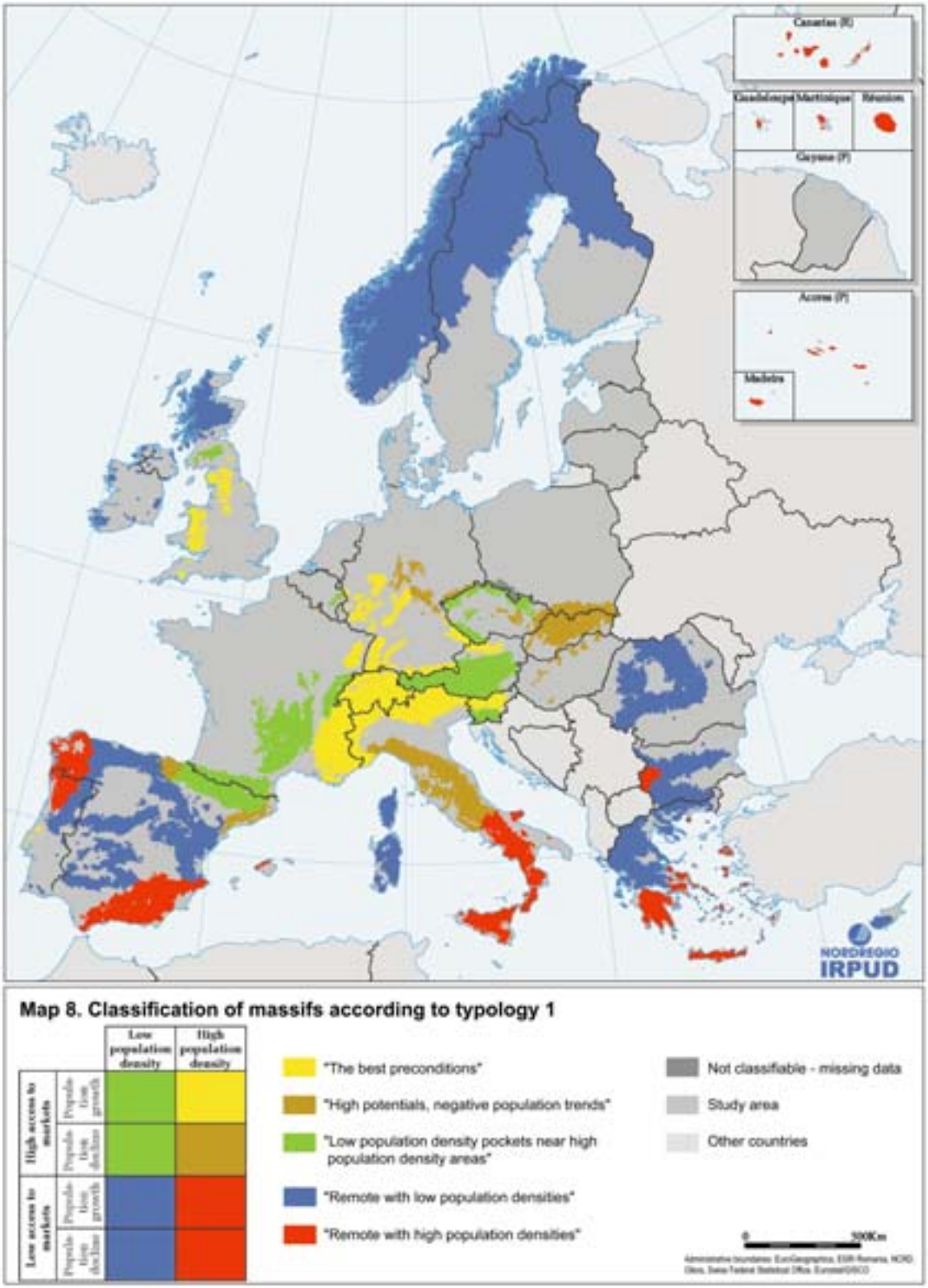
The other massifs with low access to markets and low population densities have more varied profiles. While the Swedish and Norwegian massifs have very high employment in the public sector, all remaining mountain areas in this category have a large manufacturing sector. These massifs are situated in Scotland (UK), central Spain, northern Greece, Bulgaria, Finland and Sweden.

- ***'Remote with high population densities'***: High density, low access to markets (red)

Massifs with low access to markets and high population densities are mostly in Southern Europe, surpris-

ingly enough in areas situated further away from the European core than the previous category. Population decline mainly characterises the Italian and Portuguese massifs in this category, while there is population growth in the corresponding mountain areas in Greece, the Canary islands and the Balearic.

The areas with population growth in this category have a very large tourism sector. In all other massifs, with population decline, the primary sector is over-represented.



Map 8. Classification of massifs according to typology 1

3.2. Islands and outermost regions

Islands ([32]) are in general territories with limited possibilities in terms of space, natural and human resources. Island have to achieve openness to outside markets in order to compensate for the weakness of the internal market. This creates a high degree of dependency that increases when the size of the territory and the population numbers are smaller and distances to mainland markets are larger.

The total population of the 284 island territories amounts to about 10 million permanent residents, which represents 2.7 percent of the total EU15 population ([33]). The Mediterranean islands comprehend 95% of the population above mentioned while the Baltic and Atlantic islands are less populated. Within the Mediterranean islands Sicily, Sardinia, the Balearic, Crete and Corsica account for 85% of the population.

The 119 Mediterranean islands have a total population of about 9 300 thousand inhabitants, which represents 95 percent of the total island population in the EU15. The Italian islands alone have a population of more than 7 millions, which corresponds to 71% of the EU15 island population and to more than 12% of the national total population. A similarly significant size of island population compared to the country's total is found in Greece. In all other countries the size of the island population compared to the national total is not significant.

In terms of population densities, the highest values – above the EU15 average island population density – are found only in the islands of Spain, Italy and Germany. Only in the case of Spain, however, the average island population density is significantly higher than the national average. The lowest population densities are generally found in the islands of the North and the Baltic Seas. However, in the case of the Finnish and Swedish islands average population densities are slightly higher than national averages. All the smaller Italian archipelagos, and especially Campania islands, Pelagie and Ponza, are among the most densely populated island territories, and so is the British archipelago of Scilly, and the Balearics. Compared to their average national value these archipelagos, and also the Finnish Åland, and the Greek Ionian islands exhibit significantly higher population densities.

([32]) Cf Study "Analysis of the island regions of the EU15". European Commission.

([33]) This calculation is based on the most recent available year. As many of these insular territories do not correspond to NUTS II or III territorial units the data collected by the study uses national estimatates that in several cases refer to the last available population censuses.

Statistical analysis show that there is a population threshold below which demographic indicators tend to decline, and this is a population size of 3 000 to 4 000 permanent inhabitants. The more populous an island is, the higher is the ratio of young population (people under 25 years of age). Here also a population threshold – of around 4 000 to 5 000 inhabitants – applies, of which the young population usually represents at least 30% of the total. Small islands are therefore prone to depopulation and ageing.

The population size of islands is positively correlated with the level of public services available to residents, but it seems that distance from the mainland is not correlated with the level of local public services, due to the fact that islands in general are not considered isolated enough to have local public services and infrastructure when these are available in neighbouring mainland regions. It has been estimated that there is a population threshold of 5000 inhabitants above which the level of locally provided public services and infrastructure is satisfactory. This shows a clear correlation between the level of public services and infrastructure and the demographic size.

The economy of islands is generally centred on one or two activities (in most cases agriculture, fisheries or tourism). Employment rates of islands are below Community average. The economic disadvantages are reflected in higher transport costs, both for people and goods, higher distribution costs and higher production costs. For goods, transport costs are higher due to the fact that islands are dependent on maritime and air transport (more expensive than road and rail for the same distances) to reach the outside market and the fact that the volume of imports is much larger than the volume of exports leading to an impossibility of reducing costs by a two-way traffic. Islands are highly dependent on fuel energy, despite the growth of renewable energy, which has large potential for the future.

Islands are privileged with natural and cultural environments which are nowadays exceptional in the European territory, but these are also fragile and require special attention. Islands isolation has often given rise to original fauna and flora species, both terrestrial and marine. Several types of excessive uses put these at risk. In a limited space the uses of land becomes especially conflicting (expanding urbanisation along the coastal strips). Environmental problems typical in islands are the scarcity of water resources which affects even Nordic islands.

Three possible causes of handicaps were analysed: the population, the physical insularity (geomorphology, climate) and distances to mainland. It results from the analysis that the population threshold is the most constraining factor. Geomorphologic factors bring with

them two types of handicaps : the altitude and the situation within the archipelago. An archipelago represents an accumulation of difficulties where each island represents a unit, so in many archipelagic insular regions connection with the mainland is only feasible through the main island of the archipelago, and the same applies to public services and administration.

Being part of an archipelago is a factor that is found to aggravate the handicap of the island status. The existence of mountainous relief and the often existing seismic activity add particular specificities to these territories. Islands often cumulate these handicaps which make internal transportation and mobility more difficult, while distance to mainland is less important (except for outermost regions). Examples of cumulated handicaps are:

– most Mediterranean islands are mountainous;
– islands belonging to Finland and Sweden are small and thinly populated;
– numerous island territories are archipelagos.

Outermost regions ([34]) are islands (25 in total), with the exception of French Guyana. Their total population amounts to 3.9 million inhabitants. They suffer from an accumulation of natural constraints, which make it difficult to improve economic and social conditions, not least their remoteness both from economic and administrative centres and the nearest mainland. The furthest away, Reunion, is over 9,000 kms from Paris and 1,700 kms from the coast of Africa, while the closest to land, the Canary Islands, are still 250 kms off the coast. Their remoteness is compounded by their natural features (many are archipelagos, small in terms of land area and population), difficult terrain and climate and prone to natural hazards. For many the nearest markets are areas that lag largely behind in economic development.

The population of the outermost regions (nearly 4 million people) is rather unevenly distributed among the 7 regions. The Canary Islands account for 40% of total population of outermost regions, while Guyana has a share of only 4%. With the exception of Guyana (the Amazonian forest covers 90% of its territory), all other outermost regions are densely populated on average. This is even more remarkable since settled areas are small due to the mountainous character of these regions.

The population of the outermost regions is extremely young, in particular in Reunion, Guyana and Azores with more than 40% of the population below the age of 25 years. Population growth rates are high with the exception of Azores which are facing depopulation and out-migration of population of working age. The level of education attainment is very low in the Portuguese regions, compared to EU15 and EU25. This difference is less striking for at the national level. The Canary islands have a slightly younger population than Spain, and smaller percentage with a high level of education attainment than Spain (and below EU15 and EU25 values).

The outermost regions are confronted with the problem of important amounts of young population wishing to enter the labour market while available jobs are limited in number. This problem will increase in the years to come and policy solutions will become necessary.

The DOM (Guadeloupe, Guyana, Martinique and Reunion) have a low level of development and suffer therefore from high unemployment rates relative to the national, EU15 and EU25 averages. Madeira and Azores are still lagging behind national averages (the latter) and EU values but have minor unemployment rates. The structure of employment shows nevertheless a large agricultural sector highlighting the importance of agricultural and fishing activities in the economic and social conditions. In recent years, the outermost regions are catching up in economic terms, with a GDP growth rate higher than the EU average.

Table: comparative change in per capita GDP (average weighted for population)

	1995	1999	Average annual growth rate of per capita GDP - PPS
European Union	100%	100%	5.0%
Member States concerned	91%	91%	5.0%
Outermost regions	64%	66%	5.7%
Outermost regions excluding Canary islands	55%	57%	5.8%
Poor regions	58%	59%	5.5%

([34]) Cf. Study "Analysis of the outermost regions of the EU". European Commission.

Canary Islands are the exception and show an economic development still below EU15, but only slightly inferior to the national average.

The main handicap of outermost regions is their high level of isolation. In addition to this, other factors have a detrimental effect, such as the average altitude of the territory, the intensity of natural hazards and in various cases the archipelagic character.

A number of outermost regions are among the poorest of the European Union, but also of their own country. Generally however, the outermost regions are in a better economic position than the poorest EU regions.

A catching up process with reference to the EU average was confirmed in recent years.. The lower the level of GDP, the stronger the catching up process occurred.

3.3. Sparsely populated areas in the far north and others low population density (< 10 hab/km^2) ([35])

Since the accession of Finland and Sweden to the EU (Article 2 of Protocol 6 to the Act of Accession for Austria, Finland and Sweden) the problems linked to extremely low density population areas have been debated in the context of cohesion policy.

NUTS2 regions with a population density below 10 inh./km2 are to be found in only four countries of EU-25. In addition to the Nordic countries (Finland and Sweden), the French overseas region of Guyana and the Scottish Highlands and Islands belong to this category. Out of the 6 regions concerned, 4 were facing population decline between 1995 and 1999.

NUTS 2 regions with a population density below 10 inh/sqkm in 1999

	Population density	Population change 1995-1999 (%)
Finland		
Itä Suomi	9.8	-2.5
Pohjois Suomi	4.3	+0.2
France		
Guyane ([36])	1.9	+3.9
Sweden		
Mellersta Norrland	5.4	3.3
Oevre Norrland	-3.0	-1.9
UK		
Highlands and Islands	9.3	-0.5

The most striking example of low population density in Europe concerns parts of the peripheral sub-arctic areas of Finland and Sweden which cover an area of 424 thousand sqkm and have an average population density of 5 inh./km^2. Some of these areas have an extremely low population density, such as the NUTS3 regions of Kainuu (4.2 inh/sqkm), Lappi (2.1 inh/sqkm), Jämtsland Län (2.6 inh/sqkm), Norbottens Län (2.6 inh/sqkm). Remoteness and emigration of the young and more skilled confront these regions with specific problems, although they are rich in mineral, wood and energy resources as well as in natural and cultural heritage.

Modern society needs economic, social and cultural infrastructure and services, the feasibility and profitability of which requires a minimum amount of users. For regions with a population density, the maintenance, modernisation and further development of infrastructure and services poses difficulties to public and private decision makers. On the other hand low level of infrastructure and services reduces the attractiveness of the areas concerned, in particular for young skilled people. Too low a population density is therefore considered a handicap to development and a threat to the conservation of the rich natural heritage of such regions.

Since out-migration still is an important factor of depopulation in a large number of regions with low population density, regional and spatial development policies have to strengthen the attractiveness of these regions through better provision of services and em-

([35]) Cf. ESPON Project 1.1.4. « The spatial effects of demographic trends and migration » led by the Swedish Institute for Growth Policy Studies (ITPS)

([36]) In Guyane, population is concentrated in a few localities. The situation is not comparable with the other low density areas.

ployment and improvement of accessibility to infrastructures and knowledge that should be adapted to the specific conditions of each one of them and respectful of the population and natural resources needs

3.4. New discontinuities in cross-border areas

With the eastern enlargement, the structure of European borders will change substantially. The length of borders of the EU will increase by 42% (EU-25) and 60% (EU-27). The length of land borders will increase both in relation to the area and to the population. EU enlargement will have significant impact primarily on the economy of border regions, because barriers such as limited market or tariffs which have been eliminated. New challenges and problems will emerge along the new external borders.

The importance of border regions, of cross-border cooperation and of the permeability of these borders will increase. After political changes in 1989/90, cross-border cooperation started with difficulty because of the non-existence of competencies at the regional level in central and eastern Europe. The only competent level was that of municipalities. The political, legal and economic conditions for cross-border cooperation improved substantially after 1995, in particular in the context of administrative/territorial reforms (Poland, Czech Republic, Slovakia, Bulgaria) and thanks to the support of the EU. Nowadays, there are 58 Euroregions or "Euroregion type" organisations in which accession countries participate.

From the point of view of cohesion, a decisive criterion is the size of the gap in economic welfare and development level between the two sides of borders. Previously, the largest gap existed on the external EU border. The income gap between the respective countries was 2:1 on average: in the case of Poland, Hungary and Slovakia it was larger, in the case of Slovenia and the Czech Republic it was smaller. In the case of Hungary and Slovakia, however, the gap at regional level is substantially smaller, because the border brings together the most developed regions of Hungary and Slovakia and the least developed region of Austria, Burgenland.

In recent years, as a consequence of diverging developments, a new gap has emerged along the eastern borders of the accession countries. Today, the former Iron Curtain no longer represents the single largest relative income gap in Europe. Large gaps are found in two border sections (Map 9):

– Between Greece on the one side and Bulgaria, Macedonia, Albania on the other (the quotients in development levels range from 2.5 to 4.5);
– Between Poland, Slovakia, Hungary and Romania on the one side and the Ukraine and Moldova on the other. This gap is even larger than what might be expected on the basis of the respective national GDP figures, as the Western regions are the poorest regions in the Ukraine, in contrast to the spatial pattern of development in the other countries (the GDP ratios range from 1.35 to 2.4).

Though of minor importance, the other aspect of cross-border regional disparity is the employment (or rather unemployment) disparity. These disparities have a pattern, different from income disparities. The largest gaps are in the Balkans between the very high unemployment levels of Bulgaria, Serbia and Macedonia and the substantially lower levels of Greece, Romania and Hungary. The gap measured in differences of points of unemployment percentages ranges from 16.4 to 26.4. Statistically, there is a large gap between the relatively high unemployment levels of Poland, Slovakia and the Baltic states on the one hand and the very low levels in the CIS countries Russia, Belarus and Ukraine. This gap is, however, only a "statistical gap". The low unemployment figures in CIS countries are the results of keeping former employees on the payroll even if they are not any more practically employed and they receive no wages. The reason is that only this arrangement allows the unemployed access to some social allowances and amenities.

Map 9. The dimension of economic disparities at the borders of the Enlargement Area

Conclusion:

The European Union comprises various types of regions with geographic handicaps and other specific constraints which inhibit their development.

Geographical handicaps basically exist in two types of regions: the mountain regions and the insular regions. In the context of enlargement, both categories of territories will be expanded: the mountainous areas with the massifs of Balkans and Carpets and the islands with two insular states: Malta and Cyprus.

Outermost regions, quite often accumulate these type of handicaps and are characterised by their remoteness from institutional and market access.

As far as mountain regions are concerned, trends show population decline in many massifs as well as high levels of unemployment, in particular in periphery mountains and slower evolution towards economic diversification. The situation varies however widely among the various massifs, though economic activities such as agriculture and industry or tourism require specific adaptations to the terrain and climate of these regions.

In the case of islands, the main handicap is the population threshold. Islands with a population below 3000/4000 inhabitants often show population decline and ageing, mainly resulting from insufficient public services (health, education, transportation etc.). Other insular constraints are linked to geomorphology (altitude, archipelagos) or to the distance to mainland in the case of outermost islands. The insular economy is generally based on one or two economic sectors and the GDP level reflects the peripheral situation of these territories. In the case of outermost regions, a catching up process has been observed in recent years for most of them.

Both mountainous and island regions have a valuable and sensitive environment show a large potential to benefit from sustainable tourism activities...

Other types of territorial constraints are of more socio-economic nature. Areas with low population density have reduced attractiveness by several reasons and because of low level of infrastructure and services and the modernisation and further development of such infrastructure and services raises difficulties for public and private decision-makers a negative cycle can be installed and the depopulation trend is exacerbated. An example are the far north scarcely populated areas.

The main constraint along borders of central and eastern Europe is the discontinuity in economic development. Wide gaps in GDP/head exist across the borders in numerous regions of eastern and central Europe. This type of discontinuity will also exist along external borders after EU enlargement. Low density regions and external borders have in common their very strong peripheral character.

[Part II]
Addressing the imbalanced distribution of factors of competitiveness to improve territorial cohesion

As already emphasised in the report, certain territorial disparities are not permanent in nature and can be reduced with the implementation of appropriate policy measures. Such policies seek to increase the competitiveness of regions, but they also contribute to reducing territorial imbalances of a more general nature. For instance, greater accessibility and connectivity can represent a significant contribution to cohesion (Art. 16 of the Treaty) since they increase regional competitiveness. Moreover, they are also likely to have a positive impact on depopulation trends by facilitating the development of activities in sparsely populated areas and strengthening urban centres in backward regions. Similar effects are very likely to be achieved also through the promotion of R&D activities and advanced telecommunication systems.

Therefore, in this chapter these fundamental competitiveness factors will be examined. Moreover, the contribution of the relative Community policies in transport, RDT and innovation, telecommunications and energy in view of alleviating the various types of territorial imbalances and increasing thus the competitiveness and potential of problem regions will also be assessed.

1. Promoting innovation and ensuring an equitable distribution of factors of competitiveness

1.1. R&D capacity and territorial competitiveness ([37])

1.1.1. R&D Intensity ([38])

Viewed on a European scale, there is marked concentration of R&D in a relatively small number of core regions, with 15 % of all regions accounting for half of the R&D expenditures in the Union and just 13 regions amounting to half of all the high-tech patents in Europe. A number of regions in the candidate countries perform nevertheless well on this indicator. R&D intensity is highest in Sweden, Finland and parts of the UK, Netherlands, Germany, France and Austria.

The most recent data largely confirm the familiar pattern of R&D across Europe. Among the 10 European regions with the highest R&D intensity, six are in Germany, led by Braunschweig, Stuttgart and Oberbayern. In these three, R&D represented 6.2%, 4.8% and 4.7% of GDP respectively, compared to an EU-15 average of 2.0 in 2001%. The regional top ten also include two Swedish regions, Vastsverige and Stockholm, Midi-Pyrénées and UK Eastern region.

More surprising is perhaps the high figure for the Czech region of Stredni Cechy (the area surrounding the Prague region), where R&D expenditure accounted for 2.5% of GDP; a figure significantly higher than for any region in Spain or Italy, and also for all French regions, except Ile de France and Midi-Pyrinnées. In addition, the Prague region together with Opolskie in Poland and the Hungarian region of Kozep-Magyarorszag (which includes Budapest) also feature in the top 25 regions, along with more traditionally recognized research centres such as Berlin, the East of England and Ile de France. Nevertheless, the high R&D intensity (expressed relative to GDP) for several candidate country regions should be interpreted with care, since the absolute levels of R&D expenditure in these areas remain low by European standards.

In contrast to these areas, R&D expenditure is on average less than 1% of GDP in all regions of Greece, Spain and Portugal, as well as in all Candidate Countries except for Slovenia and the Czech Republic. In 2000, the average R&D intensity for the 11 candidate countries (excluding Malta, for which no data is available) was 0.77% of GDP compared with an EU average for the same year of 1.93%. The figure was lowest in Cyprus, Romania and Latvia (0.26%, 0.37% and 0.48%, respectively).

Within countries, R&D intensity varies considerably across regions, with marked concentration of expenditure in a small number of areas often surrounding the capital city. This is the case in Austria, the Czech Republic, Poland, Finland, France, Hungary, Greece and Portugal – where the highest R&D region accounts for around half of the total national expenditure – and especially in Bulgaria, where 80% of all expenditure occurred in Yugozapaden where Sofia is located. In France, 45% of national R&D expenditure is concentrated in Ile de France (the region with the highest R&D expenditure of any European region in absolute terms), compared with a figure of only 10% the region with the second highest level of R&D expenditure in France (Rhône-Alpes).

Separating the total R&D expenditure between public and business-related expenditure, it becomes clear that a number of high expenditure regions depend

([37]) Cf. ESPON Project 2.1.2 "The territorial impact of EU research and development policy" led by ECOTEC and 3rd Cohesion Report by European Commission.

([38]) R&D intensity is defined as total R&D expenditure (performed in business enterprises, higher education, government and private non-profit sectors) as percentage of GDP.

upon public funding. Business expenditure is rather more concentrated in a limited number of regions than gross expenditure as a whole. In 2000, the highest intensities of BES (Business Enterprise Sector) expenditure were found in German, Swedish, Finnish and UK regions. Braunschweig and Västsverige stand out with particularly high levels. In absolute terms, Ile de France again has the highest levels of BES spending, while BES accounted for over 70% of total R&D spending in Sweden, Germany, Ireland and Belgium .

In the candidate countries, the average level of business expenditure on R&D is one third of the EU-15 average (i.e.0.36% of GDP), but marginally higher than Objective 1 regions. In Slovenia and the Czech Republic business R&D expenditure is clearly above the candidate average (i.e.0.83% GDP in Slovenia for 1999, 0.81% GDP in the Czech Republic for2000), although these figures are still well below the EU-15 average.

1.1.2 R&D personnel ([39])

In the EU-15, the levels of employment in R&D as a percentage of the labour force largely mirror the pattern of R&D expenditure, with many of the highest regional concentrations of total R&D personnel located in the Northern part of the European territory. The average level of total R&D employment in the EU-15 in 1999 was 1.36% of the labour force, although studies highlight that a number of core regions have research employment rates considerably above this level.

On the basis of available data, 9 of the top 25 regions in terms of total R&D employment were located in Germany (the top three again include Oberbayern, Braunschweig, and Stuttgart with 3.72%, 3.41% and 3.04% of the labour force respectively) ([40]), three in Sweden and two in Finland. Core R&D regions, in terms of research personnel, are also found in many other countries, in particular Slovakia (where Bratislavsky scores the overall highest of any other region), Hungary, the Czech Republic, Austria, France and Bulgaria. It should be noted that comparable total R&D employment figures are not available at regional level in the UK.

Once again reflecting the pattern of R&D expenditure, more peripheral regions of the EU-27, particularly in the cohesion countries and parts of Eastern Europe, exhibit the lowest levels of R&D employment. There is also considerable variation in the proportion of R&D personnel in the labour force between the candidate countries. While in Slovenia and Hungary, the levels of R&D employment are very close to the EU-15 average, R&D personnel accounts for a much smaller proportion of the workforce in many other countries, particularly in Bulgaria (0.48%) and Romania (0.39%).

As in the case of R&D expenditure, there is considerable variation also in the level of regional R&D employment in many EU-27 countries. Indeed, the pattern of national "core" regions in and around capital cities is even more marked when R&D personnel data is considered. The areas with the highest levels of R&D employment in the Candidate countries are all capital regions. Bratislavasky, Közép-Magyarország (Budapest), Prague, Yugozapaden (Sofia), Mazowieckie (Warsaw) all appear in the top 25 of EU-27 regions for this indicator. In contrast, peripheral regions in Bulgaria, the Czech Republic and Poland appear in the bottom 50 European regions for R&D personnel. This core-periphery pattern is also striking in France, Austria, Italy and Spain, although large disparities in terms of R&D employment appear to exist in almost all European countries. Even in Germany, which has the largest number of regions in the top 25, there are also regions which appear in the bottom quartile of the R&D employment ranking.

1.1.3. Human Resources in Science and Technology (HRST) ([41])

The pattern of HRST shares of total regional employment (in the EU-15) is interesting. Two countries stand out ahead of the others: Sweden (6 out of the 25 regions, including Stockholm, have among the highest shares) and Belgium (with 7 out of the top 25 regions). This is largely explained by the high levels of tertiary education and the important concentration of high technology sectors which characterise these two countries . for example, both perform particularly well in terms of total employment in High Technology Services. Other leading regions in the EU-15 include core or capital regions in Finland (Uusimaa, Manner-Suomi), the UK (Inner London), Germany (Berlin), France (Ile de France) and the Netherlands (Utrecht). At the

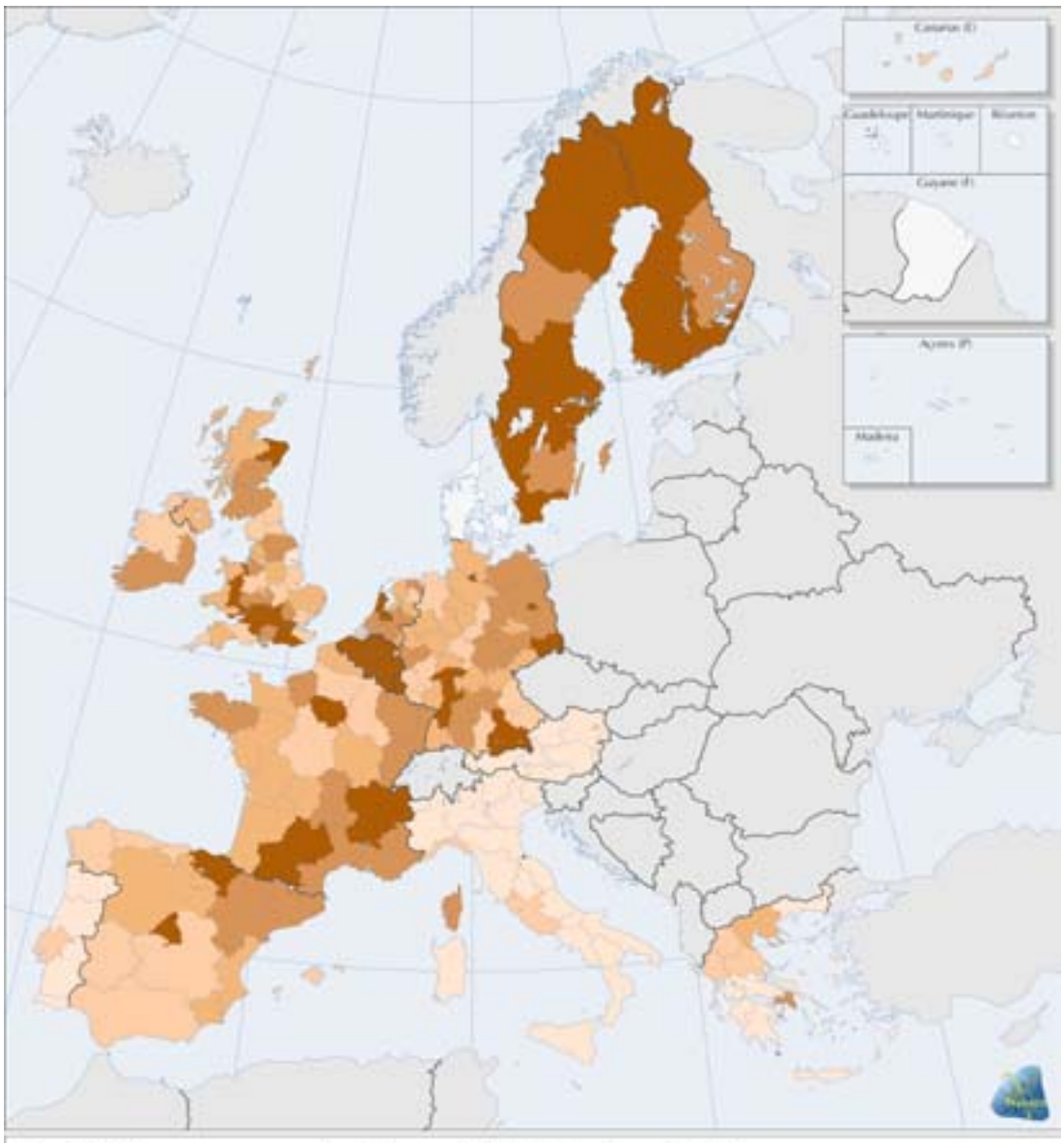
([39]) R&D personnel is expressed as a percentage of the total labour force. R&D personnel comprises individuals directly employed in R&D activities, as well as those providing direct services in the R&D sector, such as R&D managers, administrators and clerical staff

([40]) Figures for 1997

([41]) Total HRST in a given territory is thus measured by the number of people having successfully completed third level education in a Science and Technology field of study (referred to as HRST – Education / HRSTE) and the number of people not formally qualified at this level, but who are employed in a S&T occupation where the above qualifications are normally required (HRST – Occupation / HRSTO). In practice, HRSTE covers nearly all educational fields. Those people who have third level education and work in a S&T occupation are referred to as the HRST "core" or HRSTC. Data are provided for NUTS2 except Ireland (NUTS1), Switzerland and Norway (NUTS0) for 1999.

lower end of the scale regions of Portugal, Greece, Italy and Austria are found. In Italy and Austria there are also comparatively low levels of tertiary level education, even in core economic areas.

Within some countries in the EU-15 there are marked regional disparities in terms of human resources in science and technology. This is notably the case in the UK and Spain, with London and Madrid in the top 25 regions, but Cornwall, Tees Valley and Durham as well as the Canaries among the bottom 50 regions.



Map 10. Human resources in science and technology (core), 2001

1.2. Innovation capacity

1.2.1. Employment in high and medium high technology manufacturing ([42])

High and Medium High Technology manufacturing sectors in the EU-15 accounted for 7.57% of total employment in 2001, compared to 6.63% in the candidate countries.

The highest shares of these sectors in total are found in Germany, which includes the top seven regions (it is highest in Stuttgart, at 21.08´%) Other top performing regions include Franche-Comté, Piemonte and Comunidad Foral de Navarra. The bottom 50 regions include many regions from Southern Europe, along with a number of regions from core economic areas such as Outer London (1.96%), Utrecht (2.14%) and Noord Holland (2.56%). The low figures for these latter regions reflect the dominant role of the service sector employment these regions. In the candidate countries, the highest shares are found in the Czech Republic, Hungary and Slovenia, where medium high and high tech manufacturing employment is above the EU-15 average. In Cyprus, the three Baltic States and Romania, the shares are well below the EU-15, and candidate country, average

Regional disparities in the level of high technology manufacturing employment are particularly marked in Germany, Spain and Italy. This reflects substantial differences in the regional economic structure in these countries, which include both the manufacturing heartland of Europe and the rural periphery.

1.2.2. Employment in high technology services ([43])

Employment in high tech and medium tech ([44]) in the EU continued growing with an annual average growth rate of 0,9% for the 1997-02 period and accounted for 7,4% of the EU employment in 2002. The highest concentration of employment in high-tech sectors are found in North Western Europe, in London and the South East in the UK, in Stockholm, Helsinki, Utrecht and the Paris region. The highest shares (4.65% of total)are in the Berkshire, Buckinghamshire and Oxfordshire region in the UK. In the candidate countries, 2.34% of the labour force was employed in high tech services in 2001. The share was highest in Estonia (3.38%), with similar levels in the Czech Republic, Hungary, Malta and Slovakia (3.22%, 3.24%, 3.06% and 3.03% respectively). Romania, Cyprus and Latvia had the lowest shares (1.43%, 1.83% and 2.01%).

Employment in High Technology Services is high in capital regions, such as London, Paris, Madrid or Stockholm, whereas peripheral and rural areas of the continent have much lower employment levels in these services.

1.2.3. Research and Innovation Infrastructure

The strength of the innovation infrastructure can actively support the development of a strong and innovative economy. At a European level the strength of the local university base, the presence of recognised science parks and Business Innovation Centres all play a role. Analysis of the location of such infrastructure across Europe demonstrates some clear patterns:

- 4% of EU regions account for 40% of the leading research universities and institutes (e.g. Universities with the highest number of publications); 46% of recognised Science Parks and 25% of Business Innovation Centres.
- in the 12 Accession Countries there are just 18 recognised Science Parks and 10 Business Innovation Centres.
- the concentration of high quality research infrastructure occurs not only internationally among regions but also at national level where the highest concentrations are to be found in and around capital cities in most EU countries. Over half the research infrastructure in EU regions is located in just 8 regions, representing a significant endowment of knowledge and opportunity. All 8 of these are capital city regions, specifically: Stockholm Län, Paris, Barcelona, Dublin, Greater Lisbon, Communidad de Madrid, Attiki, Rome.

([42]) The medium high and high technology manufacturing sectors include chemicals, machinery, office equipment, electrical equipment, telecom equipment, precision instruments, automobiles and aerospace and other transport (based on the NACE industrial classification). As these sectors are viewed as the most innovative within the manufacturing economy, the proportion of the workforce employed in these fields is an indicator of the capacity of the economy as a whole to exploit the results of R&D and innovation.

([43]) This indicator covers three leading providing high technology services: post and telecommunications, information technology including software development and R&D services (NACE 64, 72 and 73). These sectors provide services directly to consumers and inputs to the innovative activities of other firms in all sectors of the economy. This indicator is considered to be a more accurate indication of innovative potential in the service sector than "knowledge intensive services", which includes a far wider range of sectors.

([44]) Employment in knowledge intensive services in the EU grew at an annual average growth rate of 3,1% during the 1997-2002 period, accounting for and increasing proportion of the EU's total employment (33,3% in 2002)

Summing up, innovation indicators are characterised by very strong territorial imbalances throughout Europe. The extent of concentration varies according to the indicator. Strong territorial concentration at the EU level is found for R&D, employment in high technology services and R&D infrastructure.

Concentration in the northern half of Europe occurs in the fields of R&D personnel and population with tertiary education. For employment in high and medium/high technology manufacturing, the contrast is pronounced between the manufacturing heartlands of Europe and the rural periphery.

A number of regions from the accession countries perform well compared to the EU-15 Objective 1 areas, but important differences exist between countries, in particular in the field of R&D intensity and employment in high technology services. Important imbalances also exist between regions at national level in most countries. The objective of territorial cohesion requires strong innovation policies in favour of the less advanced countries and regions.

1.2.4. Territorial impact of the current EU RDT policy

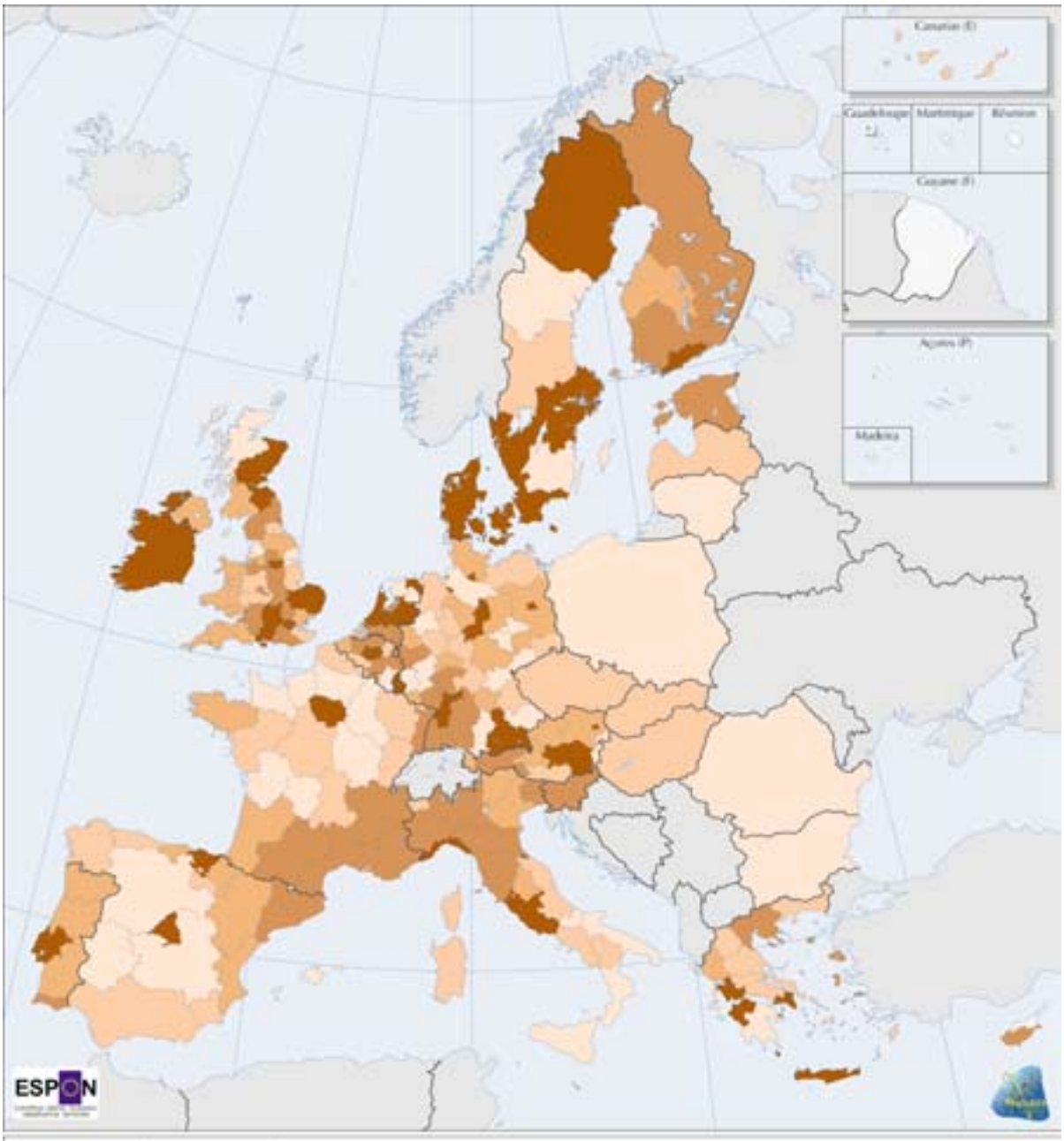
a) Framework Programme participation

The EU Framework Programme for Research and Technological Innovation plays a leading part in promoting innovation and in channelling Community and national resources towards trans-national research projects throughout Europe. Its potential contribution to territorial cohesion is important.

Participation in the Framework Programme is significantly related to levels of GDP. Regions in the lowest quartile of regions in terms of GDP tend to have the lowest levels of participation in the Framework programme. In relation to population, participation levels weighted for population appear to be even lower than those weighted for GDP. The average number of participants in Framework programme 5 (1998-2002) in an Objective 1 region is some 63% of the Eur average, although it is relatively high in a number of Objective 1 regions, particularly in Ireland, Portugal (Lisbon) and some regions Greece (map 11).

The contribution that the Framework Programme makes to knowledge flows between regions and across Europe must not be underestimated. It is reported that the Programme has led to the creation of extensive and active knowledge networks with strong ties. The networks and projects also foster ties between research institutions and firms, contributing to the development of active innovation networks. These are leading to new practices of working and communicating and promoting trust – a key element of in the promotion of R&D and its eventual adoption in the form of innovation. The Framework Programmes are also contributing to the development of clusters of activity.

The Framework Programmes are having an effect on the development of new methodologies and interactions between different actor-groups. This improves organizational and scientific practice. Trans-regional cooperation is also affecting working methods. The 'large players' in particular are reported to have benefited by developing new products and processes within trans-national partnerships. There is however little evidence of the development of sustainable network creation within regions; most job creation (or safeguarding of existing jobs) has been of a temporary nature.



Map 11. 5th Framework Programme participations

number per million inhabitants

- < 39.5
- 39.5 - 65.0
- 65.0 - 115.1
- 115.1 - 201.0
- >= 201.0
- no data

EU-27 = 119

IE, BG, CZ, HU, PL, RO, SK : NUTS0

Origin of data: CORDIS
Source: ESPON Database

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

b) Use of Structural Funds

The Structural Funds have allocated a total of 10.6bn euros to R&D activities in the 2000-2006 programming period. Around three-quarters (74%) of this comes from the ERDF and one quarter (25%) from the ESF. Just under half of all planned expenditure is intended to support innovation and technology transfers, the establishment of networks and partnerships between businesses and/or research institutes. Support for research projects based in universities and other research institutes and the development of Research, Technological Development and Innovation (RTDI) Infrastructure represent the other two main areas of activity.

Objective 1 regions are generally characterised by low levels of R&D investment and poorly developed research and innovation infrastructure. As a result of these basic weaknesses, R&D-related actions in early Objective 1 Programmes have traditionally been focused on infrastructure development (support for research establishments, capital investment as so on). However, the evaluation of RTDI actions in Objective 1 regions under the 1994-1999 Programming period notes a shift in emphasis from 1994 onwards, less concentration on science and technology supply and more towards market demand.

The lower level of funding available for Objective 2 actions means that the large-scale infrastructure investments undertaken in Objective 1 regions are not possible; nevertheless Objective 2 programmes have often contributed to physical infrastructure development.

Examples include support for expanding business parks and educational establishments (for example in East Netherlands, Lorraine and Cologne) or for the acquisition of equipment, such as computer software (Liguria). This also includes support for public or private research, such as direct grants for R&D projects and R&D-related productive investment in businesses, contributions to the cost of recruiting R&D personnel and subsidies for the registration of patents (such as in Mecklenburg-Vorpommern).

Support is in some cases directed at the provision of advice and consultancy to business, in particular to SMEs. This encompasses a wide range of projects aimed at developing links between different actors in the regional innovation system, either on the supply or demand side. Initiatives co-financed by Objective 1 Programmes include the expansion of Business Innovation Centres and the creation of a network of business incubator support infrastructure in Wales, the development of a "one-stop shop" at a university in Calabria and promotion of R&D co-operation among businesses in Mecklenburg-Vorpommern.

Other interventions within objective 1 programmes include training initiatives with a specific focus on R&D or innovation and direct support for research and innovation projects focusing on the demand side of the innovation system.

Summing up, the Framework Programme generates significant added-value in several areas, notably innovation capacity, development of active innovation networks and of new methodologies, creation of technological clusters etc. It appears, however, that participation is much higher in non-objective 1 regions, although a limited number of objective 1 regions benefit from significant support. In order to improve territorial cohesion implies, the participation of objective 1 regions needs to improve, which underlines the need to increase capacity building.

Structural Funds programmes have provided significant support to R&D and innovation within both Objective 1 and Objective 2 regions. Support for science and technology has in recent years significantly diversified. While originally it concentrated mainly on R&D infrastructure (ERDF support) and human resources (ESF support), other types of activities are increasingly supported: advice and consultancy, direct support to research and innovation projects etc. This evolution has been justified by the recognition that the regional capacity to innovate depends not only on the local supply of technology, but also on the receptiveness (or absorptive capacity) of the local economy and in particular of SMEs.

2. Improving accessibility to services of general interest (SGI)

The Treaty explicitly recognizes the important role played by the services of general interest in the promotion of social and territorial cohesion. The political importance of these services is obvious, as they represent an essential element of the European model of society. But they also play an unavoidable role in territorial cohesion, as effective and accessible public services constitute an essential condition for the attractiveness and development of territories.

This chapter will therefore examine the accessibility situation for three network industries: transport, telecommunications and energy.

Although accessibility covers several concepts, including universality, affordability, territorial accessibility or subjective criteria related to quality or continuity, the following sections will analyse only territorial accessibility, through the territorial distribution of supply.

2.1. Accessibility / Transportation

Territorial accessibility in the transport sector can be considered at two levels. Firstly, disparities in the endowment of transport infrastructures (air, rails, ports and airports); allow a picture of territorial accessibility (NUTS3) to be constructed for each mode, as well as configuration of transport flows and corridors. This report will subsequently examine the accessibility to the major transport infrastructures, and analyze the extent of connectivity to the major axes through secondary networks.

2.1.1 Disparities in transport infrastructure endowment

A close relationship exists between endowment in transport infrastructure and territorial competitiveness, as transport infrastructure facilitates . Infrastructure endowment can be measured by a range of indicators: it can be related to the surface area or to population living there. This latter has been chosen here.

Density of motorways and expressways by population

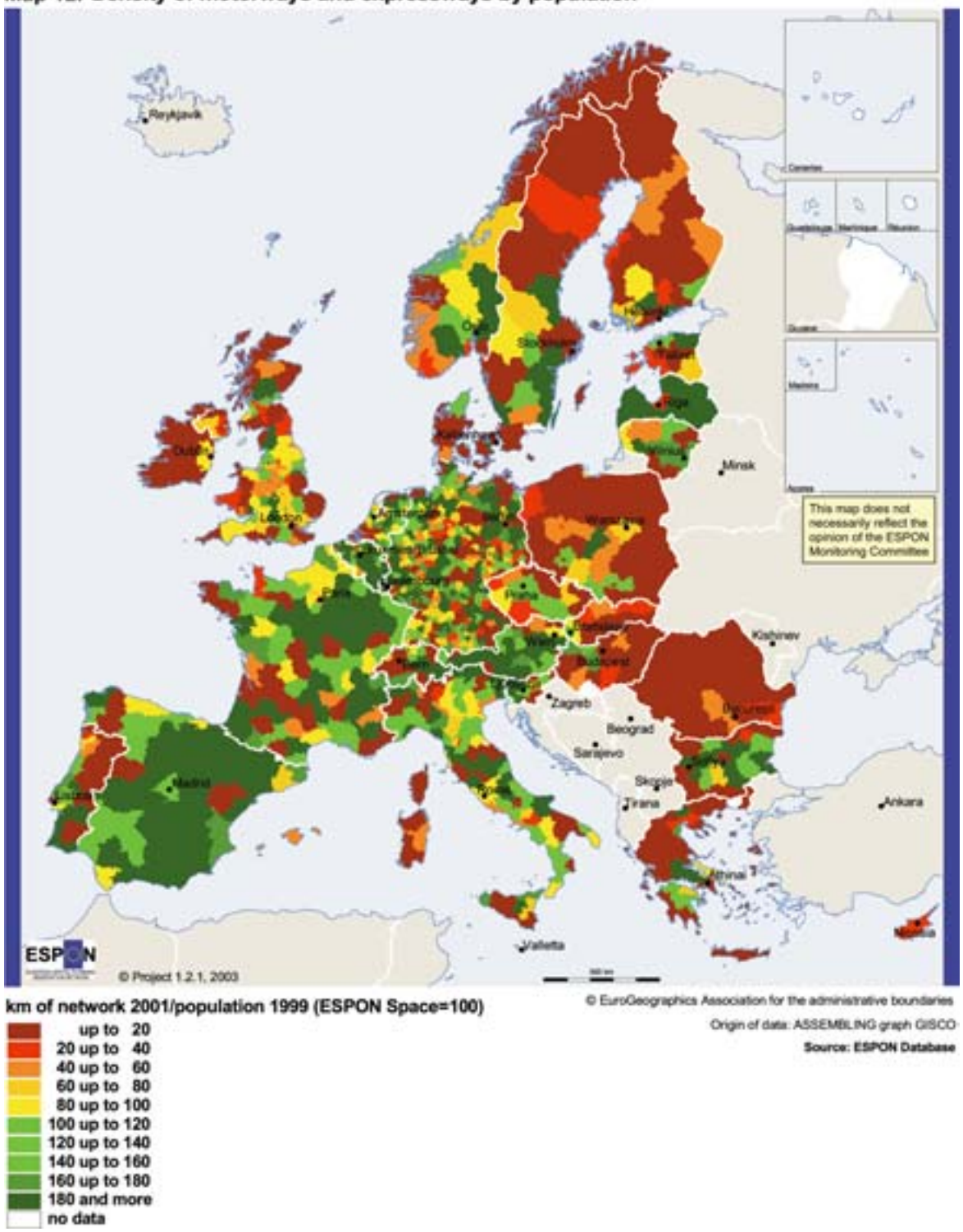
The density of motorways and expressways with estimated speeds above 85 km/h has been calculated relative to population for all NUTS3 regions of the ESPON space. It has been mapped (see Map 11 “Density of motorways and expressways by population”) using relative values (percentage of the EU-27 average).

Low density of motorways and expressways (below 40% of EU-27 average) is found in large areas in the northern periphery (central and northern parts of Sweden and Finland) and in the majority of the accession countries (with the exception of Slovenia, central/western parts of the Czech Republic and eastern parts of Bulgaria). In the rest of the EU-15, the situation is more diverse. Low density areas are generally smaller in size. They are located in the European periphery (northern Scotland, Ireland, Brittany, mountain areas of Portugal and Galicia, Corsica, Sardinia, large parts of Sicily and Puglia, northern parts of Greece and Greek Islands), but also in a number of more central regions (parts of southwest France and Massif Central, parts of central Italy, large parts of Denmark and numerous smaller areas of Germany). In Germany, the small size of the NUTS3 units may give the wrong impression of lower motorway density in some areas.

High density of motorways and expressways by population (above 140% of EU27 average) are not generally in the periphery, with the significant exception of Spain, most of which belongs to this category. The other major high density areas are situated in the northern half of France, the Benelux countries, Austria, southern Sweden, Latvia, the eastern part of Bulgaria and the central part of Greece, as well as in the coastal zones of Portugal.

In conclusion, the smallest endowment of motorways and expressways (relative to population) are in the accession countries and the northern periphery.

Map 12. Density of motorways and expressways by population



Density of rail lines by population

The density of railways by population has been calculated for all NUTS3 of the ESPON space, although this takes no account of the quality of service. This has also been mapped (see Map 12 "Density of rail lines by population) in using relative values (percentage of the EU-27 average).

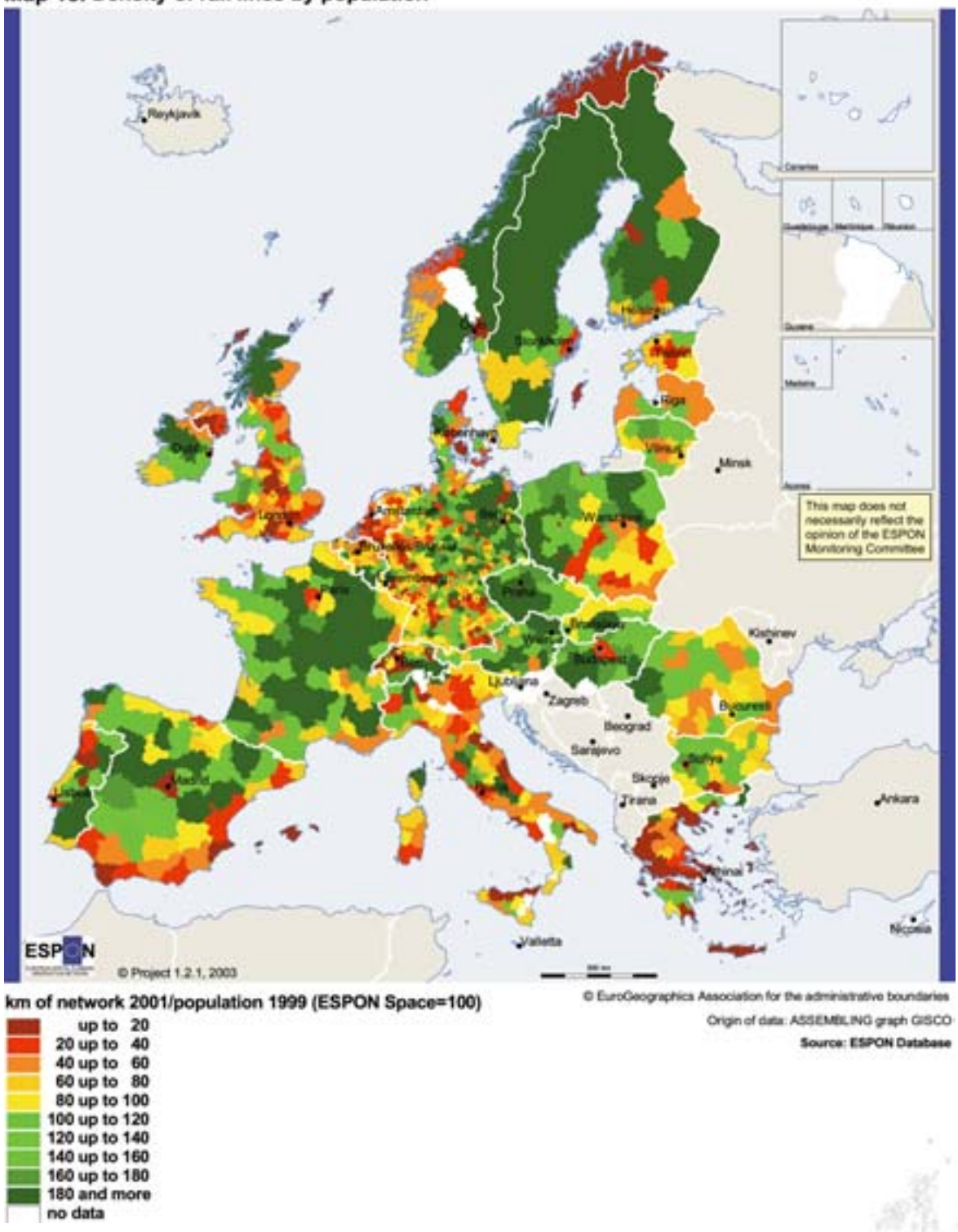
The relative situation of the northern periphery and the accession countries is quite different to the that for motorways and expressways. Large parts of these have railway density above the EU-27 average, although with some exceptions (Romania, southern Poland, Latvia and Eastland). In the EU-15, peripheral areas with significant above-average (higher than 140%) railway den-

sity are in northern Scotland, central/western Ireland, Galicia, Alentejo and large parts of central and northern Spain. Large parts of the French territory also have an above-average railway density (by population).

It is striking that low railway density areas (by population) mirror "Blue Banana" quite closely, with an extension at the Southern end, covering central and southern Italy. Other areas with low density are situated along the whole Mediterranean coast of Spain, Sardinia, most parts of Greece, the northern half of Portugal as well as in a number of smaller areas of West-Germany.

The map reflects the fact that railways are generally much older than motorways and their density did not follow the strong urbanisation process of the second

Map 13. Density of rail lines by population

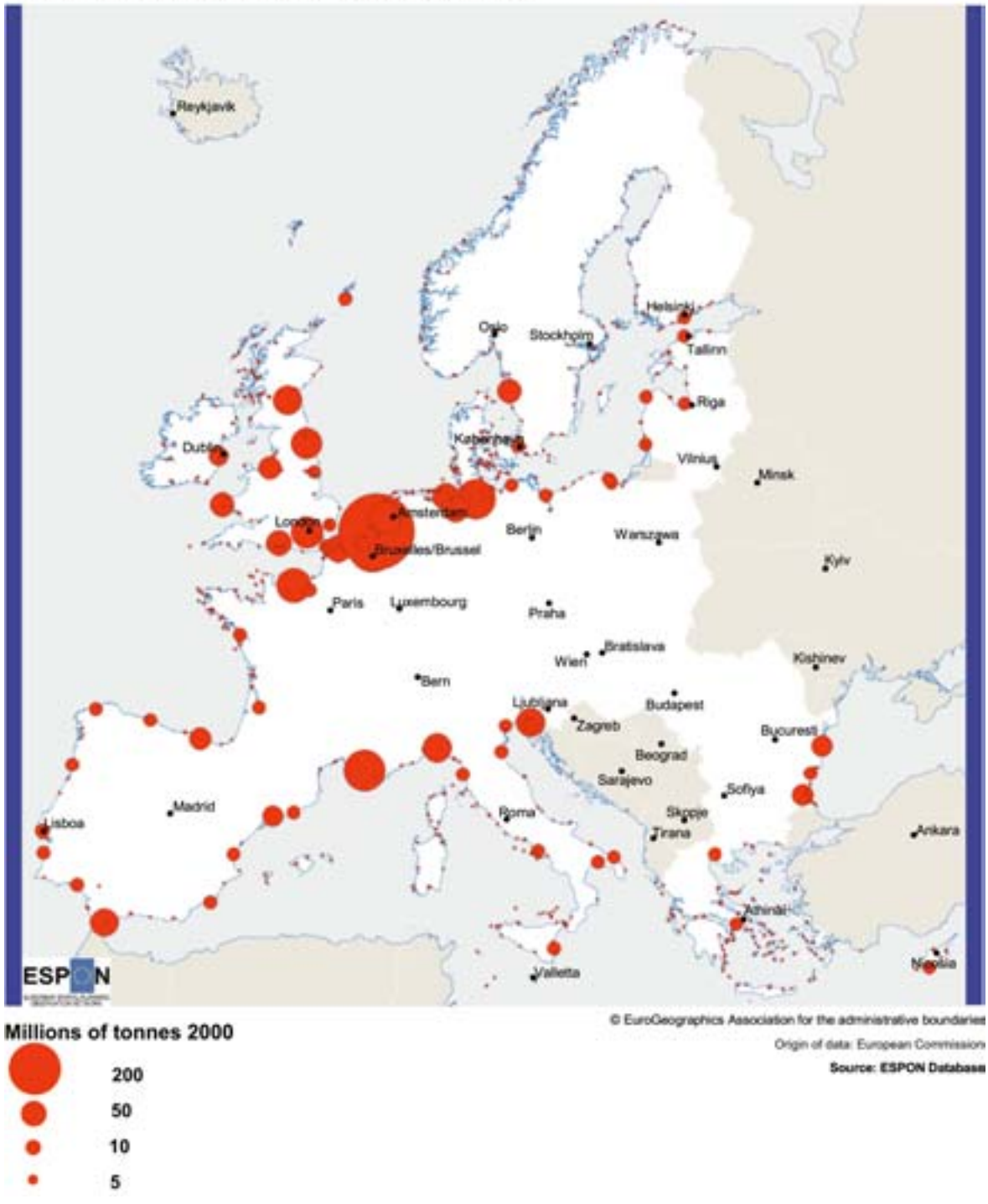


half of the 20th century. Their density by population is therefore higher in less urbanised regions.

Commercial seaport infrastructure

In terms of absolute numbers, commercial seaports – turning over more than 5 million tons – are fairly distributed along the various European seaboards (See Map 12). Taking into account their size and turnover, the picture is reversed; an overwhelming concentration of very large ports is found in the channel and North-Sea area (Rotterdam, Antwerp, Bremen, Hamburg, Le Havre etc.), while only three such ports (Marseilles, Genoa, Trieste) are in the northern Mediterranean. The Baltic Sea, the Atlantic coast, the rest of the Mediterranean as well as the western Black Sea only have medium-sized and small commercial ports.

Map 14. Commercial seaports infrastructure

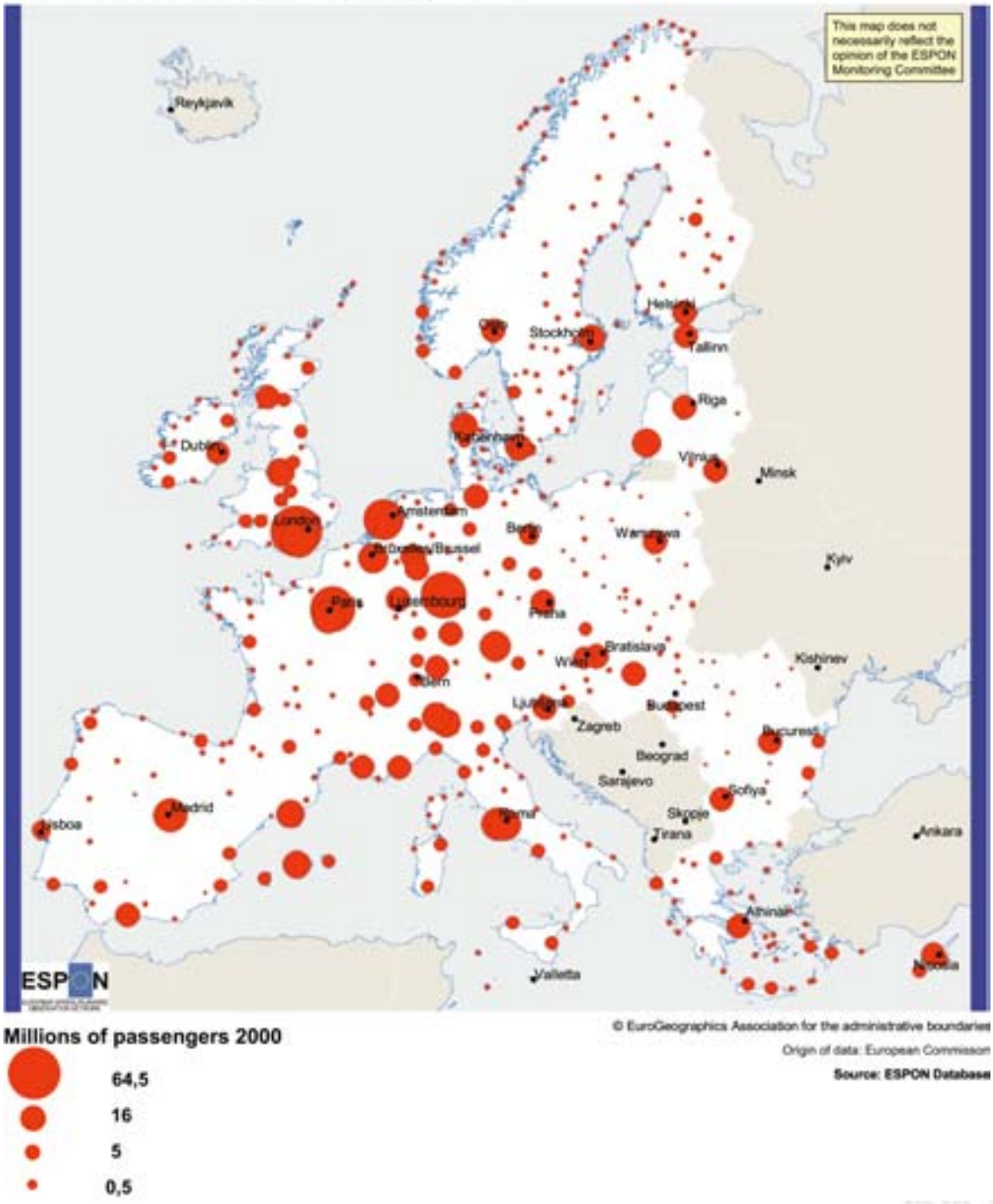


The concentration of all large ports in a small part of the European seaboards, in particular in rich and well developed regions, is a major factor of territorial imbalance in Europe often resulting from historical developments.

Commercial airports

As with commercial seaports, the spatial distribution of commercial airports across the territory of the EU-27 is fairly balanced, if their size is left out of consideration (see Map 13). There is relatively low airport density in Spain (outside Madrid and the coastal regions), central France (outside Paris), Bulgaria and Romania (outside the capital regions) and the Baltic states (outside the capital regions). If the level of airport traffic is taken into consideration, the picture is rather different; this indicates a strong concentration of very large airports in the Pentagon, followed by a further

Map 15. Commercial airports infrastructure



concentration of large and medium-sized airports in the Mediterranean regions, in particular there where tourism plays an important role. In the accession countries and in the Nordic countries, large airports are primarily those of the capital cities. The largest number of small airports (less than 500 000 passengers per year) is found in the Nordic countries and in the accession countries, outside the capital regions.

Transport infrastructure makes a significant contribution to territorial competitiveness. The density of motorways and expressways by population shows a centre-periphery pattern (with the exception of Spain). Areas with the lowest endowment of motorways and expressways (by population) are the accession countries and the northern periphery.

The situation of these regions is reversed when considering the density of rail lines by population. It is striking that areas with low railway density by population cover the area of the Blue Banana, extended towards central and southern Italy. Other areas with low railway density are situated along the whole Mediterranean coast of Spain, Sardinia, most parts of Greece, the northern half of Portugal as well as a number of smaller areas of West-Germany.

Considering seaports by size and turnover, very large ports are concentrated in the Channel and North Sea area. A strong concentration of very large airports (on the basis of airport traffic) is to be found in the pentagon, followed by another concentration of large and medium-sized airports in the Mediterranean regions. Stronger balance in the infrastructural endowment of regions would contribute to more equilibrated territorial competitiveness.

2.1.2. Consequences of these disparities for the Europe-wide accessibility and the organisation of major flows

a) Accessibility to transport

Access to transport is an important factor for measuring the peripherality of a region compared to the core area of the Union. It determines the locational advantage of an area and its attractiveness for firms and households. Regions with better access to input materials and markets should indeed be more productive, more competitive and hence more successful than more remote and isolated regions.

Accessibility indicators should therefore measure the benefits derived by households and firms from the existence of the transport infrastructure in their area. This can be constructed from two major components; the first represents the size of the market opportunities that are accessed (measured by GDP and/or population), while the second represents the effort, time, distance or cost needed to reach these.

Potential accessibility indicators for each NUTS 3 region have thus been calculated in the maps below, by summing the population that can be accessed weighted by the travel time required to go there by road/ rail or air ([45]).

Accessibility by road

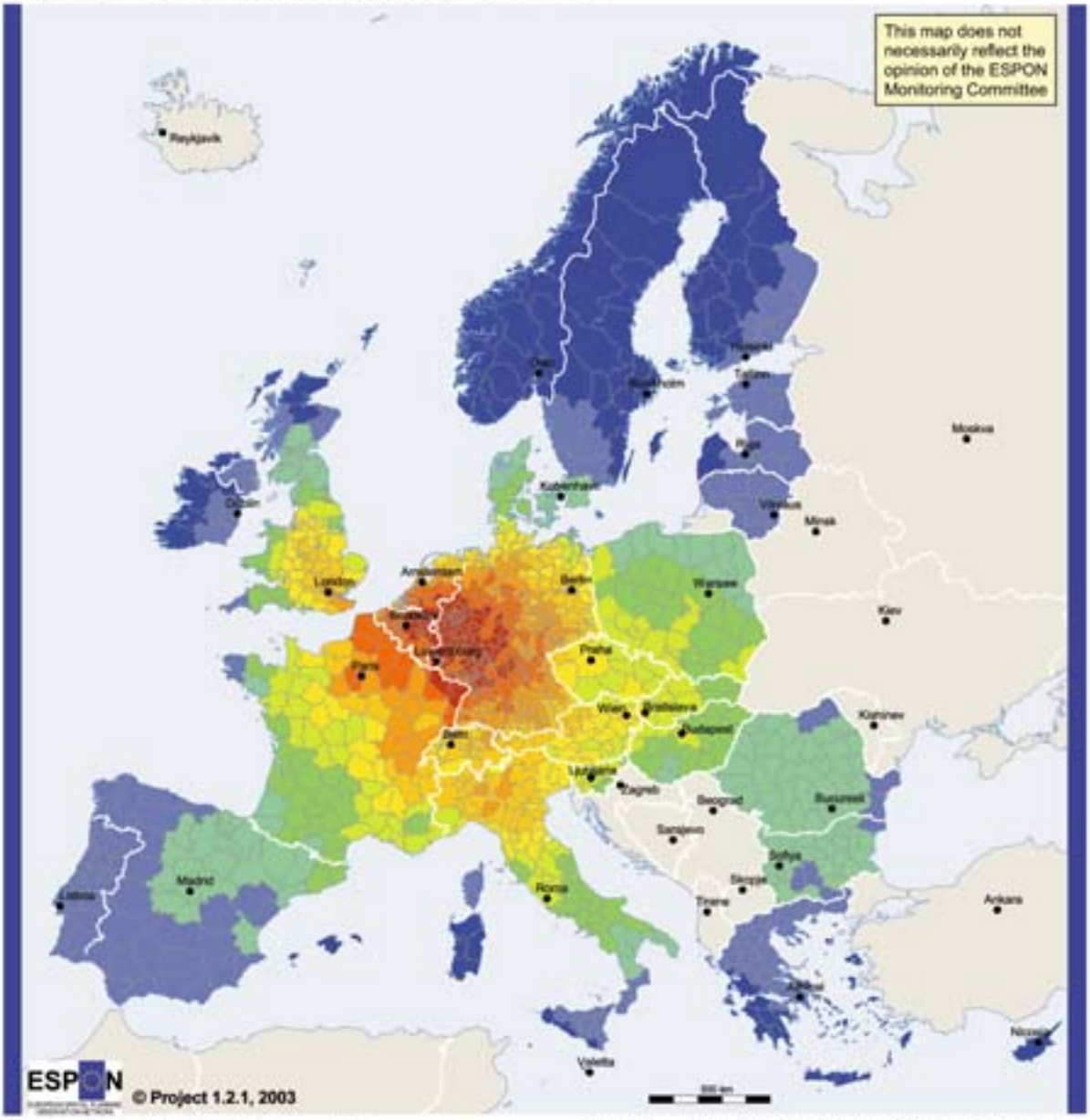
The indicator of potential accessibility by road to population has been calculated for all NUTS3 regions of the ESPON space (See Map 14). The road network used for the calculation contains all existing motorways, dual carriageways and other expressways, E-Roads and the most important national roads, as well as car ferries and the Eurotunnel. The road network database contains information on the type of road, the inclusion in the TEN and TINA programmes, national speed limits and border delays. Travel time takes account of average speeds in relation to different speed limits in the various countries.

The map "Potential accessibility, road, 2001" shows clearly that the most accessible regions by road (accessibility index higher than 120% of ESPON space average) are very similar to the Pentagon, with an eastwards extension to include East-Germany. The regions with highest accessibility (accessibility index above 180% of the ESPON space average) are located in the Benelux countries and in the German Länder of Rheinland-Pfalz and Nordrhein-Westfalen.

The least accessible regions (accessibility index below 40% of the ESPON space average) are all located in the European periphery (Nordic countries, north of Scotland, Ireland, Portugal, western and southern parts of Spain, Corsica, Sardinia, Greece, Cyprus, Malta, eastern parts of Romania, Baltic states). It is remarkable that the largest part of the accession countries of central and eastern Europe have an accessibility index similar to that of south-west France, northern Spain and Denmark, which is in all cases better than that of Portugal, Ireland, western and southern Spain.

([45]) These indicators contain parameters that need to be calibrated and their values cannot be expressed in familiar units. They are therefore expressed in percentage of the ESPON space average.

Map 16. Potential accessibility by road 2001



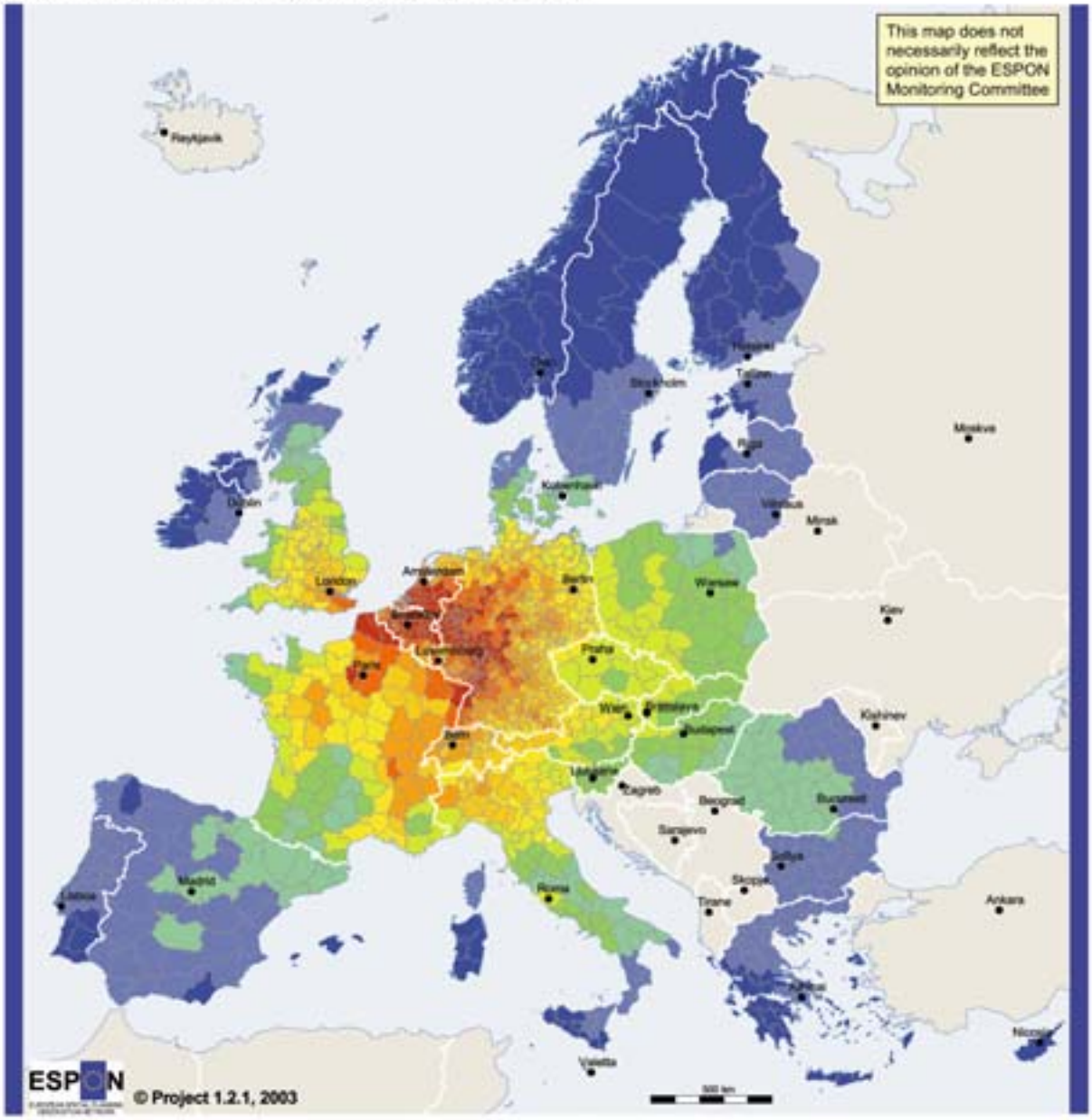
Accessibility index (EU27 = 100)

- 0 < 20
- 20 < 40
- 40 < 60
- 60 < 80
- 80 < 100
- 100 < 120
- 120 < 140
- 140 < 160
- 160 < 180
- 180 and more

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

Source: ESPON Database

Map 17. Potential accessibility by rail, 2001



Accessibility index (EU27 = 100)

- 0 < 20
- 20 < 40
- 40 < 60
- 60 < 80
- 80 < 100
- 100 < 120
- 120 < 140
- 140 < 160
- 160 < 180
- 180 and more

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

Source: ESPON Database

Accessibility by rail

The indicator of potential accessibility to population by rail has been calculated for all NUTS3 regions of the ESPON space (See Map 15). The rail network used for the calculation contains all existing and planned high-speed rail lines, upgraded high-speed rail lines and the most important conventional lines as well as some rail ferry and other secondary rail lines, to ensure connectivity of the NUTS3 regions. The rail network database contains information on the link category, the length inclusion in the TEN and TINA programmes and travel time derived from rail time tables.

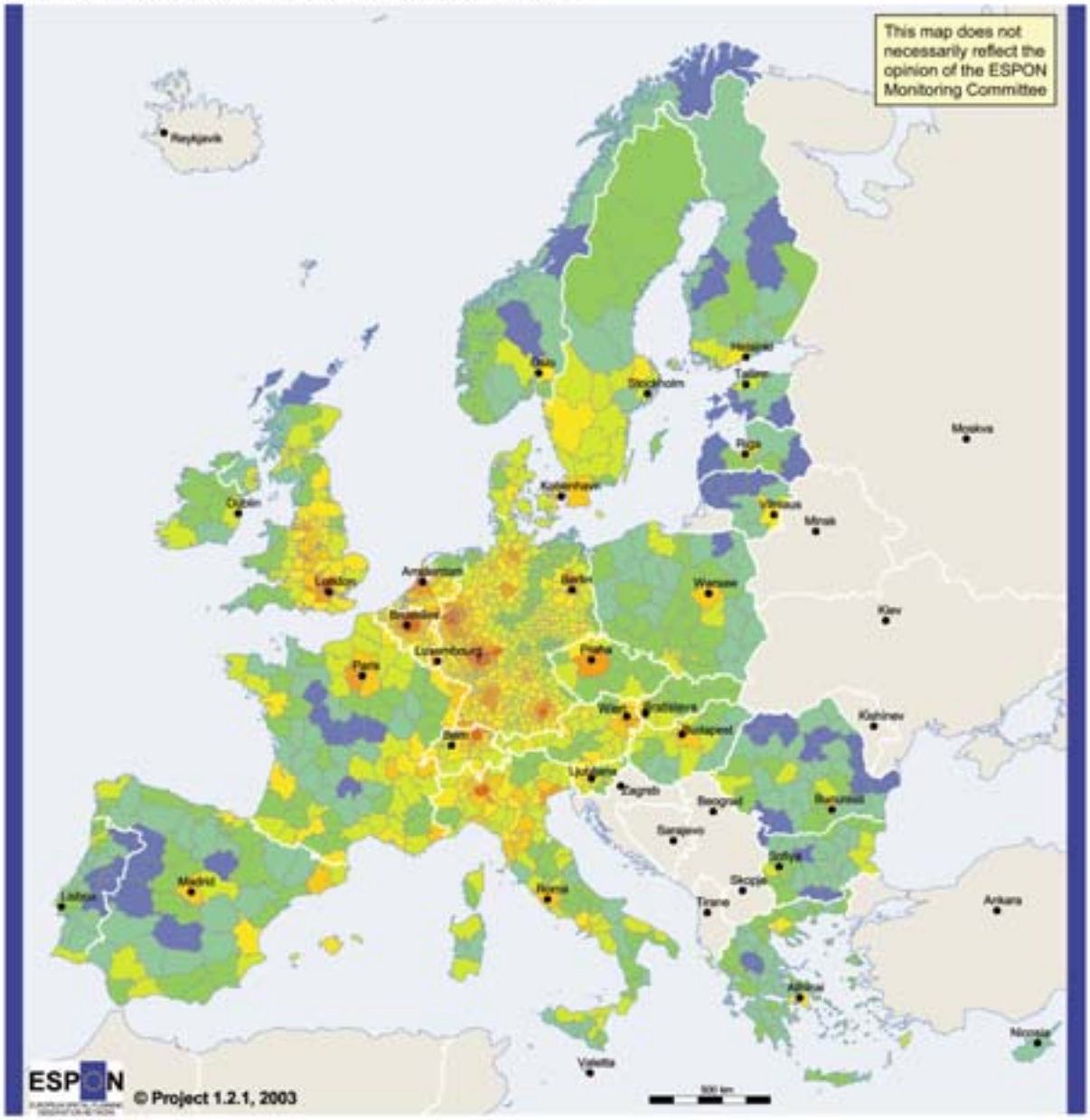
The map "Potential accessibility, rail, 2001" shows a pattern similar to that obtained for accessibility by road. Here again, the most accessible regions (accessibility index above 120% of the ESPON space average) are largely contained in the Pentagon, with some extensions towards East-Germany as well as towards the Rhone valley and the Loire valley in France. Low accessibility by rail (accessibility index below 40% of ESPON space average) are mainly in the European periphery, especially in Spain, Bulgaria and Romania. The high density of rail lines noted above for some candidate countries does not lead to better accessibility at European level, as they are relatively old rail lines, or regional, low speed trains. In spite of higher density of rail lines in some peripheral areas, their low speed is not sufficient to compensate the distance to market of these regions.

Accessibility by air

The indicator of potential accessibility to population by air has been calculated for all NUTS3 regions in the ESPON space (See Map 16). The airports are all those contained in the TEN and TINA programmes. In addition, important airports in Eastern Europe and in other non-EU countries were included to ensure the connectivity of these regions. The air network contains non-stop relations between two airports. Only regular scheduled flights are taken into consideration. For each relation, the average flight time based on flight time table information and the frequency of flights are taken into account. The frequency is used for time penalties for those relations that do not have several flights per day.

The picture for potential accessibility by air (see Map "Potential accessibility, air, 2001") is completely different to those for land transport accessibility. The map of Europe is converted into a patchwork of regions with high accessibility surrounded by regions with low accessibility. Low accessibility, however, is not only a concern for the "traditional" European periphery, but also for some regions located in the European core. Some regions of central France, south-west of Paris, are classified in the accessibility category below 40% of the ESPON space average. Other regions with low accessibility are mainly in the European periphery: Nordic countries, Baltic States, peripheral regions of Romania, border regions between Spain and Portugal, central Greece, northern Scotland.

Map 18. Potential accessibility by air, 2001



Accessibility index (EU27 = 100)

- 0 < 20
- 20 < 40
- 40 < 60
- 60 < 80
- 80 < 100
- 100 < 120
- 120 < 140
- 140 < 160
- 160 < 180
- 180 and more

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

Source: ESPON Database

b) Relations between accessibility and size of urban regions

It is of interest whether there is a relation between the size of urban agglomerations and their transport accessibility, in particular with a view to considering the impact of more polycentric urban systems on accessibility and, therefore, on competitiveness. For this purpose, a map representing both the size of FUAs and their level of multimodal accessibility has been produced (see Map 17 "Potential accessibility of FUAs, multimodal, 2001).

It shows that FUAs located in the Pentagon generally have a high level of accessibility, rather independently of their size. The medium-sized and small FUAs of the Pentagon generally have an accessibility index above the ESPON space average or, in the worst case, slightly below it (between 80% and 100% of this average).

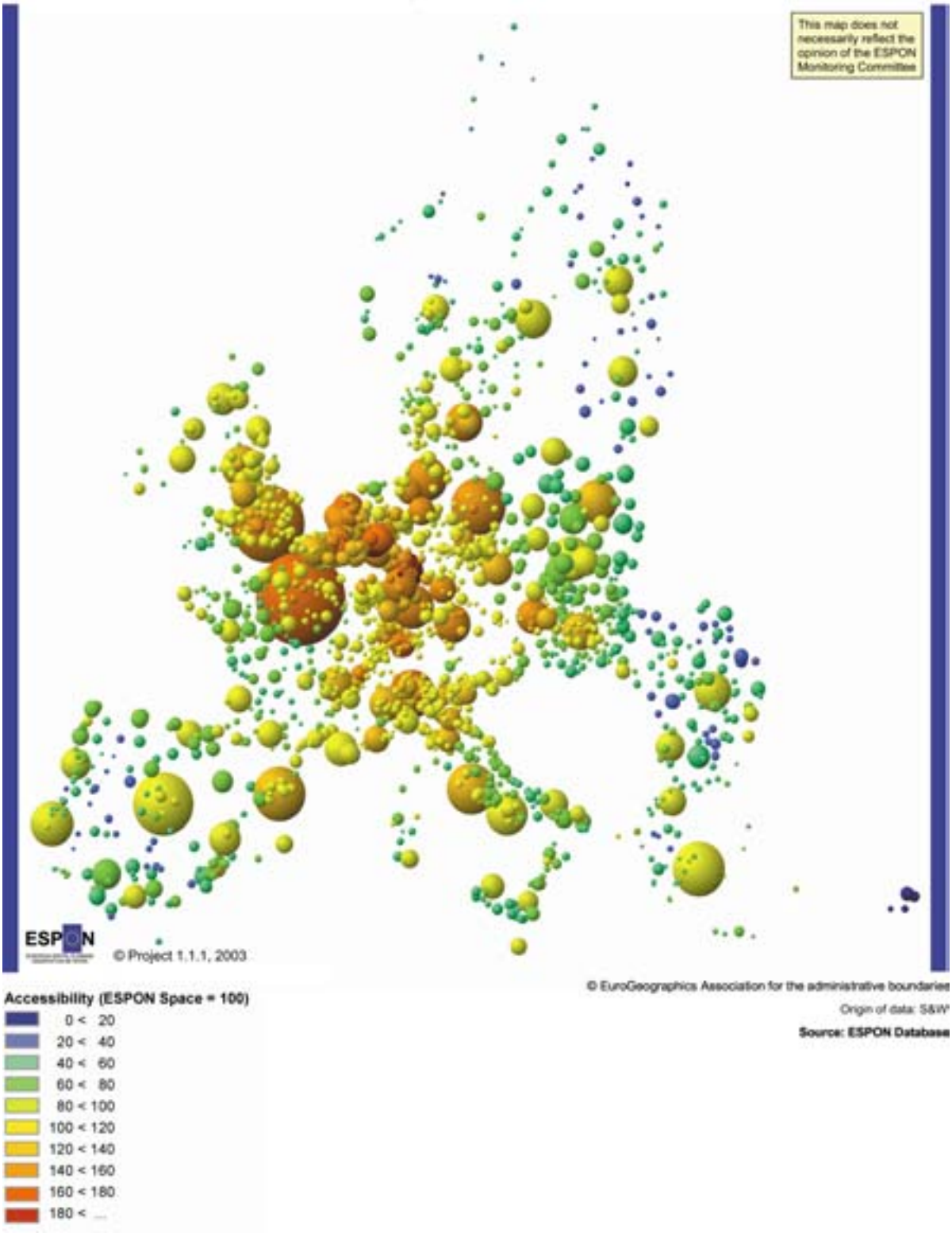
Outside the Pentagon, there are only a few large towns with an accessibility index above the ESPON space average (Barcelona, Rome, Nice, Berlin, Warsaw, Vienna, Bratislava, Budapest, Copenhagen, Manchester, and Liverpool). Capital cities such as Madrid, Lisbon, Athens, Stockholm, Helsinki, Tallinn, Riga, Vilnius, Bucharest, Sofia, and Dublin all have an accessibility indices in the range of 80%-100% of the ESPON space average. In the accession countries, in the Iberian Peninsula and in the Nordic countries, there are numerous medium-sized and small FUAs with a very low accessibility index (below 60% of the ESPON space average).

It must be stressed here that this picture is distorted as only transport of people is taken into account in the accessibility calculation. The situation of peripheral metropolitan areas is rather different when considering goods transport. In this case, the existence of a large port is more important than that of a large airport. In case of land transport, low efficiency and long distances are always a handicap for peripheral regions. While the mobility of people be increasingly be substituted by electronic exchange of information, this does not hold true for goods transport.

Analysed on the basis of the transportation of persons, Europe-wide accessibility shows a clear centre-periphery pattern for roads and railways. Regions with the highest Europe-wide accessibility are located within the pentagon. Accessibility by air shows a quite different pattern, with high accessibility in a number of regions of the periphery, provided they have a well developed airport.

The multimodal accessibility of FUAs is primarily a function of their geographic location (centre versus periphery) and secondarily a function of their size. The analysis shows that the improvement of accessibility is an important prerequisite for the emergence of more polycentric urban systems.

Map 19. Potential accessibilty of FUAs, multimodal 2001



c) North-south and east-west patterns in the organisation of major flows and corridors

Maps of major flows of road and rail traffic show various corridors broadly following a north-south trend, some running from north-west to south-east along the axis of the "Blue banana" and others running from north-east to south-west. The morphology of flows varies however from country to country, depending on their networks. It is possible to identify three main types of network corridors:

– centralized networks combined with a peripheral network for instance the Iberian Peninsula,
– parallel networks as in France, Italy, United Kingdom, Sweden, Finland…
– networks with a square pattern as for example the German network.

In the others, networks are combinations of these three types. The third type is the most connected network, the least vulnerable because it has many possible paths. The vulnerability of the others is greater.

A general reorientation of economic flows in the East-West direction has already begun during the 90s. What is now expected is increased intensity – and in some cases a changing composition – of flows.

Trade between the Western and Eastern parts of Europe will increasingly reflect comparative advantage and will therefore increase.

Some transport flows will also change due to the elimination of barriers between the present candidate countries. Barriers have several dimensions, from physical to cultural, but are generally lower along established trade and transport corridors.

This leads to the assumption that development of the cities, city clusters and city networks located in corridors that mainly constitute axial extensions of the single Global Integration Zone of EU –15 will be reinforced.

Nevertheless the quality of transport infrastructure in candidate countries and between these countries and western Europe is very poor. This problem has already been addressed by the Transport Infrastructure Needs Assessment (TINA) programme of transport infrastructure corridors for the accession countries. From an economic point of view, TEN-T and TINA projects seem to support the integration of the accession countries into the European Union.

While north-south corridors of transportation still dominate in Europe, enlargement will strongly contribute to the development of East-West corridors. The forecasted increase of flows in major corridors will generate saturation effects. It is therefore important that the implementation of TEN-T and TINA Networks be accelerated.

d) Limited permeability on east-west cross-border and trans-national corridors

Borders can be classified by their permeability, according to the frequency of border crossings and of the administrative arrangements which facilitate the crossing of these borders.

On average, there is an international road border crossing every 60 km along the borders of the Enlargement Area. But the actual figure varies substantially: for every 100km of border, there are 3 crossing points between EU member states and accession states, 1.5 such crossing points between accession countries, and only 0.75 crossing points leading to third countries. But there are extreme cases. On the borders between Greece and Bulgaria, and between Romania and Ukraine, the density is only 0.4 crossing point per 100 km.

While in the past, a relatively dense network of roads and railways connected the areas of the accession and neighbouring third countries, which are now on the two sides of the borders, according to estimations, only 40 percent of built roads, and 50 percent of built railway lines crossing the borders are currently used as international border crossings. Some other roads can be used only by citizens of the two neighbouring countries or regions, some are open only for a couple of hours daily, some are open only on holidays or during some extraordinary events, others are never crossable, and even the rails have been removed.

Integration within the enlarged EU cannot be achieved if the level of border permeability remains insufficient. Increased permeability is needed not only along important transnational corridors, but also for the integration between border regions and for the normalisation of neighbourhood relationships.

2.1.3. Effective access to transport services : territorial disparities in connectivity ([46]) to major networks and the role of secondary networks

Accessibility to Services of General Interest depends upon the infrastructural endowment of regions and upon various existing modes of transport that are available. Connectivity to hubs and major infrastructure access points is an important element for this type of accessibility.

The connectivity to transport terminals has thus been calculated for all NUTS 3 centres of the ESPON space using road transport network in 2001. A partial measurement of connectivity can be made for each type of network and of terminal (motorways, railways, airports, seaports). These partial measurements can be aggregated for all available terminals and all transport networks to give a synthetic measure of spatial connectivity to transport networks.

For connectivity to motorways (See Map 18), there is a clear distinction between eastern countries and EU countries. This applies especially to the EU core (the Netherlands, Belgium and the west of Germany) which is served by a dense motorway network, while connectivity in accession countries is much lower (with the exception of Slovenia and Bulgaria), in particular in their eastern regions. It has to be noted that nearly all capitals in the EU are linked via a motorway network. This is not the case in some isolated areas, particularly on the EU periphery and on the EU borders with the accession countries, as well as between these countries (Poland, Romania and Bulgaria), where some missing links still have to be filled in.

For connectivity to rail stations (See Map 18), the whole ESPON space is well served, with a service of 75 interregional trains per day. There are only few areas of significant size which are not well serviced. These tend to be mountain areas or remote rural areas in the Nordic and Baltic countries.

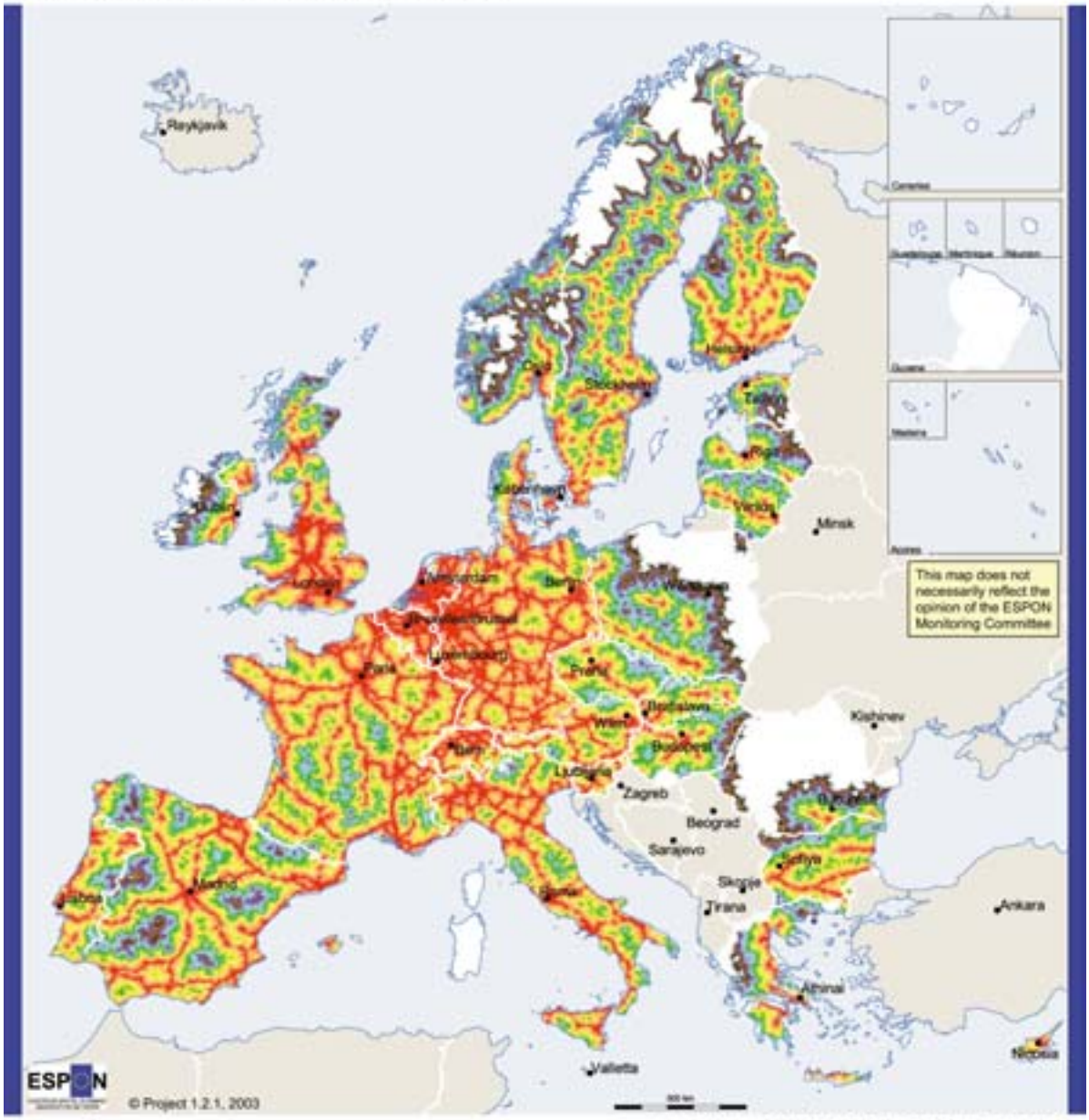
Most coastal regions (except a large part of Scandinavia which has only small fishing ports) have good seaport infrastructure, but the size of their hinterland is dependent upon the existing road network.

In EU core countries, major airports with good services are spread through all the territory. This is not the case for the peripheral EU countries like Spain, Sweden and Finland, neither for the accession countries, where the hinterlands are small and surrounded by ineffectively connected regions. An extreme case occurs in the Scandinavian countries, where only the metropolitan areas of the capital cities are connected to well-serviced airports; the rest of the territory is hardly connected at all. The main airports in accession countries do not appear to act as hubs for secondary hubs across the rest of the territory.

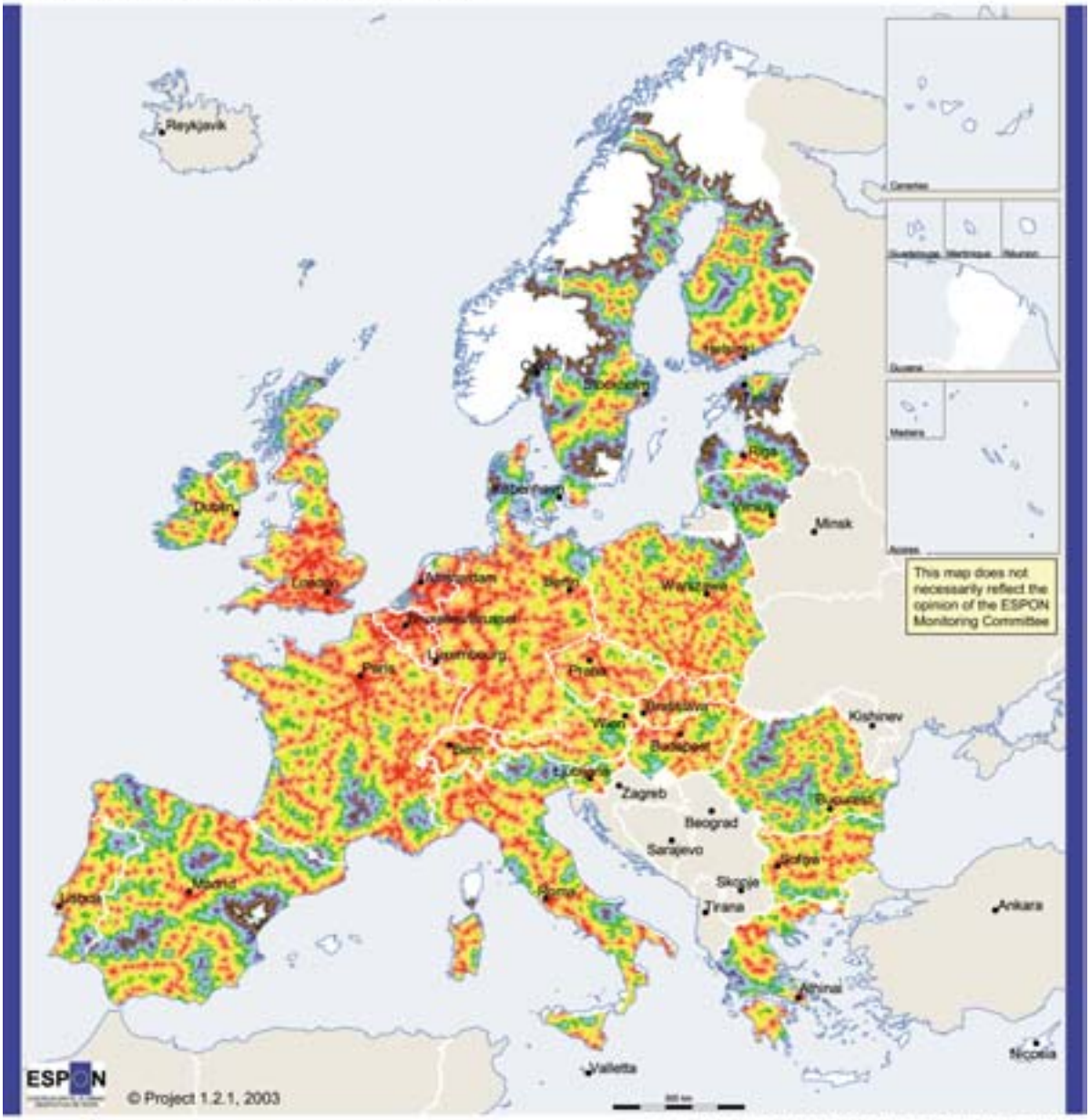
Summing up, serious deficiencies in connectivity exist in the south-western, north-western, and eastern European peripheries. Connectivity relies directly upon the extent and quality of secondary networks, in particular road networks. This is an important message for the regional and local policies. Connectivity is also low in regions where the major networks are weak (motorway networks in Central and Eastern Europe, airports in a number of large rural regions), which is a more structural problem. The improvement of the connectivity is an important task for the years to come in the context of regional and spatial development policies.

([46]) The ICON (Connectivity to transport terminals) evaluates the connectivity of any place as their minimum access time by road to the closest transportation nodes (e.g., the closest motorway entrance, the closest railway station, and the closest commercial port...) and the utility that the node provides in terms of service provision (facility to get access to all possible destinations).

Map 20. Cost to motorway entrances



Map 21. Connectivity to rail stations



Acess time

- 0' - 10'
- 10' - 20'
- 20' - 30'
- 30' - 40'
- 40' - 50'
- 50' - 1h
- 1h - 1h 10'
- 1h 10' - 1h 20'
- 1h 20' - 1h 30'
- 1h 30' - 1h 40'
- 1h 40' - 1h 50'
- 1h 50' - 2h
- 2h' - 2h 10'
- 2h 10' - 2h 20'
- 2h 20' - 2h 30'
- 2h 30' - 2h 40'
- 2h 40' - 2h 50'
- 2h 50' - 3h

Origin of data: ASSEMBLING graph GISCO

Source: ESPON Database

2.1.4. Territorial impact of current EU transport policy (results from SASI model)

Transport policies have important territorial impact ([47]), in particular through infrastructure development and pricing policy. Impact is mainly upon accessibility and regional economic development. The analysis of territorial impact of the EU Transport and TEN policies has been carried out on the basis of 10 scenarios. The results of the application of the SASI ([48]) model are presented hereafter. The ten policy scenarios ([49]) are the following:

Policy scenario	Transport characteristics
A1 Infrastructure	Implementation of all rail projects 1991-2001
A2 Infrastructure	Implementation of all road projects 1991-2001
A3 Infrastructure	Implementation of all projects (road and rail) 1991-2001
B1 Infrastructure	Implementation of all most probable rail projects 2001-2021
B2 Infrastructure	Implementation of all most probable road projects 2001-2021
B3 Infrastructure	Implementation of all most probable projects (road and rail) 2001-2021
C1 Pricing	Reduction of the price of rail transport
C2 Pricing	Rise in the price of road transport
C3 Pricing	Social marginal cost pricing of all transport modes
D Pricing and Infrastructure	Implementation of all projects 2001-2021 and marginal cost pricing of all transport modes (B3 + C3)

The retrospective scenarios A1-A3 seek to analyse the spatial impact of transport policies that are already implemented. The prospective scenarios B1-D seek to analyse the likely effects of potential future transport policies.

Accessibility is improved in all A and B scenarios, as these assume infrastructure investments and improvements relative to the reference scenarios. Scenario C1, where rail fares are reduced, results in an increase in accessibility, and scenarios C2 and C3, in which transport prices are increased, results in a reduction of accessibility.

The relatively large differences in accessibility translate into only very small changes in GDP per capita to the member states of the present European Union (EU15) in the backward looking (scenarios A1-A3), nor are they likely to do so in the future (scenarios B1-D). The effects for the candidate countries (CC12) are nevertheless much larger. In the future those for the candidate countries are even larger because of the expected implementation of the TINA projects.

In particular, for both past and prospective policy, road infrastructure projects have a significantly larger effect upon growth (scenarios A2 and B2) than rail infrastructure projects (scenarios A1 and B1). Between 1991-2001 only a few new high-speed rail lines were opened in scenario A1, mainly in France and Spain;

([47]) Cf. ESPON project 2.1.1. "Territorial impact of EU Transport and TEN Policies" led by the Institut für Regionalforschung in Kiel (Germany)

([48]) The SASI model is a simulation model of socio-economic development of regions in Europe which takes into account as input variables the economic and demographic development of the ESPON Space as well as transport infrastructure investments and transport system improvements, in particular of the trans-European transport networks (TEN-T) and TINA networks . For each region the model forecasts the development of accessibility, GDP per capita and unemployment. In addition cohesion indicators expressing the impact of transport infrastructure investments and transport system improvements on the convergence (or divergence) of socio-economic development in the regions Union are calculated.

([49]) All transport network scenarios modelled in ESPON 2.1.1 are based on the trans-European transport network GIS database developed by IRPUD (2001). The strategic road, rail and inland waterways networks defined are subsets of this database, comprising the trans-European networks specified in Decision 1692/96/EC and latest revisions of the TEN guidelines provided by the European Commission (1999; 2002a), information on priority projects (European Commission, 1995), latest publications on the priority projects (European Commission, 2002b), on the TINA networks as identified and further promoted by the TINA Secretariat (1999, 2002), the Helsinki Corridors as well as selected additional links in eastern Europe and other links to guarantee connectivity of NUTS-3 level regions. The strategic air network is based on the TEN and TINA airports and other important airports in the remaining countries and contains all flights between these airports (Bröcker et al., 2002, 22).

and other rail infrastructure over the past decade favoured mostly central European regions, whereas road scenario A2 had a clear cohesion effect. Because road infrastructure investments had a much stronger effect, scenario A3 (See Map 24), in which both road and rail projects were implemented, is very similar to scenario A2. The prospective infrastructure scenarios have a pro-cohesion effect with the strongest effects in scenario B3, in which all road and rail TEN and TINA projects are assumed to be implemented.

Impact of overall future transport investments (scenario B3) has also been estimated over the development potential ([50]) of the regions and shows a much larger effect (in average 3.1%) than on total GDP. Large positive impacts are observed in north-eastern Spain and along the coastal region to Italy, in many Italian regions (particularly on the east coast) and in southern Scandinavia.

As far as pricing scenarios are concerned, a reduction of rail fares (scenario C1) has similar effects as building infrastructure. It favours several peripheral regions, but also a number of more central regions. Thus its impact upon cohesion is positive, but with some exceptions. Its global impact on the economy of regions, however, is modest.

The two pricing scenarios with cost increases (scenarios C2 and C3) have global negative impacts on the economy of regions (GDP decreases everywhere) because they increase the cost of trade and mobility. This negative impact is generally stronger in less developed regions (northern periphery, western parts of the Iberian Peninsula, northern parts of Scotland and Ireland, southern Italy), although the impact upon development potential is more limited in the eastern part of EU-27 (accession countries) and in the inner part of the Iberian Peninsula and France. The two scenarios with price rises (C2 and C3) increase disparities in accessibility and are globally not favourable to cohesion, with some exceptions

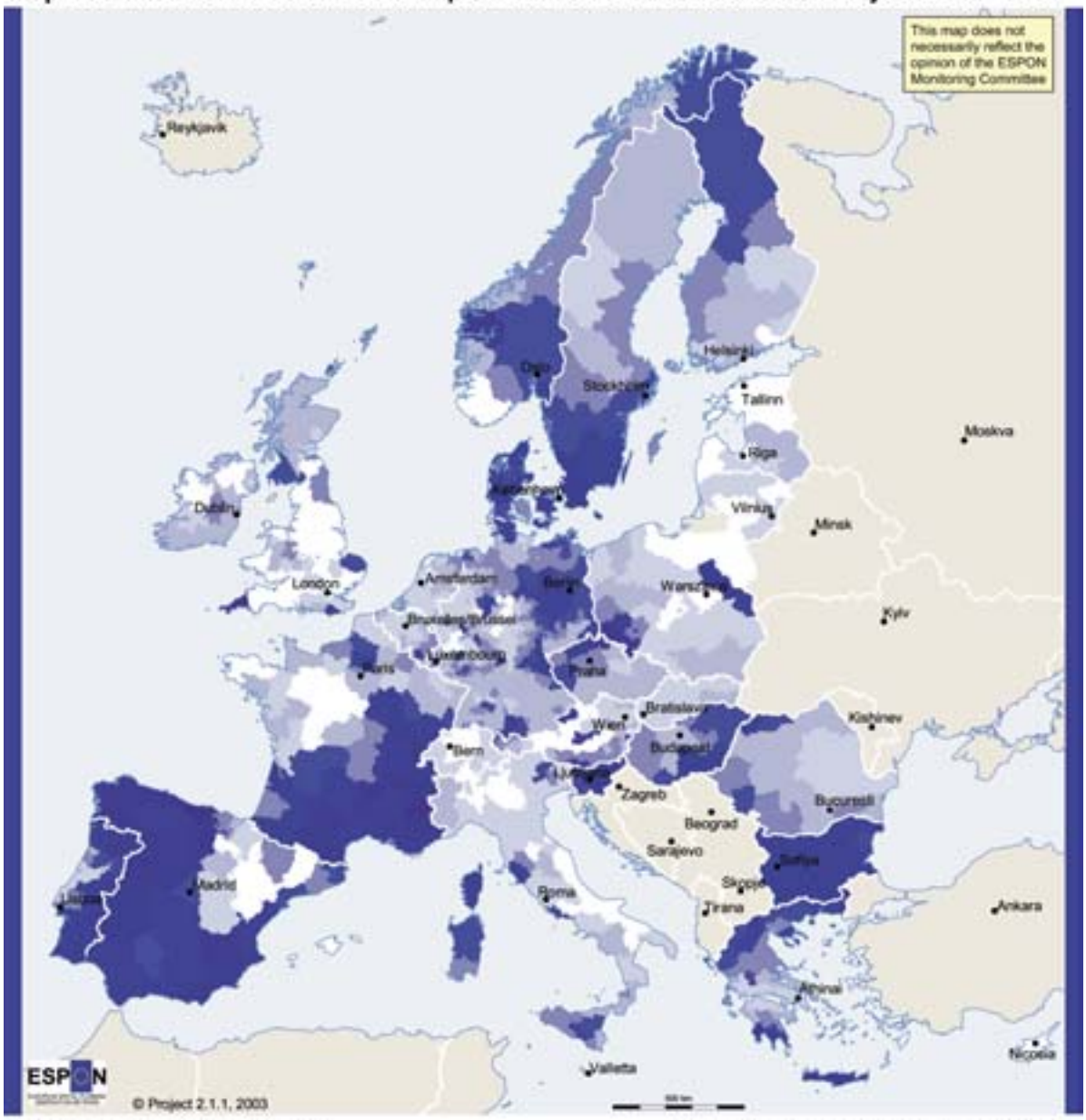
Summing up, transport investments have a positive impact on accessibility and total GDP, while increasing transport costs have a somewhat larger negative impact. Transport investments have considerable positive effects on the development potential of many regions outside the “pentagon”. Large positive impacts are observed in north-eastern Spain and along the coastal region to Italy, in many Italian regions (particularly on the east coast) and in southern Scandinavia. Also positive impacts are observed in the southern part of East Central Europe.

Under the combined investment and marginal cost pricing scenario (see Map 25) the impact is similar to that for only investment, but with relatively improved positions of regions in East Central Europe, while a large share of the positive impact is outside the “pentagon”. Marginal cost pricing improves the relative position of some peripheral regions and most accession countries in terms of development potential, but is rather detrimental to most peripheral regions. The transport investments improve the relative position of semi-central regions, mainly outside the “pentagon” and of a number of the most peripheral regions.

Under the combined investment and marginal pricing scenario, regions improving their relative position are broadly extended to the eastern part of the “pentagon” and East Central European regions outside the “pentagon”. The results indicate that transport policy (investments and/or pricing) can potentially be used to encourage various forms of polycentric development. It must however be questioned whether the complete implementation of the TEN-T and TINA networks in a period of 20 years is realistic.

([50]) Development potential: geometric average of the values of four indicators: population density (mass), GDP/inh (competitiveness), multimodal accessibility, estimated change of GDP/inh for period 2001-2021(development trend).

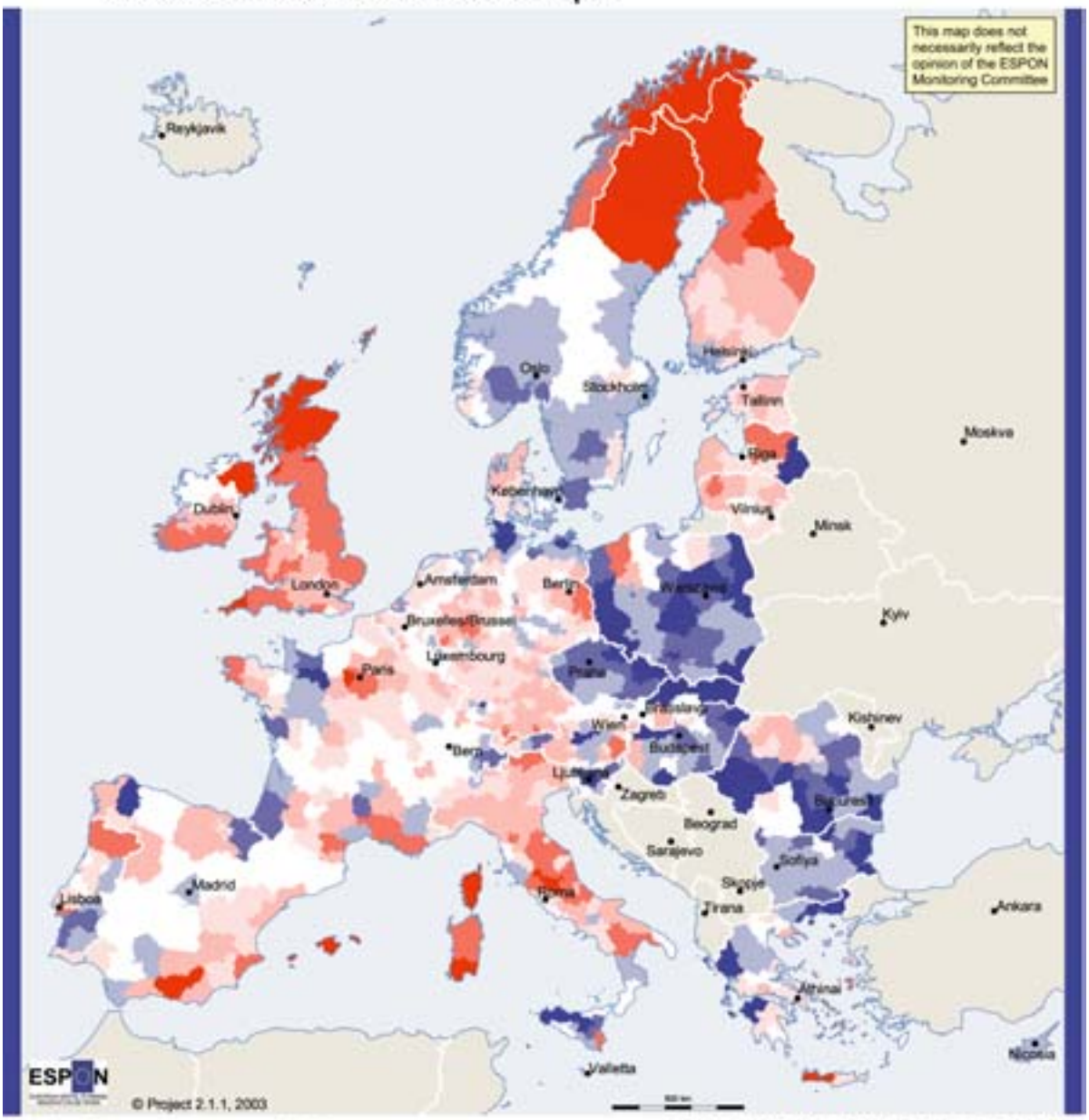
Map 22. Simulation of Scenario A3: Implementation of all Road and Rail Projects 1991 - 2001



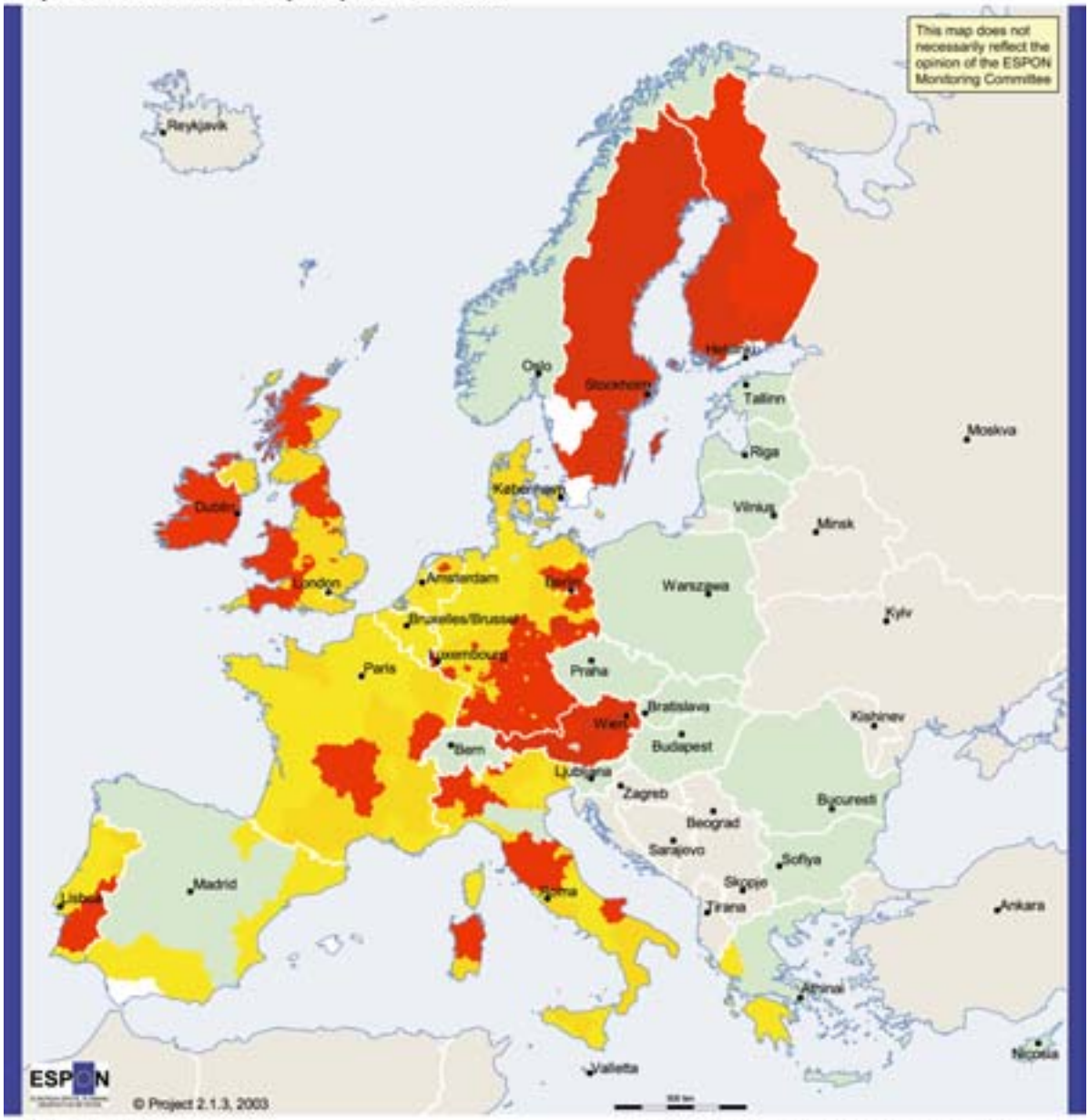
Welfare Change in percent of GDP

- -0.034 - 0.129
- 0.129 - 0.197
- 0.197 - 0.270
- 0.270 - 0.359
- 0.359 - 0.476
- 0.476 - 0.614
- 0.614 - 0.812
- 0.812 - 1.166
- 1.166 - 1.888
- 1.888 - 3.320

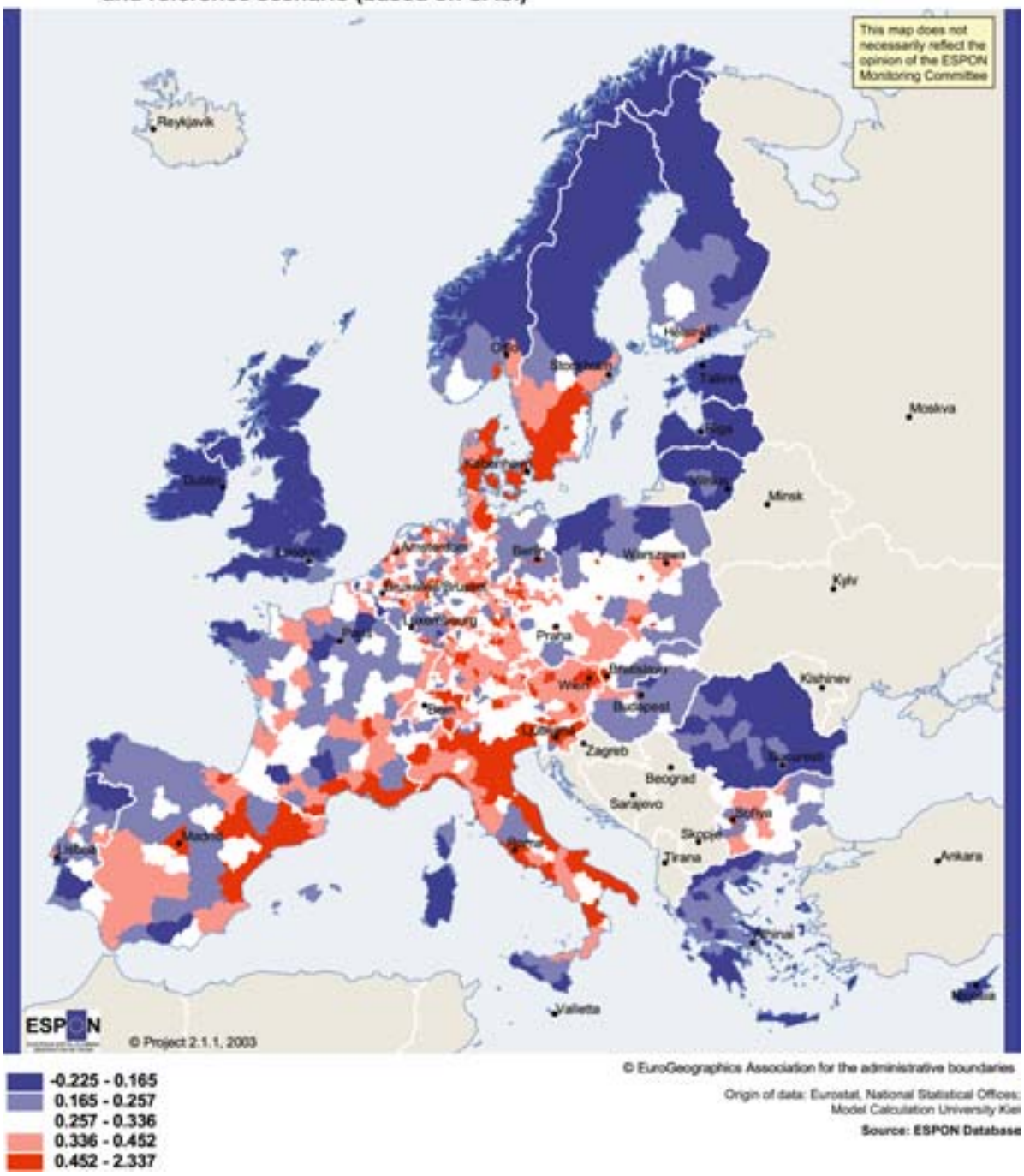
Map 23. Simulation of Scenario D: Implementation of all Road and Rail projects 2001 - 2021 and Rise of Prices for all Modes of Transport



Map 24. Total Pillar 2 Suport per AWU 1999



Map 25. Differences in development potential (geometric average) between scenario B3 and reference scenario (based on SASI)



2.2. Accessibility / Telecommunications ([51])

As the availability of information has become one of the most important driving forces of the economy in a context of globalisation, and therefore of territorial competitiveness, the infrastructure and technologies enabling the transportation of information have gained a strategic importance, similar to that of conventional transport infrastructure.

A significant difference with transport infrastructure and systems is however that telecommunication systems are subject to rapid change. The combination of liberalisation of telecommunication markets in the 1980s and 1990s (a process which is continuing) and the development and deployment of new technologies has created a highly dynamic telecommunication environment in Europe. This dynamism means that the situation in respect of territorial patterns of investments and uptake are constantly changing. It is important to understand the different territorialities (and potential territorialities) of the various telecommunication technologies, but also to understand the close relationships and synergies between these technologies. In this context, technologies related to the Internet play a dominating part and the territorial imbalances which may be generated in the process of adoption, in particular between urban and rural areas, create a differential in territorial attractiveness

2.2.1. North-south, east-west and other territorial imbalances in ICT penetration

a) Terrestrial fixed line networks

Although the main focus of ICT policy relating to networks and services now tends to be the Internet and broadband, terrestrial fixed line networks remain important. Not only are they still crucial for most users of basic voice telephony, but the historical investment patterns in fixed telephone networks also have an impact on patterns of investment in newer technologies. Substantial investment in telecommunications networks – much of it supported by the Structural Funds – has largely removed the supply-side bottlenecks in EU15.

Some of the candidate countries have relatively few installed telephone lines, with Poland, Slovakia and Romania having fewer than 30 main telephone lines per 100 inhabitants. The figure for Romania is as low as 19 per100 inhabitants. They do tend to have higher growth rates in the number of lines, however, suggesting some 'closing of the gap'. This is not surprising as fixed telephony may have reached saturation point in Member States, particularly in the light of the growth of mobile telephony. The 'gap' in fixed telephony may not close completely, however, as EUCCs may substitute investment in mobile telephony for investment in fixed telephony. A number of countries in both EU15 and in EUCC are beginning to experience a decline in fixed telephony, as measured by main telephone lines per 100 inhabitants.

It is likely that some EUCCs will not reach the level of fixed telephony experienced by EU15 countries as alternative technologies will be used. There is reason to suppose that fixed *voice* telephony is becoming relatively less important. As a result the nature of network investment (and perhaps the focus of public support for investment) will differ from that of the recent past.

There are differences within countries in respect of uptake of fixed telephony. The largest city generally has a higher teledensity than the rest of the country. In some countries – notably Slovakia, Romania, Portugal, Malta and Latvia – the differential is substantial, with the largest city having a teledensity more than twice that of the rest of the country. There are however exceptions, such as Poland.

b) Digitalisation of switching and transmission

The most important technological advance in telecommunications networks over the past 20 years has been the digitalisation of switching and transmission, which has provided the basis for the wide range of advanced digital services with which we are now familiar. The first stage digitalisation process has been completed in most, but not all, of the EU 15, remaining to be completed in Greece, the Netherlands and Spain.

A number of the candidate countries still have substantial efforts to make to complete the digitisation of the exchanges in their basic networks, with Romania, Bulgaria, Latvia and Lithuania having less than 50% of their main telephone lines connected to digital exchanges. Strategies are in place to digitise the networks in these countries, but the process may take some time. In the case of Bulgaria the incumbent has a target of 60% digitalisation by 2005. In EU 15, exchanges tended to be digitised first in urban areas and exchanges in many rural areas were only digitised several years later. A similar pattern is apparent in EUCCs.

c) Mobile telephone

In 1999, the penetration of mobile telephony across the regions of EU 15 displayed very wide disparities, with very high levels of penetration in the Nordic countries, in Italy and in Portugal, and very low levels of penetration in France and Germany. Interestingly

([51]) Cf. ESPON Project 1.2.2. "Telecommunication services and networks: territorial trends and basic supply of infrastructure for territorial cohesion" led by the Centre for Urban and Regional Studies of the University of Newcastle upon Tyne.

then, mobile telephony appears to break with the conventional pattern of a rich-poor disparity. In 2001, in the context of EU27+2, Italy remains in the highest penetration category, and countries such as Greece, Slovenia and the Czech Republic are in the same category as Sweden, Finland and the rest of Western Europe (France and Germany have 'caught up'). Although most of the EUCCs are at the low end of the adoption spectrum, they are displaying the highest rates of growth in their subscription base.

Turning to the situation within countries, the position also seems to be quite positive in terms of territorial coverage. In all countries considered by the analysis, most of the territory is covered, the exceptions being very remote and mountainous areas and some border areas. This does not mean that there was no lag in roll-out or uptake in mobile, but it does suggest that the lag was of relatively short duration. It should be added that not all areas are covered by all operators as licenses granted to operators have different requirements in terms of population coverage. Those operators with more limited coverage will tend to concentrate on urban areas and business users, thereby leaving differences in levels of choice in different regions.

Mobile is then a technology which is (a) widely diffused, in a very short space of time; (b) is not confined to the most prosperous regions; and (c) is facilitating a 'catch up' process in those countries and regions which have lagged in the provision and adoption of previous telecommunications services. To date mobile has mainly been used for voice and, increasingly, text messaging. The speed of rollout of first and second generation mobile, its widespread territorial coverage and its rapid uptake suggests that future mobile technology will provide opportunities for citizens and businesses in more sparsely populated areas to gain access to the Internet.

d) The Internet

The most important current differentiator of participation in the information society is usage of the Internet. The highest levels, with in excess of 50 Internet users per 100 inhabitants, are estimated as occurring in the capital city regions of the most Internet-adoptive countries - Vienna, Brussels, Uusimaa (Helsinki), Ile de France, London, Stockholm and Luxembourg; and in a few other particularly prosperous and economically dynamic regions in Germany (Oberbayern; Bremen; Hamburg), the UK (Berkshire, Bucks and Oxfordshire). The highest levels of predicted Internet penetration are dominated by regions in Sweden, Denmark, the Netherlands, Belgium, the UK, Germany and Austria. There is, therefore, a strong association between the prosperous metropolitan regions of the 'Blue Banana' and the regions of the Nordic countries, and high levels of Internet penetration.

The estimated pattern of low Internet usage is, starkly defined in geographical terms; it encompasses the poorer parts of the Iberian Peninsula (Galicia Extremadura, Portugal excluding Lisboa), Greece (excepting , Athens North Aegean) and most of the regions of the candidate countries, with the exception of some capital cities (Prague, Budapest and Bratislava).

Rural areas are generally lagging behind metropolitan and urban areas in the current Member States. This gap is not new. A lag in take up of the Internet between urban and rural areas of about 1 year persisted through the second half of the 1990s. This urban-rural gap may be exacerbated by differential roll-out of broadband in the absence of suitable public policies. Urban areas users are more likely to use the Internet on a daily basis. Further, the gap is widening over time rather than narrowing.

A remarkably consistent pattern emerges across the different categories and usages of e-commerce. The Nordic countries and Germany are making the fullest use of e-commerce as a tool of business competitiveness, while firms in Greece, Italy and Spain are making very limited use of the new opportunities. Portugal is an unusual case in that although many of its firms are connected to the Internet, often by DSL or broadband connection, they appear to making little commercial use of these connections. There is then evidence of a pronounced 'digital divide' between territories in Europe in terms of their business usage of the Internet, which is likely to have significant implications for regional development disparities.

The highest estimated incidence of firms with their own websites (in excess of 60% of total firms) are to be found in the following regions: Stockholm; Denmark; Ussimaa (Helsinki); Brussels and Antwerp; Utrecht, Noord-Holland and Groningen; Luxembourg; Ile de France; 9 regions of Germany, led by Hamburg, Bremen and Oberbayern; Vienna and 10 regions in the UK, including London and most of the regions adjacent to it, Cheshire, and North East Scotland. Among the 'top half" regions, there are no regions from Portugal, Greece or any of the candidate countries.

The lowest estimated incidence of firms with their own websites (less than 25%) are found in a number of Greek regions; in many of the regions of Poland; in Romania with the exception of Bucharest, and in Lithuania.

e) Broadband technologies

Overall rates of broadband penetration (uptake) remain relatively low in comparison to other more mature technologies. There are significant differences in the degree of broadband penetration across Europe. There is a

rough north-south divide, with northern countries taking the first four places. There is also a west-east divide. The situation is, however, complex. Not all northern countries come in the top cohort and it is notable that the southern (cohesion) countries Spain and Portugal have higher penetration than France and the United Kingdom. Similarly, some accession countries have higher rates of penetration than do member states. Malta, Estonia and Slovenia outstrip France, the UK and Italy, whilst Cyprus, Hungary, Lithuania and Latvia all have higher levels of penetration than Ireland and Greece. The other EUCCs (Bulgaria, Czech Republic, Poland and Romania) have not yet rolled out DSL or cable-modem broadband or have done so very recently and will fall within the bottom quartile. In the Netherlands and Austria, for example, the relatively high rates of broadband penetration are associated primarily with cable modems rather than DSL.

The incumbents first invest in the largest urban areas and then roll out upgrades in smaller cities and towns. In some places firms are targeted first. New entrants follow a similar strategy, targeting firstly the unbundled exchanges of the main cities.

It is important to consider telecommunications territoriality at the lowest possible spatial scale. When mapped at NUTS 2 level, regional bands show highest penetration at regional level. When mapped at NUTS 5 level, however, it becomes clear that there is no generalised regional effect at all, and that densely populated areas fare better than more sparsely populated areas in all regions. In fact, the roll out of broadband follows the network of cities. Apparent regional variations in broadband coverage are, therefore, explained primarily by their different composition of urban and rural areas.

Some places will not obtain access to broadband technologies if development is left solely to the market. This is particularly true of those technologies currently being most rapidly rolled out – ADSL and cable modem – which appear to have an 'urban bias' in terms of the techno-commercial model adopted by telecoms providers. Alternative broadband technologies may hold out some hope for more rural areas, though it should not be assumed that there is automatically a market for these new technologies.

Telecommunication systems are subject to rapid changes. The combination of liberalisation of telecommunication markets and the development and deployment of new technologies has created a highly dynamic telecommunication environment in Europe. The sector of fixed line networks remains important for basic voice telephony, but also for investment patterns in newer technologies. Shortcomings in this sector are important in a number of candidate countries. Within countries, differences in teledensity can be observed between the large cities and rural areas. Digitalisation of switching and transmission has been completed in most EU-15 countries.

Substantial efforts still have to be made in the candidate countries. The penetration of mobile telephony is progressing rapidly with a number of peripheral countries (Nordic countries, Italy) having the highest rates. Although most candidate countries still have low rates of adoption, they are displaying the highest growth rates. In all countries, most of the territory is covered, the exceptions being very remote and mountainous areas and some border areas. As far as usage of Internet is concerned, important differences can be observed between the centre and the periphery, although large cities in the periphery have satisfactory levels of Internet usage. Rural areas are generally lagging behind. In the field of broadband penetration, both a north-south and an east-west divide can be observed, with a number of exceptions. Some places will not obtain access to broadband technologies if development is left solely to the market.

2.2.2. Centre-periphery model for fibre-optic networks

One of the most important shifts in telecommunications network development in competitive market environments across Europe in the last decade has been that from a predominant reliance on the national networks of traditional incumbent operators to the emergence of a vast number of alternative infrastructures constructed by new entrant carriers, many on a 'pan-European' scale. The key spatial scale for backbone infrastructure deployment moved from the national to European level. There is a broad 'three-level' core-intermediary region-periphery distinction at the European scale:

– the regions which have most networks 'noded' in them are to be found in a concentrated core area (Hamburg, London, Düsseldorf, Ile de France, Noord-Holland, Darmstradt, Région Bruxelles-Capitale, Oberbayern and Bremen). The 'core' FUAs of Europe tend to exhibit an almost homogenous pattern of territorial connectivity, with some of them approaching 200 network connections to other places, and nearly all the others having more than 150 links. There are a few exceptions – Köln in Germany has 10 networks passing through it, yet only 139 links to other FUAs, which actually makes it less linked than Brno and Bratislava.

– other relatively well 'noded' regions include the major city regions of the Nordic countries (Stockholm, Oslo og Akershus, Sydsverige, Denmark), and most notably, a roughly Mediterranean-bordering telecommunications 'development corridor' extending from Cataluna through all the regions of southern France to Piemonte and Lombardia in northern Italy. This axis can also be extended up through Alsace and into the German regions of Karlsruhe, Stuttgart and Mittelfranken, as a number of pan-European operators already present in the concentrated core area have looked to extend their deployments towards the south and into the Iberian Peninsula. The 'orienting' or 'crossroads' role of the Rhône-Alpes region can be highlighted here as, through its main node Lyon, many pan-European networks are deployed towards southern France, northern Italy and Spain.

– Greece, southern Italy, Portugal, Scotland, northern regions of the Nordic countries and Eastern Europe (beyond Prague and Budapest) have little representation. A Greek or southern Italian city present on 1 or 2 networks is thus only linked to 5 other places, eg Athens, Patras, Naples and Bari. Meanwhile, however, other peripheral cities both in Poland (Bydgoszcz, Krakow, Rzeszow) and the 'Celtic fringe' (Dundalk, Cardiff, Aberdeen, Inverness) are also only present on 1 network, but that network connects them to 83 other places.

In addition to these general trends of European territorial 'divide', however, some of the potentially more positive trends can also be highlighted, particularly around the notion of a polycentric form of territorial development of telecommunications:

– operators are also investing in cities outside the traditional European core, presumably as they see these cities as new or potential nodes capable of generating international traffic and perhaps as 'gateways' to other parts of the expanded European Union and beyond. Examples of such cities are Prague, Budapest and Copenhagen. Potentially, then these patterns of new investment may contribute towards the policy goal of a more polycentric space at least at the level of cities.

– some more regionally focused pan-European networks have concentrated on connecting more peripheral cities;

– other pan-European companies have combined the deployment of a very extensive network infrastructure with a series of particular regional or national network loops which link up a number of more peripheral cities to this overall infrastructure;

This explains the emerging importance of urban centres outside the core area of the EU for attracting bandwidth connections (eg. Prague, Toulouse, Leipzig, and, to a slightly lesser extent, Dublin, Oslo); 'new network cities' surpassing some traditionally larger city regions and a crucial part of a more polycentric European urban system. Some of these emerging urban centres may be viewed as 'gateway cities' for telecommunications bandwidth connections, in the way in which they act as links between the core area and more peripheral areas eg. Copenhagen for the Nordic region, Berlin for Poland, Vienna and Prague for south eastern Europe.

The emergence of a Pan-European scale in major telecommunication networks shows a territorial pattern with three categories of regions. Regions with the most noded networks are to be found in the pentagon. Other relatively well noded regions include the major city regions of the Nordic countries and of the Mediterranean border from Catalonia to northern Italy. The less noded regions are to be found in the periphery. The emergence of urban centres outside the core area for attracting bandwidth connections has a strategic importance.

2.2.3. Territorial impact of ICT (results from the STIMA model) ([52])

The STIMA Model (Spatial Telecommunications Impact Assessment) is a tool enabling the assessment of spatial economic impacts of ICTs investments. From a conceptual point of view, the framework of STIMA ([53]) is based on the idea that ICTs infrastructure and services are production factors which, together with the traditional labour and capital factors, explain the GDP level.

Assuming that the EU financial effort in the field of ICTs investments in the next 20 years will be equal to 2% of total investments by EU 15 Member States, the financial resources available will be around 20 billion euros. The hypothesis of 2% stems from considerations on previous EU efforts in this field and on new accession countries. On that basis, per capita GDP, ICT accessibility and Internet connexions can be forecasted according to different policy scenarios:

– Scenario A is based on indiscriminate policy (See Map 22). The average per capita GDP growth rate is around 0.99% with a slightly higher effect on lagging regions (+1.06%) and a lower on non-lagging ones (+0.97%). GDP growth is equally distributed in most regions, with some peaks (positive or negative) explained by statistical effects. Most of the regions show per capita GDP growth rates between 0.5% and 1.2%. In terms of GDP, this scenario affects all regions almost in the same way. Changes in ICT accessibility and Internet endowment reinforce this conclusion: also these indicators show a well distributed pattern throughout Europe.
– Scenario B called "Efficiency scenario" is based on a strong discrimination in favour of more efficient regions towards which the main part of investments is directed (See Map 23). Moreover, a second differentiation is done, in terms of different policy mixes for the two kinds of regions (lagging behind and non-lagging). This scenario presents the highest average growth rate for GDP (near 1.10%). The non-lagging regions show a growth rate (1.11%) higher than the lagging ones (1.02%). The marginal efficiency of investments explains the allocation of resources to more advanced regions and more innovative infrastructure where returns are higher. These high returns in internet investments leads to GDP growth in advanced regions belonging to the Blue Banana (the Netherlands, Belgium, Luxemburg, French regions along the Rhine) and to the sunbelt (southern regions of France and Spain and northern Italy).
– In Scenario C (Cohesion Policy), the financial resources are devoted to lagging regions, which record the highest growth rates, compared with the other scenarios (See Map 24). The average growth rate in per capita GDP amounts to 0.30%. Non-lagging regions have no GDP increase while the lagging regions have an average increase of per capita GDP of 1.34%. Thanks to the concentration of investments, not only GDP, but also ICT accessibility and Internet connections increase in the Objective 1 areas.

Despite the differences among policies, the impacts of ICTs investments are also influenced by regional characteristics. According to the different reactions and results of ICTs policies, the four following categories/clusters of regions can be identified within lagging and non-lagging regions:

([52]) Cf ESPON Project 2.1.1. »Territorial impact of EU transport and TEN policies » led by the Institut für Regionalforschung; Christian-Albrechts-Universität Kiel (Germany)

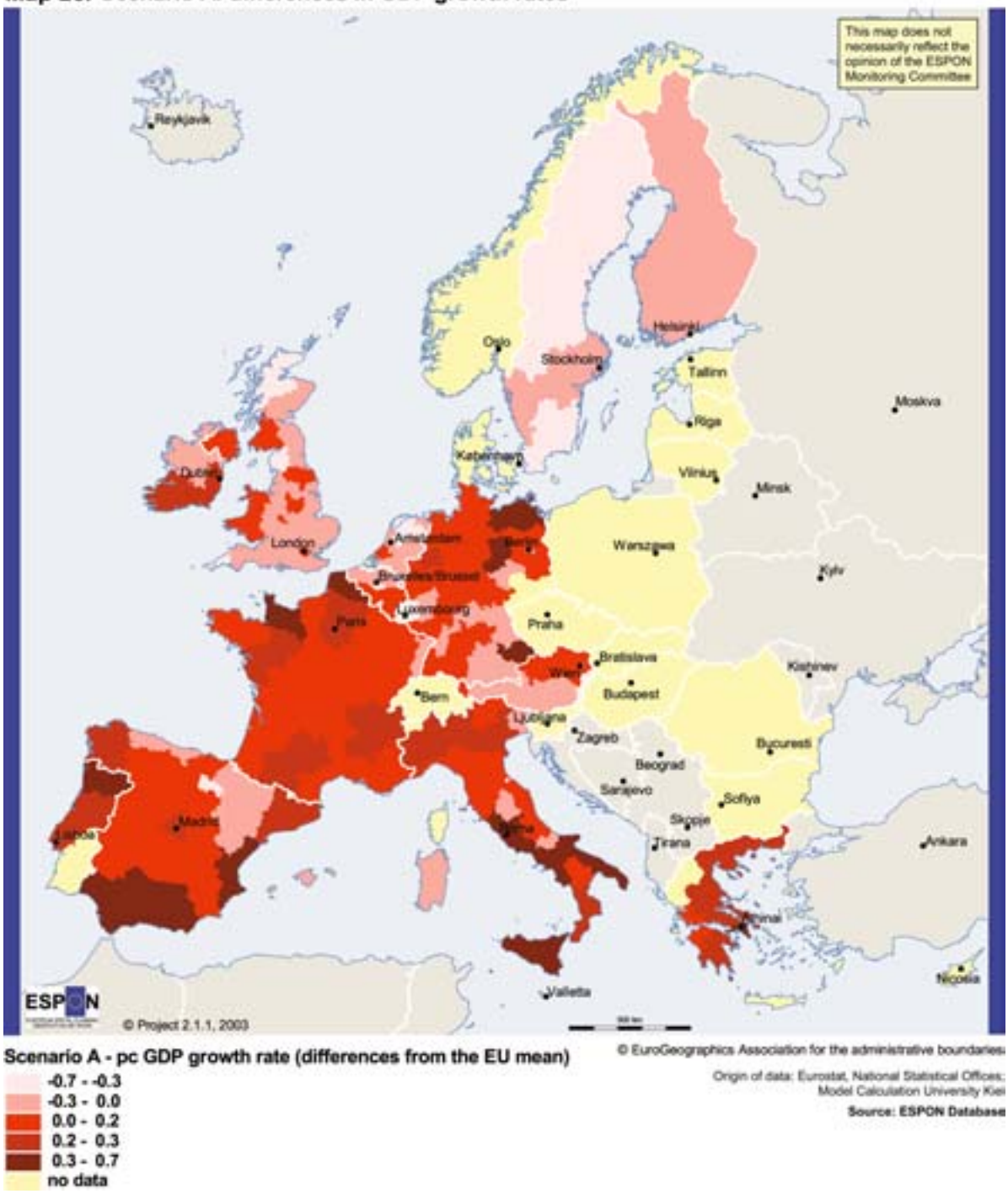
([53]) From a methodological point of view, the STIMA model is based on the estimate of a quasi production function and allows measuring the role that ICTs play on regional performance. The enabling factors regard the general level of economic development of the country analysed, the regulatory regime that characterises the ICTs market in that country, the economic structure and the innovative capacity of the local area.

Summing up, the role of ICT is very important for the creation of GDP, its growth and distribution. Therefore, the EU policies in this sector are extremely relevant, both for efficiency (GDP growth) and for cohesion (GDP distribution).

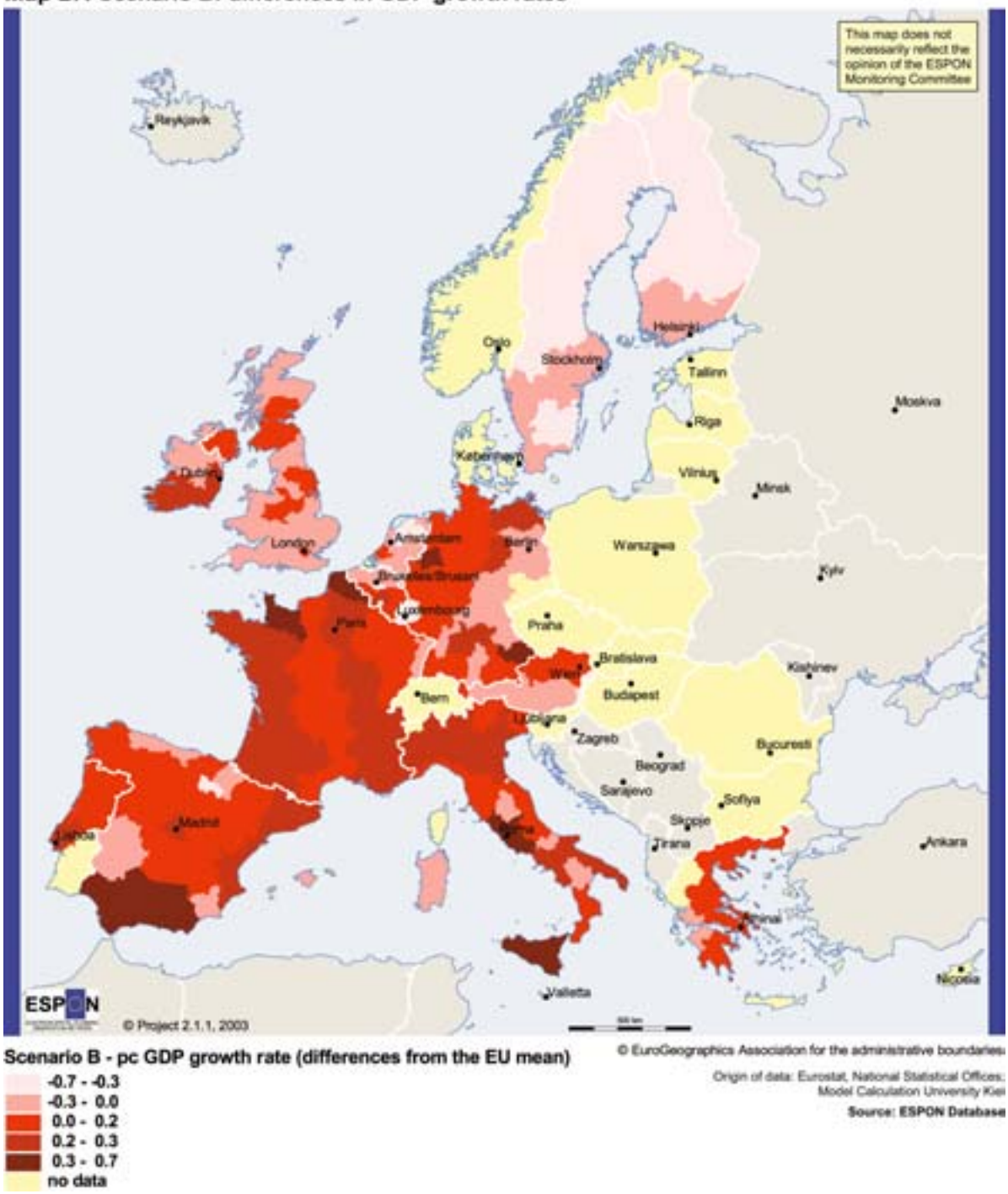
ICTs investments have different marginal efficiencies, depending on the infrastructure or services (ICTs factors) on which they are spent. The choice of infrastructures and services has a critical role for the territorial impact of ICTs policies.

The ICTs policies suggested by the eEurope Action plan could lead to very different scenarios, depending on their regional implementation. The three scenarios described above show the range of possible impacts on regional income distribution. In addition, within different typologies of regions (objective 1 regions or more advanced regions), different reactions to a specific ICTs policy exist. Within lagging regions, some areas are able to take advantage all policies implemented, while others react exclusively to cohesion policies; similarly, there are non-lagging regions that react dynamically to ICTs policies, while others seem more static.

Map 26. Scenario A: differences in GDP growth rates



Map 27. Scenario B: differences in GDP growth rates



Mapa 28. Scenario C: differences in GDP growth rates

– The first cluster contains lagging regions that improve their situation only in scenario C: these, probably weaker regions need specific cohesion policies to achieve an increase in per capita GDP.
– The second cluster includes lagging regions whose GDP shows an increase in all scenarios: consequently, these regions can be labelled "lagging regions reacting to all ICTs policies". These are probably developing regions, ready to benefit from the opportunities offered by new technologies.
– Cluster 3 contains non-lagging regions whose GDP is not improved much by ICTs policies. However, these are developed regions, that may already be endowed with infrastructure and skills.
– Finally, the last cluster contains non-lagging regions with a strong increase in GDP in scenario B: these regions react in particular to efficiency policies, probably because these policies eliminate some congestion effects and allow a better exploitation of the current endowment of ICTs and skills.

2.3. Accessibility /energy ([54])

2.3.1 Territorial patterns of energy sector

At present stage of the study, only national data are available and an analysis of energy territorial patterns is missing, but first results are presented below.

a) Energy supply

With the exception of Norway, the United Kingdom and, more recently, Denmark, European countries are net importers of energy. The European Union imports about 50% of its primary energy consumption and the dependence rate increased from 51.6% in 2000 to 52.4% in 2001. "Candidate countries" as a whole have a much lesser dependence rate, due to the low dependence level of Poland, Romania and Czech Republic, but several countries do not cover 50% of their energy needs.

In 2000, five countries out of EU-29 had primary energy production above EU-15 average: the UK and Norway had a dominating position, followed by France, Germany and Poland. Most countries are highly dependent on fossil fuels, mainly imported oil, gas and coal. In 2000, the countries least dependent on fossil fuels, such as Sweden, Norway or France, had well developed sources of nuclear or hydro electricity.

The indicator of primary energy supply per capita shows a significant difference between EU and candidate countries, with the exception of Portugal which has low values similar to those of the candidate countries. The indicator reflects differences in welfare of population, the way energy is used (efficiency degree) and the importance and structure of the industry sector versus the services sector.

Most countries have reduced their dependence on fossil fuels since 1995 by developing alternative sources. Only Austria, Bulgaria, Cyprus and Estonia have increased their dependence between 1995 and 2000. Diversity of supply contributes both to security of supply and to the stability in the broad cost of energy (because alternatives are available). Diversity thus carries benefits for individual consumers and for the national economy. In the case of fuels used for electricity generation the *Shannon-Weiner measure of diversity* increased between 1995 and 2000 for a great part of the 29 countries (exceptions are Austria, Greece, Luxembourg, Sweden, Czech Republic, Hungary and Slovakia). In 2000 countries such as Finland or Slovenia, with higher values of the Shannon-Weiner measure, have energy systems less dependent on a reduced number of fuels.

As far as electricity generation is concerned, there is greater balance between the respective shares of coal, gas and nuclear power. Further diversification is likely to occur if renewable sources take a larger share in generation capacity. In 2000, the proportion of electricity generated by renewable sources is significant in countries such as Austria, Luxembourg or Norway, although it must be understood that the nature of renewable sources in this context is very different among countries.

b) Energy demand

Concerning primary energy consumption, Germany is the largest consumer followed by France and the UK (2000). In the EU countries, a growth of primary energy consumption of about 6% took place between 1995 and 1999, while in the candidate countries the trend was the opposite, with a decline of about 8%.

The European Union has a structure of final energy consumption by source quite different from Candidate Countries. Oil is the most significant energy source in EU15, representing about 46%, while in the Candidate Countries the energy consumption is more differentiated among sources, also showing greater diversity among countries.

Although final energy consumption by the domestic and services sectors had increased slowly between 1995 and 2000, these sectors are responsible for nearly 40% of final energy consumption in European

([54]) Cf. ESPON project 2.1.4. « Territorial trends of energy services and networks and territorial impact of EU energy policy » led by CEEETA (Portugal).

Union in 2000 and for 47% in Candidate Countries in 1999, making it the largest energy consuming sectors, ahead of the industrial sector and transport sector, in average terms. It is important to notice that final energy consumption by the transport sector had the most significant growth between 1995 and 2000, about 12% in European Union and 17% in Candidate Countries.

Considering that final energy consumption per capita reflects the welfare of the population, the structure of the economy and the energetic efficiency of the industrial equipment and buildings, the Scandinavian countries, as well as Luxembourg, have the highest per capita energy consumptions in the country sample selected. Total final energy consumption per capita in the more developed countries is about twice as high as in the Candidate Countries, which is mainly due to higher consumption in the industry and transport sectors. The evolution of electricity consumption per capita shows a general trend of growth in the period 1995 to 2000, with few countries exceptions, such as Norway, Bulgaria and Romania.

In 2000, the average of final energy consumption per GDP was around 0,13 toe per thousand Euros in EU15 and 0,44 toe per thousand Euros in the Candidate Countries. Large differences exist between countries ranging from 0,09 toe/1000Euros in Switzerland to 0,6 toe/1000Euro in Romania. Besides economic inequality between countries, the difference in this indicator may also reflect differences in energy consumption patterns as well as inefficiency within energy transformation.

The countries vary considerably in the amount of energy each person uses at home. This variation is a combination of many factors, such as climate, household size, comfort levels, energy efficiency and energy prices. Those countries with the lowest levels of household energy use per person, such as Portugal and Spain, have experienced increases in energy use per person between 1995 and 2000.

2.3.2. Territorial impact of EU energy policy and TENS

The prime aim of the European Community's energy policy, as set out in the November 2000 Green Paper on the security of energy supply, is to ensure a supply of energy to all consumers at affordable prices while respecting the environment and promoting healthy competition on the European energy market. The European Union is facing new energy challenges for which it must have an appropriate energy strategy.

Security of the Union's energy supply and protection of the environment have been highly important in recent years. In particular, the signature of the 1997 Kyoto Protocol on Climate Change boosted the importance of the environment dimension and sustainable development in Community energy policy. The Union's external energy dependence is continuing to grow (it currently meets 50% of its energy requirements through imports). As the Green Paper states, if nothing is done, this rate of dependence will grow to 70% by 2030, which would further weaken the Union's position on the international energy market.

The European Community's energy policy is made up of various components:

– the creation of a single market is a part of the energy policy and has long been a priority of the Community. In 1996 and 1998, in an important move forward in the construction of the single energy market, Directives were adopted on common rules for electricity and gas. These Directives ensured the free movement of electricity and gas within the Community. Liberalisation of the electricity and gas markets, which were opened up to major consumers in 1999 and 2000 respectively, has enjoyed some success, though the degree of liberalisation still varies greatly from one Member State to another. The call made at the Lisbon European Council of 23 and 24 March 2000 for the energy markets to be opened up more quickly provided a new major impetus in this area. In March 2001 the Commission adopted a set of measures to open up the gas and electricity markets fully by 2005.

– the completion of the internal market for energy is accompanied by measures to strengthen economic and social cohesion, such as the creation of trans-European energy networks. The decisions on the guidelines contain a list of projects of common interest in the trans-European electricity and natural gas networks. Under these guidelines, some 74 projects of common interest have been identified, representing a total investment of EUR 18 000 million. The funding of these projects is largely the responsibility of the operators in this sector. In a number of cases, the Union's financial instruments, consisting essentially of EIB loans and ERDF aid, have been mobilised.

– the introduction of trans-European energy networks also has an impact on relations with third countries. Interconnections have been made with certain Mediterranean countries, the countries of Central and Eastern Europe and Norway. The CENTREL electricity grid, which covers Poland, the Czech Republic, Slovakia and Hungary, was connected to the UCPTE grid (the main European electricity grid) in 1995. The extension of the UCPTE grid to the Balkan States and its interconnection with the countries of the CIS is the subject of stud-

ies being funded by the Community, as are gas links between Eastern and Western Europe.

– energy from renewable energy sources (RES) is playing a key role in the diversification and sustainability of energy sources and the campaign to combat climate change. The Altener programme, set up in 1993 and renewed in 1998, promotes RES in the European Union. The 1997 White Paper provided a strategy and a Community action plan for RES. The prime objective set by the White Paper is to double the proportion of renewable energy sources in the EU gross domestic energy consumption from 6% in 1997 to 12% in 2010. A "take-off" campaign to get RES off the ground is an integral part of the action plan and strategy for 2010 and must act as a catalyst for the development of key renewable energy sectors for which quantitative targets have been set for 2003.
– for the first time, the Green Paper on security of energy supply stresses the fundamental importance of influencing demand rather than concentrating solely on energy supply. In the context of the Kyoto Protocol, improved energy efficiency has become even more important element of Community strategy. In April 2000, the Commission adopted an action plan to improve energy efficiency in the European Community. The SAVE programme encourages energy efficiency measures, and will be the main instrument for coordination of the plan.
– as 40% of energy is consumed in the transport sector which in turn is responsible for 28% of CO2 emissions, the Green Paper stresses the importance of taking transport policy measures to reduce energy consumption. In this connection, the White Paper "European Transport Policy for 2010: time to decide" adopted in September 2001 by the Commission is, with its 60 proposals, a key instrument to change the present modal split.
– alongside legislative measures or measures designed to encourage changes, technological progress is an important mean of achieving the objectives of the Community energy strategy. The Commission supports research, development and demonstration projects in the field of non-nuclear energy under the ENERGY sub-programme of the Fifth Framework Programme for research and technological development.
– nuclear safety is of particular concern to certain countries, particularly in Eastern Europe. It has a prominent place in the negotiations underway with candidate countries. The TACIS, PHARE and to some extent SURE programmes are involved in measures to improve safety in third countries.

Besides investments in energy facilities, the territorial impacts of EU energy policy are mediated by energy process. It is therefore important to develop a methodology that can evaluate the effects of energy prices on regional GDP. The quantification of environmental impacts is equally important. At the present stage of the study, an input-output framework appears as the most suitable method to quantify the territorial impacts of energy policy.

Most European countries (with the exception of Norway, the UK and Denmark) are net importers of energy. Most countries have reduced their dependence on fossil fuels since 1995 by developing alternative sources. As far as electricity generation is concerned, balance in the respective shares of coal, gas and nuclear power has increased. Further diversification is likely to occur if renewable sources take a larger share in generation capacity. In the EU countries, a growth of primary energy consumption of about 6% took place between 1995 and 1999, while in the candidate countries the trend was the opposite, with a decline of about 8%. EU policies related to energy are rather diversified, stretching from the creation of a Single European Market for energy to the development of the TEN-E through the promotion of renewable energy sources. The study of the territorial impacts of these policies is in progress.

Conclusions

Territorial imbalances are rather significant in the European Union and will be aggravated with the enlargement that will further reinforce the Centre (pentagon) relative to the periphery.

These imbalances, deriving from the interaction of various historical and geographical factors concern different fields and are rather relevant in terms of distribution of population, production, infrastructure endowments (transport, telecommunication, energy endowments), R&D activities and innovation capacities.

The result of these territorial imbalances is the existence of one major global integration zone, delimited by the metropolises of London, Paris, Milan, Munich and Hamburg. Even though there are also other competitive cities (mainly capital) in the areas outside the pentagon, and identified above as "potential MEGAs", they are not integrated into a competitive urban network. Urban systems are particularly weak in the 12 accession countries which, with the exception of Poland, have a monocentric rather than polycentric structure. Capital cities experience accelerated growth at the expenses of the rest of the urban systems. Physical and economic connections among them and with the rest of the Union are lacking.

At regional level, integration of rural areas is not taking place and, at the same time, important socio-economic disparities between various neighbourhoods are still persisting within urban areas .

Some specific regions such as border regions are affected by particular problems of integration and accessibility to services of general interest due to geographic handicaps or institutional barriers. .

As already analysed, some of these territorial imbalances are the consequence of permanent natural factors or of historical processes. On the other hand, adequate interventions on specific policy fields may have a fundamental role in counterbalancing these imbalances. In particular, the European Union may contribute, through various policies, to increasing the competitiveness of problem regions ultimately reducing lastingly territorial imbalances of diverse nature. A main objective is to stimulate "polycentrism", thus the development of urban and development poles, aiming at creating global integration zones, beyond the "pentagon", able to compete at European and international level.

In the field of accessibility, connectivity and transport, EU action takes place through the development of infrastructure, pricing policies and regulations (safety, environment etc.). ESPON studies showed that support to transport investments and more generally infrastructure development, improves the relative position of semi-central regions, mainly outside the pentagon, and of a number of most peripheral regions, while marginal cost pricing improves the relative position of some peripheral regions and of most accession countries, but could be detrimental for those regions with the highest peripherality. Thus, transport policies can be potentially used to encourage various forms of polycentric development.

The innovation capacity of regions is boosted by the Research Framework Programme and by the Structural funds. The support through Structural Funds (limited to Objective 1 and 2 regions) concentrates mainly on R&D infrastructure and human resources. This evolution towards supporting research and innovation projects and consultancy activities is justified by the recognition of the fact that the regional capacity to innovate depends not only upon the supply of know-how and technology, but also upon SMEs' capacity to absorb innovation.

The role of ICT is very important for the creation, growth and distribution of GDP. However, ICT investments have different marginal efficiencies depending on the infrastructure or services they are spent for. The ICT policies suggested by the eEurope Action Plan could lead to different scenarios, depending on their regional implementation. The search for more cohesion and polycentrism suggests that ICT policies should not be territorially homogeneous, but should favour less developed regions.

Structural Funds represent indeed the major European policy tool to encourage territorial cohesion. Within the Objective 1 regions, substantial progress has been achieved in the improvement of accessibility in terms of transport, energy, telecommunications and social infrastructure for most peripheral areas.. On the same line as the Research Framework programme, the Structural Funds have contributed to improve research infrastructure and innovation capacity of the least developed regions.

The major fields of intervention within Objective 2 programmes, are the connectivity to European networks and the improvement of secondary networks. . These programmes should also contribute to enhancing research and innovation capacities of regions in difficulties in order to improve their competitiveness. Furthermore, the equal accessibility of territories to services of general interest should also be promoted within Objective 2 programmes.

In general terms, the Structural Funds should primarily focus on regions with specific difficulties and geographical handicaps. Within each region, SF should also aim at increasing interactions between urban and rural areas and encouraging diversification and integration of rural areas in the regional economy. At a lower scale, SF measures should promote local authorities' direct intervention aiming at improving the competitiveness of the urban areas and counterbalancing the negative externalities of urbanisation such as congestion, social exclusion.

As far as implementation mechanisms are concerned, territorial cohesion requires an effective coordination of different policies both at a vertical level (Community, national and regional/local level) and at a horizontal level (between sector and regional policies). In this sense, cooperation would allow for an effective evaluation of each policy in terms of its contribution to overall territorial cohesion in each specific territory. . This type of coordination would require a strategic framework which should identify the priorities for intervention of each policy in order to guarantee territorial cohesion at European, national and regional level. Finally cooperation and networking of regions is a precondition for ensuring the consistency of the various policies, taking into account the continuity and complementary of territories independently of the institutional barriers.

This report has presented only the most advanced results of Commission and ESPON studies. Some studies are still in progress while new ones will start soon. The work carried out so far has shown that a limited number of basic indicators have gained central importance in European territorial analysis, such as for instance "accessibility", "population density" and "ranking of FUAs" based on functionality. Other concepts and indicators are being developed such as the level of peripherality of urban systems (based on specific criteria such as dimension, position and networks) or the synthetic level risk related to natural hazards.

Finally, the ESPON programme has made possible the development of innovative approaches to territorial analysis methods. An example is the development of multilevel territorial analysis. This approach concentrates on the measurement of regional deviations (related to European, national or local reference contexts) and on syntheses of deviation taking into account simultaneously the various levels ("multilevel"). A complement to this is the analysis of territorial discontinuities (contrasts between regions, border effects). Transnational cooperation proves to generate significant added value in scientific approaches to territorial analysis.

Appendix 1

Studies in progress

In the ESPON programme, some studies started later or did not progress as rapidly as others. For a number of them, provisional outcomes are provided hereafter.

Territorial impacts of structural policies in EU-15 (ESPON Project 2.2.1.) ([55])

In terms of the objectives of structural policies, there is little evidence of an explicit territorial approach being adopted in the current programmes. Territorial cohesion, however, has in a number of cases been inferred as one of the policy objectives of the programmes. Territorial cohesion and balance are often mentioned in the programmes among the objectives. The theme of polycentrism is not so apparent in the strategies of the programmes. The theme of rural development still features as an important policy aim.

As far as the geography of Structural Fund spending 1994-99 is concerned, cohesion countries and Objective 1 regions generally received more Structural and Cohesion Fund money than did other regions. Moreover, bearing in mind that Objective 3 programmes and many Community Initiatives covered urban and densely populated areas in particular, which were sometimes not eligible for Objectives 1, 2 or 5b, the number of benefiting regions was even higher. The rural regions received mostly A-Funds (Agriculture, Fishery and Rural Development), since they were generally eligible for Objective 5b. The leading objective for Structural Fund spending was strengthening the Regional Development and the Productive Infrastructure (R-Fund). Less expenditure presented the S-Fund (Social Integration, Human Resources and Training).

From the review of past and current Structural Fund programmes some considerations emerge relating to the extent to which these programmes may have contributed, and/or are contributing, to the objectives of territorial cohesion and polycentric development. There is evidence to suggests that Structural Fund programmes can contribute to achieving (depending largely on national policies) increased territorial cohesion and polycentric development. The potential contribution of the Structural Funds to achieving these spatial policy aims will depend on the geographical level in question. This is illustrated by looking at the geography of Structural Fund spending according to the types of Functional Urban Areas. A first assessment on where Structural and Cohesion Fund assistance has been used during the 1994-99 period, shows that more than half has been used in what is categorised by ESPON 1.1.1 as local or regional functional urban areas, less than 20% went to the meso level, approx 10% to the macro level and approx 15% to areas that are not typologised as functional urban areas.

([55]) Cf. ESPON project 2.2.1. "Territorial effects of structural funds" led by NORDREGIO

Territorial impacts of CAP and Rural Development Policy (ESPON Project 2.1.3.) ([56])

Among EU policies, CAP and Rural Development Policy (RDP) are among those with strong impact on the territory. The evolution of CAP in the past ten years and the related liberalisation of the sector have however reduced this impact in relative terms. A key factor that needs to be borne in mind is that the CAP is only one of many external factors influencing farm-level decisions and agricultural and rural development. It is difficult to separate out, from all of the other factors and in particular market forces, those changes which can be attributed solely to the existence of the CAP and RDP.

The location of a region also plays a significant role in explaining the level of CAP support received by a region in 1999. In the case of Pillar 1 support, decreasing peripherality (increasing accessibility) was positively associated with higher levels of support: the more accessible regions in the EU received higher levels of Pillar 1 support. The opposite effects for Pillar 2 support were however found: the least accessible regions received, on average, higher levels of support. From a spatial policy perspective, these findings confirm that although Pillar 1 measures are a-spatial, they have very discernible spatial impacts.

a) Impacts of Pillar 1

The results of the analysis suggest a conflict between the strategic objective of improving social cohesion and the distribution of Pillar 1 support: CAP Pillar 1 support in 1999 was higher in areas where population growth had been most rapid. In addition, regions with larger farms received higher levels of CAP support. Thus, 42% of regions receiving the lowest level of support fell into the smallest farm size category while 64% of those regions receiving the highest level of support fell into the two largest average economic size categories.

Only market price support was distributed in a manner inconsistent with economic cohesion objectives. Crop-related direct income payments tended to be higher in areas with a low GDP per capita and with high unemployment rates. A similar pattern is evident in relation to direct income payments associated with livestock production (although this relationship is only statistically significant when considering support per UAA).

The introduction of direct payments has led to a more equitable distribution of support between regions of Europe. Direct income payments remain however problematic for two reasons. Firstly, the levels of payments have not been sufficiently linked to the income reductions associated with the lowering of commodity price supports, leading to over-compensation of some farmers. Secondly, there has not been a clearly articulated rationale to support an indefinite continuation of such payments for a once-off policy change.

b) Impacts of Pillar 2

The results in terms of Pillar 2 support are more ambiguous but showing also levels of support from funds for Rural Development measures positively associated with the rate of population growth. However, the situation is more complex because support varies between commodities and, in general, does not differentiate between production conditions. The relative importance of various Pillar 2 measures varies widely between member states. Less Favoured Areas (LFA) payments would tend to be higher in regions with lower per capita GDP and higher unemployment rates. On the other hand, higher levels of agri-environmental payments accrue to richer areas of the EU whilst the poorer regions of the south and the accession countries prioritise agricultural development measures. In other words, the distribution of agri-environmental payments does not seem consistent with economic cohesion objectives. Results from regression analyses show a positive association between the level of agri-environmental support received by a NUTS 3 region and its level of per capita GDP.

([56]) ESPON project 2.1.3. "The territorial impacts of CAP and Rural Development Policy" led by the Arkleton Centre for rural Development Research; University of Aberdeen (UK)

c) Assessment of the Implications of Proposed Policy Reforms

Simulation (CAPRI model) of the potential impacts of the proposed policy reform provide following results. For cereals, regional impacts are found to vary considerably, affecting especially North-West France, all of Germany, Northern Italy, South-East England, Denmark, Southern Sweden and Finland, and the north-eastern corner of Greece. Spain and Italy are favoured by a special agreement in Agenda 2000 concerning reference yields which results in substantially higher premia for cereals. CAP payments would change by more than about 25% in relatively few regions, such as the Low Countries and parts of northern Germany and northern Italy (increases) and southern France and Austria (decrease). Farm incomes would be only marginally affected, with changes of more than 5% apparent only in a small number of NUTS3 regions in France (mainly in the south) and Austria (both falls) and in some or all of Northern Ireland, Belgium, northern Italy, Denmark and Sweden (all rises).

The CAP reform proposals would increase CAP direct payments more in those NUTS3 regions with higher GDP per inhabitant, i.e. the generally more prosperous areas. In this respect the reform would work against cohesion. CAP premiums would increase more, compared to the benchmark scenario, in those areas with more slowly growing populations in the late 1990s. MTR CAP reform, if anything, would increase farming prosperity (GVA + CAP direct payments) in areas with higher unemployment. The proposals' effects on farm profitability would however have very little effect on economic and social cohesion at NUTS3 level.

The current policies of CAP seem hardly suitable for the structural problems of the CEECs. Decline in livestock production and a modest growth in cereal and oilseed production would be the effect of accession. Rural regions in the enlargement area are affected especially by transformation problems. They show sharp economic spatial disparities and have few urban centres. To a certain extent, the mix of sharp declines in production and employment levels, poor infrastructure and poor transport accessibility could lead to a massive wave of out-migration from rural regions, and as a consequence, to the collapse of their socio-economic viability. Yet, in many accession countries the formulation of rural development policies is at a rather early stage and they are still mainly targeted at the agricultural sector and the basic rural infrastructure.

Natural hazards as constraints for territorial competitiveness (ESPON Project 1.3.1.) ([57])

Regions exposed to natural hazards are facing specific constraints in terms of territorial competitiveness. Natural hazards are of various nature. Their occurrence is hardly predictable. Spatial development policies have the task to elaborate and implement measures likely to contain and reduce the potential impact of natural hazards on assets and people's security.

Major flood events had tragic consequences in recent years. Flood risks are concentrated in South-Eastern France, northern Italy, Central and Southern Germany, the Netherlands, the East of England, Hungary, the North-West of Romania, etc.

A large number of regions, in particular of the Mediterranean Basin have been facing drought in the past decades. Rainfall deficiency is the primary driving factor for drought and directly influences soil moisture, groundwater recharge and river flow, although the hydrological system will delay and smooth the effects. The severity of a drought is not simply a function of the size of the rainfall deficit but depends on the timing of the deficit. Droughts, for example in the growing season, can have serious financial implications on large regions.

The occurrence of large forest fires is closely related to the emergence of drought. Large scale forest fires are therefore concentrated in the Southern parts of Europe like Romania, Bulgaria, Hungary, Greece, Italy, Portugal, southern France and Spain.

([57]) ESPON project 1.3.1. "The spatial effects and management of natural and technological hazards in general and in relation to climate change" led by the Geological Survey of Finland (GTK)

The European regions most exposed to winter storms are generally coastal regions, in particular along the Atlantic and the North Sea. It may also happen that severe winter storms cross the whole continent and cause important damage to more continental regions.

Most earthquakes occur along the margins of plates, where one plate comes into contact with another, developing shear stresses. There are, however, examples of significant earthquakes apparently not associated with the plate boundaries. The earthquake activity zone affecting continental Europe is sometimes called the "Mediterranean and trans-Asiatic" zone. Earthquakes in this zone have foci aligned along mountain chains. These active zones have not changed significantly through human history.

Volcanic eruption hazard is a localised phenomenon. Active volcanoes are well known and are not very numerous in Europe.

Nuclear power plants are classified into five classes showing the number of operational reactors (from shut down status to max. 6 reactors) giving an idea about the potential hazard intensity. Nuclear power plants are widely spread throughout Europe. Risks linked to specific technologies and to obsolescence are more concentrated.

Large dams present significant risks for the areas located downstream, in particular when large towns are located there. Risk may be generated by earthquakes, construction deficiencies, heavy rainfalls, obsolescence etc. 486 major dams were identified in Europe.

Oil spill is hazardous, both physically and chemically. For example, oil can physically coat and clog biological structures (feathers and gills) that are adapted to cope with water. Chemically, oil contains a range of toxins that can either poison living organisms directly in high concentrations or build up slowly in low concentrations, gradually disrupting their biochemistry and increasing their vulnerability to other natural or man-made hazards. Exposure can be both rapid through the massive release of oil associated with the bigger oil tanker accidents or chronic through the build-up of toxins in the marine community after years of oil dumping. Chemical toxins that are not rapidly broken down become concentrated in ecosystems, rendering those organisms at the top of food chain (including humans) most vulnerable to chronic pollution. Oil spills are also highly detrimental to tourist activities in coastal areas.

A synthetic indicator should be superimposed onto the separate assessments for the individual hazards, in order to identify the most areas most at risk from multiple hazards.

Territorial impacts of energy policy and TENs-E

In addition to what has been presented above (section 3.3.2), the study is progressing along the following lines:

The first component of the assessment work is to clarify whether energy policies, namely liberalization (meaning larger role for market mechanisms on price and supply determination), can lead to improved development conditions. The second assessment required is which can be the impact of liberalization on security of supply and on environment and, generally, on the policy targets for the energy sector that can be set fourfold:

1. the need for a price mechanism that optimizes competitiveness conditions for industries and quality of life for the households;
2. the need for a regulatory mechanism that ensures polycentric and territorially balanced development patterns;
3. the need for a sustainable and secure energy supply;
4. the need for an environmental friendly energy development.

Using the fixed energy budget hypothesis, which is more stringent towards the efficiency of price mechanisms on energy markets, points to two main effects:

i) in the short run, price changes have some effect on growth, price increases implying lower levels of economic activities, and price decreases leading to enlarged aggregate supply, but with much larger elasticity to price increases;
ii) in the long run we can expect technological change and possible delocalisation of more energy intensive industries.

But this hypothesis hardly holds considering only recent data for European countries. Another hypothesis is that only great variations in energy prices will have a visible impact on location decision of firms and in the growth of GDP. More detailed results will be available when the study is more advanced.

Appendix 2

Classification of MEGAs

Classification of the 76 MEGAs	
Global Nodes: Largest and most competitive urban systems with high connectivity. Total score above 15	Paris and London
European Engines Often large, highly competitive, possess strong human capital and good accessibility Total score from 10 to 14	**Location in the pentagon:** Munich, Frankfurt, Milan, Hamburg, Brussels, Stuttgart, Zurich, Amsterdam, Dusseldorf, Cologne **Location outside the pentagon:** Madrid, Rome, Copenhagen, Berlin, Barcelona, Stockholm, Vienna
Strong MEGAs Cities relatively large, competitive and often possessing strong human capital. Total score from 7 to 9	Helsinki, Manchester, Athens, Dublin, Gothenburg, Turin, Geneva, Oslo
Potential MEGAs Smaller, with lower competitiveness, more peripheral and often having weaker human capital than Strong MEGAs. Total score from 5 to 6	**Capital cities:** Warsaw, Budapest, Prague, Lisbon **Non-capital cities:** Lyon, Antwerp, Rotterdam, Malmö, Marseille, Nice, Neaples, Bremen, Toulouse, Lille, Bergen, Glasgow, Edinburgh, Birmingham, Luxemburg, Palma de Mallorca, Bologna, Valencia, Bilbao, Aarhus, Bern
Weak MEGAs Often smaller, less competitive, more peripheral and have lower human capital figures than Potential MEGAs. Total score from 1 to 4	Bordeaux, Le Havre, Genoa, Bucharest, Tallinn, Sofia, Seville, Porto, Ljubljana, Katowice, Vilnius, Krakow, Riga, Gdansk-Gdynia, Wroclaw; Bratislava, Poznan, Lodz, Szczecin, Timisoara, Valetta, Turku, Cork, Southampton/Eastleigh

Appendix 3

Growth and decline of FUAs in the accession countries

Accession countries with mainly population decline in FUAs are:

- Bulgaria with Sofia as the dominating city and only three FUAs with more than 200 000 inhabitants. All FUAs are declining, the smallest most.
- the Czech Republic which has two large FUAs (Praha and Ostrava) and a couple of medium-sized cities. Large cities are losing population.
- Estonia which is dominated by Tallinn. All but one FUAs are losing population.
- Hungary has one dominating FUA, Budapest, and a dense network of small and medium-sized cities. The largest cities are losing population
- Lithuania has eight FUAs with a balanced structure. Larger FUAs are losing population.
- Latvia is strongly dominated by Riga. All FUAs are losing population.
- Poland has a balanced urban structure with two large FUAs and many medium-sized cities. Polish FUAs are larger (population) than in most of the other countries. Large FUAs are losing population.
- Romania is dominated by Bucharest and has in addition seven FUAs with appr. 300 000 inhabitants. All but two FUAs are losing population.

Only few accession countries are characterised by general population growth in FUAs:

- Cyprus has four FUAs. The population is increasing rapidly in all of them.
- Slovakia is rather polycentric. Most of the weight of urban system is in medium-sized cities. Most of FUAs are growing.

In a number of countries, however, where the population of large FUAs is declining, there is population growth in medium-sized and small FUAs. This is the case:

- in the Czech Republic where the largest population growth is in FUAs with population 100
- 200 000 inhabitants.
- in Hungary, where growth takes place in many small and medium-sized cities.
- in Lithuania, where small FUAs are growing.
- in Poland, where only cities with less than 500 000 inhabitants are growing, some of them very rapidly.

Appendix 4

Potential counterweights to the pentagon

MEGAS and FUAs	Population change of MEGAs 1990-2000	MEGAS and FUAs	Population change of MEGAs 1990-2000	MEGAS and FUAs	Population change of MEGAs 1990-2000	MEGAS and FUAs	Population change of MEGAs 1990-2000
AUSTRIA/ SLOVAKIA		GERMANY		LATVIA		SPAIN	
• **Vienna (AT)**	-	• **Berlin** Potsdam	-1%	• **Riga**	-	• **Madrid**	+10%
• **Bratislava (SK)** Trnava (Slovakia) Nitra (Slovakia)	+2%	• **Dresden** Chemnitz Leipzig Halle	-22%	POLAND		• **Barcelona** Tarragona	- 7% -
BULGARIA		GREECE		• **Gdansk**	- 2%	• **Valencia** Castellon de la Plana	-
• **Sofia**	- 4%	• **Athens** Khalkis	+7%	• **Krakow**	- 1%	• **Alicante** Murcia	-
CZECH REPUBLIC		HUNGARY		• **Katowice** *Bielsko-Biala* Czestochowa Ostrava (CZ)	-7%	• **Sevilla** Cadiz	+11%
• **Prague** Plzen	- 2%	• **Budapest**	-	PORTUGAL		SWEDEN	
DENMARK/SWEDEN		ITALY		• **Porto** Braga Coimbra	+5%	• **Stockholm** Uppsala Västerås	-
• **Copenhagen (DK)**	+7%	• **Napoli** Salerno	-	• **Lisboa**	+7%	UNITED KINGDOM	
• **Malmø (SE)** Helsingborg (SE)	+8%	• **Genova** La Spezia Pisa Florence Livorno	-	ROMANIA		• **Birmingham** Wolverhampton Coventry/Bedworth Nottingham	-
FRANCE/ (SWITZERLAND)		• **Torino**	-	• **Bucharest** Ploiesti	-7%	• **Manchester** Derby Sheffield Liverpool Leeds Tyneside-Newcastle-Gateshead Huddersfield	+7%
• **Lyon** St.Etienne Chambery Annecy Grenoble Valence Geneve (CH) Lausanne (CH)	+9%	• **Bologna** Parma Modena	-			• **Edinburgh** Glasgow	
• **Marseille** Montpellier Nimes Avignon Toulon	+13%	• **Udine** Trieste	-				
• **Bordeaux**	+11%	• **Venezia** Vicenza	-				
• **Nice**	+73%	• Verona	-				

Appendix 5: Urban-rural

Categories of urban-rural relationships as identified in the SPESP Study

- **Home-work relationships**: Home-work relationships are traditionally seen as the most intense and obvious component of the relationships between towns and cities and their surrounding areas. Home-work relationships appear in statistics in the form of labour market areas, which may extend over vast areas, although their size and the levels of commuting they involve vary enormously over the European Union. Homework relationships expanding the physical limits of urban centres have lead to the notion of Functional Urban Regions. In some areas of Europe, where urban labour markets are penetrating each other, it is hardly possible to make a distinction between the different functional regions, and hence between functionally connected urban and rural areas.
- **Central place relationships**: The services and amenities provided by urban centres are often referred to as central place relationships: a city or urban centre supplies its surroundings with services that call for concentration at a specific point in space (education and training, markets, shopping centres, banks, insurance, hospitals, health centres, cinemas, theatres, libraries and other cultural facilities). There is a general tendency for central place systems to become more hierarchical or simply lose their lower echelons in rural as well as in urban areas. Many of the services and amenities discussed here require a large number of users or high turnover over time. Where population figures are dropping, which is the case in many rural areas in Europe, the consequences in terms of service level are often extremely negative. In response some suppliers of services and facilities may offer a system of mobile outlets.
- **Relationships between metropolitan areas and urban centres in rural and intermediate areas**: Many small and medium-sized town and cities located in the vicinity of a large city or conurbation often grow rapidly in terms of employment and population size. Their scale, amenities, accessibility and supply of locations for new development place these towns and cities in a highly competitive position vis-à-vis large cities. This is especially the case in *corridors*, which stretch from one conurbation to another or cross large, polycentric urban systems. It is here where one finds an intricate patchwork of rurality and urbanity. Being further away from large metropolitan areas does not necessarily mean that small and medium sized cities lack development potential. For instance, towns located in attractive areas or which are by themselves attractive can draw in new residents and businesses. As a result even small towns in fairly remote locations may be part of national and even global economic systems. This is especially true where a particular specialisation has occurred due to historic circumstances or where a successful company has kept aspects of its activity at its original location.
- **Relationships between rural and urban enterprises**: Some urban enterprises deliver their services primarily to the general public, like banks and (some) insurance companies. Other relationships are exclusively between enterprises. One can think of consulting or Research & Development in this connection. Modern agriculture is also connected to urban centres in many ways: modern agriculture in general is very dependent on the transfer of knowledge and new products supplied by companies and institutions with an urban location; local trading places though have been replaced by regional trading places. With the emergence of large supermarket chains farm products are in a growing number of instances sold directly to these companies.

- **Rural areas as recreation and consumption areas for urban dwellers**: Near large metropolitan areas some rural areas have been completely restructured to form large recreational grounds. Elsewhere rural areas have maintained their physical shape, but offer a wide range of facilities stretching from bridle paths to holiday resorts and theme parks. Rural areas characterised by a valuable natural and/or cultural heritage are especially sought after, often beyond the limits of their carrying capacity.
- **Rural areas as open spaces and suppliers of natural resources for urban areas**: Sub-urbanisation and the seemingly unlimited growth of cities have made the policy goal of maintaining openness an important aspect of spatial diversity. As a consequence limits are set on building, not primarily because the rural areas are particularly scenic, but as the result of public values attached to the concept of open areas. This policy often also encompasses building and development restrictions on endogenous functions. An open space or green belt policy sometimes leads to the development of recreational facilities like footpaths, picnic areas, etc. Modern urban society cannot function without the use of natural resources like water and energy. For drinking water especially, urban centres are almost completely dependent on rural areas. It is there where the main purification plants and reservoirs are located, often with an enormous impact on the local environment. Many rural areas show the scars of historical or present day open-pit mining, another example of exploiting natural resources in rural areas.
- **Rural areas as carriers of urban infrastructure**: Roads, rail links, waterways, telecommunication lines, high-voltage lines, pipelines, television and telecommunication towers - overhead and underground Europe is covered by an intricate system of networks, with a very high density in highly urbanised regions. Many of these networks cross rural areas, sometimes forming corridors when more than one line follows the same route. Although many facilities cater to rural areas a well, the main networks link up urban areas within and across national borders. Spatial fragmentation and environmental pressure are a few of their consequences. Furthermore, urban waste collection and processing could conceivably be included under the heading of urban infrastructure. Although a growing part of Europe's waste production is recycled or incinerated, a substantial part of it is still dumped, primarily at locations in rural areas.

Appendix 6: Mountain areas

Mountain areas compared to lowlands in EU15 and accession countries

Table : Mountain areas compared to lowlands in EU 15 and Accession countries

	Unemployment rate (%) 2001 (1)				Employment by sector (%) 2001 (6)			Demography % of population by age class 2001 (10)		
	Total (2)	Female (3)	Young (4)	Long term (5)	Agriculture (7)	Industry	Services	under 15	15 - 60	over 60
EU15 mountains	9.7	12.4	2.7	3.7	6.7	32.5	60.7	18.0	62.4	19.6
EU15 lowlands	8.8	9.9	2.4	4.1	3.5	31.4	65.0	19.3	61.9	18.8
Accession countries mountains	13.9	13.5	3.8	5.7	6.1 (8)	36.4	57.5	17.7	63.8	18.5
Accession countries lowlands	11.7	12.9	2.6	4.7	16.2 (9)	29.0	54.8	18.3	63.4	18.3

Source: national statistics institutes and calculations/estimations NORDREGIO and IRPUD

(1) Unemployment rates have been calculated by dividing number unemployed people by active population.

(2) Total unemployment rate: without Greece, Poland; active population data disaggregated from NUTS 2 by NUTS 5 1991 data for Ireland and Italy; active population data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Spain and Cyprus; unemployment data disaggregated from NUTS 0 by NUTS 5 1991 data for Ireland; unemployment data disaggregated from NUTS3 by NUTS 5 1991 data for Italy; unemployment data disaggregated from NUTS3 by NUTS 5 2001 total population data for Spain and Cyprus.

(3) Female unemployment rate: without Austria, Greece, Spain, Cyprus, Hungary, Cyprus, Latvia, Poland, Slovenia; active population data disaggregated from NUTS 2 by NUTS 5 1991 data for Ireland and Italy; female unemployment data disaggregated from NUTS 0 by NUTS 5 1991 data for Ireland; female unemployment data disaggregated from NUTS 3 by NUTS 5 1991 data for Ireland.

(4) Youth unemployment: without Greece, Italy, Poland; active population data disaggregated from NUTS 2 by NUTS 5 1991 data for Ireland; active population data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Spain; active population data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Cyprus; active population data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Hungary; young unemployment data disaggregated from NUTS 2 by NUTS 5 1991 data for Ireland; young unemployment data disaggregated from NUTS 4 by NUTS 5 2001 total population data for Portugal; young unemployment data disaggregated from NUTS 2 by NUTS 5 2001 total population data for Spain; young unemployment data disaggregated from NUTS 0 by NUTS 5 2001 total population data for Cyprus; young unemployment data disaggregated from NUTS 2 by NUTS 5 2001 total population data for Hungary.

(5) Long-term unemployment: without Denmark, Greece, Ireland, Italy, Malta, Poland; active population data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Spain; long term unemployment data disaggregated from NUTS 3 by NUTS 5 2001 total population data for Spain.

(6) Employees by sector 2001: without Italy, Cyprus, Romania; total employment figures used for Portugal, Sweden, Poland and Romania; number of employees per sector disaggregated from NUTS 3 by NUTS 5 1991 data for Ireland; number of employees per sector disaggregated from NUTS 3 by NUTS 5 2001 total population data for Spain; values for Romania underestimate employees in agriculture sector.

(7) Agriculture sector: number of employees in agriculture sector disaggregated from NUTS 3 by NUTS 5 1991 data for Austria and Germany; number of employees in agriculture sector disaggregated from NUTS 2 by NUTS 5 1991 data for Italy; agriculture sector underestimated for Romania.

(8) Figures for Polish mountain areas only: agriculture = 20,3%, industry = 29,7%, services 50,0%. If employment by sector in Accession countries were to be calculated without Poland, the figures would be: agriculture = 4.6%, industry = 37.1%, services 58.3% (figures for Cyprus and Romania being unavailable);

(9) Figures for Polish lowland areas only are: agriculture = 29,3%, industry = 25,3%, services 45,4%. If employment by sector in Accession countries were to be calculated without Poland, the figures would be: agriculture = 6.7%, industry =31.7%, services 61.6% (figures for Cyprus and Romania being unavailable);

(10) Population by age class: without Italy; amount of people <15 and >60 years disaggregated from NUTS 3 by NUTS 5 2001 total population data for Romania.

Policies for mountain areas

National policies for mountain areas are diverse but can be grouped into three categories:

- Countries where mountain policies are sectoral, those with middle mountains among the Member States and/or accession countries. The most frequent sector addressed by mountain-related policies is agriculture (17 countries). They are also often addressed to environment (13 countries) and rural development (13 countries). In Ireland, Hungary, Portugal, Slovakia, and Slovenia, these policies are mainly addressed to agriculture, environment and tourism.
- Countries where mountain policies are addressed to multi-sectoral development. Germany and Sweden started to develop plans for mountain agriculture but, as the relative importance of agriculture in the mountain economy decreased, broadened policies to include other economic sectors (mainly tourism), public infrastructure or services, and/or environment.
- Countries where mountain policies are addressed to overall development. In the countries where a sustainable development approach is most advanced, the compensation of handicaps through agricultural policies has given way progressively to a more integrated policy. France, Italy and Switzerland are the main ones. Austria has a quite integrated policy with a strong regional power.

In countries with very few or low mountains (Belgium, Ireland, Luxembourg, Poland) no mountain policies can be identified.

As far as **EU policies** are concerned, most mountain areas are included in Objective 1 areas (which include the Nordic sparsely populated areas). In present Objective 2 though not explicit (as it was in Objective 5b for the previous programming period) mountainous relief is taken into consideration. While objective 1 mountain areas are mainly concentrated in the southernmost and northernmost regions, objective 2 areas include mainly massifs in central Europe though stretching to western Spain. Not surprisingly, the largest parts of massifs that are not included in Objectives 1 or 2 are the Black Forest and Bavarian Alps, the French Northern and Italian Western Alps (i.e. the areas that are part of the European core). Interreg is a Community Initiative important for mountain areas, mainly its strand III A due to the fact that many mountains are frontiers.

Since the mid 1970s, a specific EU instrument has been applied for supporting agricultural activities and the maintaining of population in mountainous and less favoured areas (EEC Directive 75/268). Up to 1999, the less favoured areas were defined by directives of the council on the basis of precise criteria. From 2000 onwards, the supported mountain areas are defined in the context of rural development plans. Two types of financial support have been attributed: a compensation grant for natural handicaps and higher subsidies for investments in agricultural holdings.

Less favoured areas also benefit from a special status in relation to state aids (Competition policy) while the Environment policy approaches mountains problems through the initiative and support to international agreements such as the Alpine Convention and Nature 2000 network of protected sites.

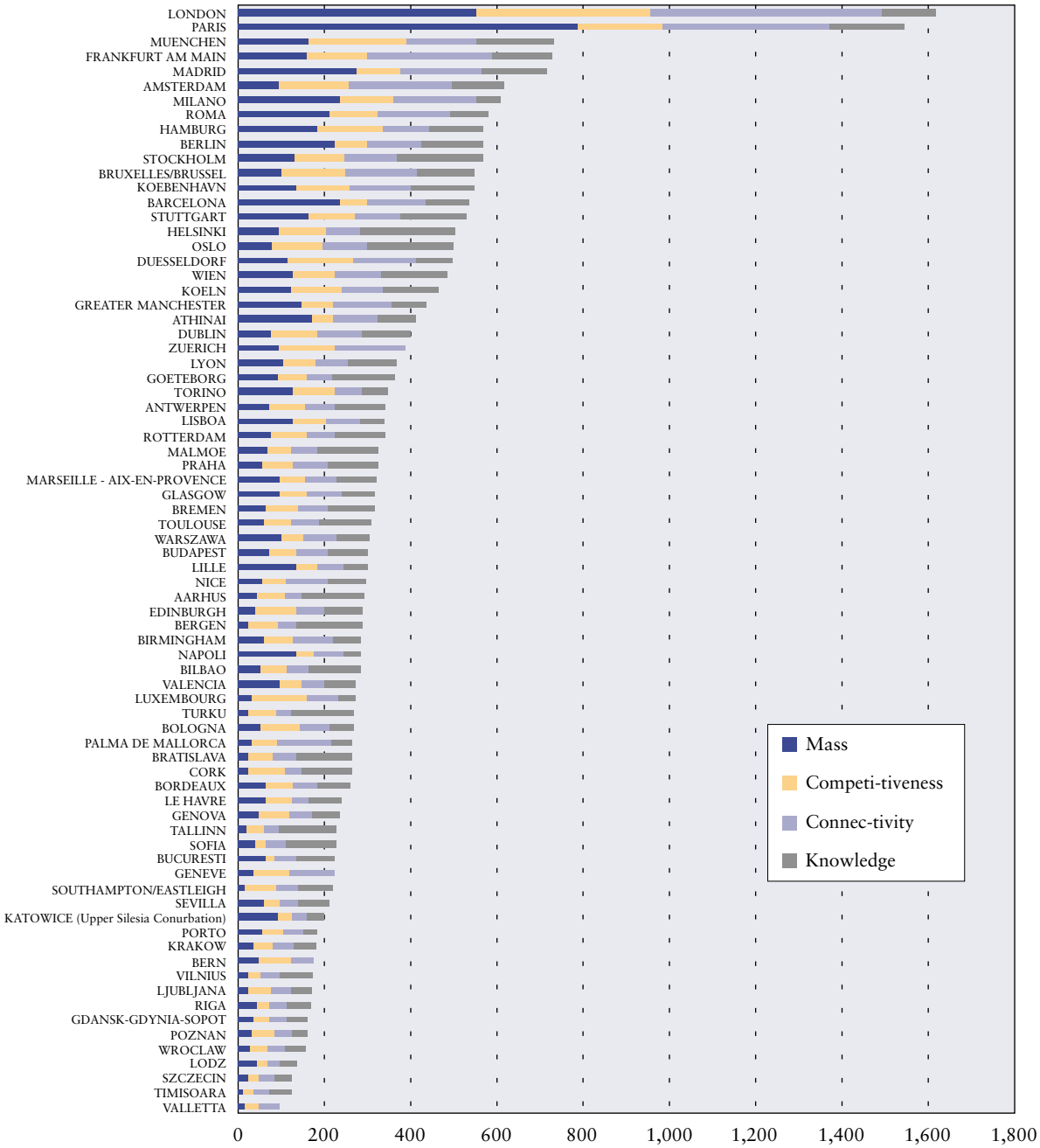
Appendix 7

Glossary of abbreviations

Abbreviation	Term
AC	Accession Country
AWU	Agricultural Working Unit
CAP	Common Agricultural Policy
CU	Co-ordination Unit
DOM	Département d'Outremer (French Overseas Districts)
ERDF	European Regional Development Fund
ESDP	European Spatial Development Perspective
ESF	European Social Fund
ESPON	European Spatial Planning Observation Network
EU-15	Present 15 EU Member States
EU-27	Present 15 EU Member States + 12 Candidate Countries (including Romania and Bulgaria)
EU27+2	EU27 + Switzerland and Norway (building together the ESPON study area)
EUCC	Candidate Countries to the European Union
FUA	Functional Urban Area
GDP	Gross Domestic Product
GIZ	Global Integration Zone
ICT	Information and Communication Technology
IR	Interim Report
LFA	Less Favoured Areas
LP	Lead Partner
MA	Management Authority
MC	Monitoring Committee
MEGA	Metropolitan European Growth Area
MTR	Mid-Term Review
R&D	Research and Development

Abbreviation	Term
RDR	Rural Development Plan
RTDI	Research, Technological Development and Innovation
SPESP	Study Programme on European Spatial Planning
TEN-E	Transeuropean Energy Network
TEN-T	Transeuropean Transport Network
TINA	Transport Infrastructure Needs Assessment
SWOT	Strengths, Weaknesses, Opportunities and Threats

The MEGAs in the European urban system



Global nodes	Indexes				Average index	Scores				Total Score
	Mass	Competi-tiveness	Connec-tivity	Know-ledge		Mass	Competi-tiveness	Connec-tivity	Know-ledge	
PARIS	787	197	386	175	**387**	4	4	4	4	**16**
LONDON	553	402	536	122	**403**	4	4	4	3	**15**

European engines	Indexes				Average index	Scores				Total Score
	Mass	Competi-tiveness	Connec-tivity	Know-ledge		Mass	Competi-tiveness	Connec-tivity	Know-ledge	
MUENCHEN	164	227	158	184	**183**	4	4	3	4	**15**
FRANKFURT AM MAIN	158	142	290	135	**181**	3	3	4	3	**13**
MADRID	276	98	187	156	**179**	4	2	4	3	**13**
BRUXELLES/BRUSSEL	100	148	166	132	**137**	2	3	4	3	**12**
MILANO	235	125	190	57	**152**	4	3	4	1	**12**
ROMA	211	112	170	86	**145**	4	2	4	2	**12**
HAMBURG	181	156	107	125	**142**	4	3	2	3	**12**
KOEBENHAVN	136	123	139	148	**136**	3	3	3	3	**12**
ZUERICH	96	125	166	—	**129**	2	3	4	3	**12**
AMSTERDAM	96	159	241	120	**154**	2	3	4	2	**11**
BERLIN	223	77	123	144	**142**	4	1	3	3	**11**
STOCKHOLM	132	116	119	199	**142**	3	2	2	4	**11**
STUTTGART	164	106	101	157	**132**	4	2	2	3	**11**
BARCELONA	234	65	136	98	**133**	4	1	3	2	**10**
DUESSELDORF	115	151	147	81	**124**	2	3	3	2	**10**
WIEN	126	95	111	151	**121**	3	2	2	3	**10**
KOELN	122	116	97	125	**115**	3	2	2	3	**10**

Strong MEGAs	Indexes				Average index	Scores				Total Score
	Mass	Competi-tiveness	Connec-tivity	Know-ledge		Mass	Competi-tiveness	Connec-tivity	Know-ledge	
HELSINKI	95	110	79	222	**126**	2	2	1	4	**9**
OSLO	80	114	103	202	**125**	1	2	2	4	**9**
ATHINAI	172	48	105	87	**103**	4	1	2	2	**9**
GREATER MANCHESTER	147	71	138	78	**108**	3	1	3	1	**8**
DUBLIN	75	109	103	114	**100**	1	2	2	2	**7**
GOETEBORG	90	68	61	146	**91**	2	1	1	3	**7**
TORINO	126	96	64	60	**87**	3	2	1	1	**7**
GENEVE	32	87	102	—	**74**	0	2	2	3	**7**

Potential MEGAs	Indexes				Average index	Scores				Total Score
	Mass	Competi-tiveness	Connec-tivity	Know-ledge		Mass	Competi-tiveness	Connec-tivity	Know-ledge	
LYON	102	76	78	110	**92**	2	1	1	2	**6**
ANTWERPEN	72	84	67	118	**85**	1	2	1	2	**6**
LISBOA	128	75	79	58	**85**	3	1	1	1	**6**
ROTTERDAM	75	86	63	114	**85**	1	2	1	2	**6**
MALMOE	66	57	62	138	**81**	1	1	1	3	**6**
MARSEILLE - AIX-EN-PR	96	59	73	90	**80**	2	1	1	2	**6**
LILLE	134	52	55	57	**75**	3	1	1	1	**6**
NICE	54	57	94	90	**74**	1	1	2	2	**6**
NAPOLI	134	40	67	40	**71**	3	1	1	1	**6**
BERN	50	75	50	—	**58**	1	1	1	3	**6**
PRAHA	55	74	78	117	**81**	1	1	1	2	**5**
GLASGOW	96	64	80	76	**79**	2	1	1	1	**5**
BREMEN	63	75	68	109	**79**	1	1	1	2	**5**
TOULOUSE	57	64	68	119	**77**	1	1	1	2	**5**
WARSZAWA	101	51	75	78	**76**	2	1	1	1	**5**
BUDAPEST	72	69	74	95	**75**	1	1	1	2	**5**
AARHUS	41	65	39	148	**73**	1	1	0	3	**5**
EDINBURGH	40	98	63	86	**72**	0	2	1	2	**5**
BERGEN	25	66	46	147	**71**	0	1	1	3	**5**
BIRMINGHAM	59	68	91	66	**71**	1	1	2	1	**5**
BILBAO	52	58	54	119	**71**	1	1	1	2	**5**
VALENCIA	96	50	51	74	**68**	2	1	1	1	**5**
LUXEMBOURG	31	130	68	41	**68**	0	3	1	1	**5**
BOLOGNA	53	90	69	55	**67**	1	2	1	1	**5**
PALMA DE MALLORCA	31	60	125	49	**66**	0	1	3	1	**5**

Weak MEGAs	Indexes				Average index	Scores				Total Score
	Mass	Competi-tiveness	Connec-tivity	Know-ledge		Mass	Competi-tiveness	Connec-tivity	Know-ledge	
BRATISLAVA	23	57	53	131	**66**	0	1	1	3	**5**
TURKU	24	65	33	145	**67**	0	1	0	3	**4**
CORK	26	79	44	114	**66**	0	1	1	2	**4**
BORDEAUX	65	63	57	76	**65**	1	1	1	1	**4**
LE HAVRE	63	62	40	74	**60**	1	1	1	1	**4**
GENOVA	47	70	54	63	**58**	1	1	1	1	**4**
BUCURESTI	63	22	51	89	**56**	1	0	1	2	**4**
TALLINN	18	38	39	132	**57**	0	0	0	3	**3**
SOFIA	39	26	45	116	**57**	0	0	1	2	**3**
SOUTHAMPTON/EASTL	14	74	52	79	**55**	0	1	1	1	**3**
SEVILLA	60	39	42	70	**53**	1	0	1	1	**3**
PORTO	53	49	50	34	**47**	1	1	1	0	**3**
KRAKOW	38	41	48	51	**44**	0	1	1	1	**3**
VILNIUS	21	30	43	80	**44**	0	0	1	2	**3**
LJUBLJANA	20	56	47	50	**43**	0	1	1	1	**3**
RIGA	41	31	41	54	**42**	1	0	1	1	**3**
KATOWICE (Upper Silesi...)	90	32	38	37	**49**	2	0	0	0	**2**
GDANSK-GDYNIA-SOPO	35	38	40	49	**40**	0	0	1	1	**2**
POZNAN	30	51	42	36	**40**	0	1	1	0	**2**
WROCLAW	27	39	40	49	**39**	0	0	1	1	**2**
LODZ	43	24	30	40	**34**	1	0	0	1	**2**
VALLETTA	15	34	48	—	**32**	0	0	1	1	**2**
SZCZECIN	21	27	32	41	**31**	0	0	0	1	**1**
TIMISOARA	13	20	39	49	**30**	0	0	0	1	**1**

National and city Unemployment rates

Unemployment Rate 2001				
National	Cities	Ratio large city / national	Medium-sized	Large
ES	10%	9%	11%	102%
GR	10%	12%	10%	98%
IT	10%	n.a.	n.a.	n.a.
FI	9%	16%	9%	102%
FR	9%	13%	13%	155%
DE	8%	11%	8%	104%
BE	7%	n.a.	n.a.	n.a.
UK	5%	5%	8%	151%
SE	5%	7%	6%	123%
DK	5%	5%	5%	105%
PT	4%	6%	8%	201%
IE	4%	9%	7%	180%
AT	4%	7%	11%	298%
NL	2%	4%	4%	184%
LU	2%	3%		

Source: Urban Audit 2004

Share of residents with a higher education degree

2001				
National	Cities	Medium-sized	Large	Ratio large city/national
FI	20%	24%	28%	143%
BE	17%	n.a.	n.a.	n.a.
DK	17%	16%	20%	123%
ES	16%	n.a.	n.a.	n.a.
SE	15%	12%	14%	92%
NL	15%	16%	21%	135%
DE	15%	21%	17%	116%
UK	15%	15%	16%	109%
FR	14%	15%	20%	138%
IE	14%	14%	17%	126%
LU	11%	18%		
GR	10%	14%	19%	188%
AT	10%	n.a.	n.a.	n.a.
IT	6%	n.a.	n.a.	n.a.
PT	6%	9%	16%	283%

Source: Urban Audit 2004

Comparing Core Cities to Cities outside the Core both Medium-sized and Large

	Core cities		Cities outside the core		Total	Number of cities that responded
	Large	Medium	Large	Medium		
Households with Children (0-17)	22,0%	23,1%	26,0%	31,7%	26,1%	134
One-person households	44,4%	41,2%	33,1%	28,1%	35,4%	160
Share of non-nationals	13,3%	7,3%	5,9%	3,9%	6,9%	164
Share of Non-EU nationals	9,8%	5,0%	4,6%	3,3%	5,2%	164
Share EU-nationals	3,5%	2,3%	1,3%	0,7%	1,7%	164
Recorded crime per 1000 inhabitants	118	109	92	69	94	152
Unemployment	7,8%	8,4%	10,1%	9,4%	9,2%	151
Highest Neighbourhood unemployment	41%	44%	58%	50%	58%	117
Days a year with Summer Smog (O_3)	12,3	13,5	6,9	4,9	8,4	127
Number of cities in the Audit	33	32	60	64	189	189