Klaus Spiekermann and Michael Wegener

The Shrinking Continent: Accessibility, Competitiveness, and Cohesion

At the beginning of the era of the railways, Heinrich Heine wrote in Paris, “The railway kills space, so we are left with time. If we only had enough money to kill time, too! It is now possible to go to Orléans in four and a half hours or in as many hours to Rouen. Wait until the lines to Belgium and Germany are built and connected with the railways there! It is as if the mountains and forests of all countries moved towards Paris. I can smell the scent of German linden trees, and the North Sea is roaring in front of my door” (Heine 1854/1964, 65). The quote circumscribes the topic of this paper, the relationship between speed and space or, in other words, the relationship between space and time.

Increasing mobility is one of the constituting features of modernity: “The history of modern societies can be read as a history of their acceleration” (Steiner 1991, 24). Modern society is a society of centaurs, creatures with a human front and an automobile abdomen (Sloterdijk 1992). Today Europe is facing a new thrust of acceleration: ever-tighter networks of motorways, high-speed railways, and air connections are pervading every corner of the continent, linking formerly isolated regions to the European core. Figure 5.1 depicts the effect of acceleration in time-space maps, in which distances are proportional to travel times (CEC 1994, 66; ESPON 1.2.1 2004, 259). The map at the left shows Europe based on rail travel times in the 1990s; the map at the right shows how Europe will look in 2020 if the present TEN-T outline plans are implemented. The full “space-eating” effect of high-speed rail becomes visible: In 2020 the continent will have dramatically shrunk in time-space.

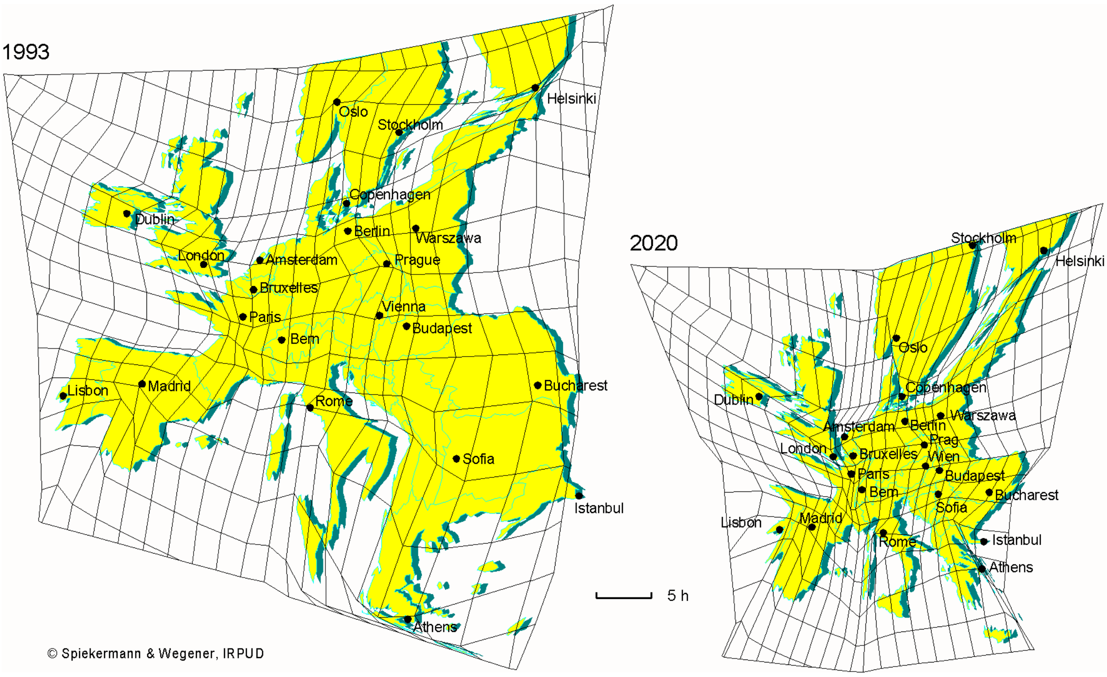

Figure 1. Time-space maps of rail travel times, 1993–2020 (ESPON 1.2.1 2004, 259)

Chapter 5 in: Faludi, A. (Ed.): *European Spatial Research and Planning*. Cambridge, MA: Lincoln Institute of Land Policy, 115-140.

The vision of a “network society,” in which locations become secondary and flows of information, innovation, products, capital, and people are what really matter, is fascinating but also misleading. While it is true that in quantitative terms the volume of flows between locations has exploded, people still need places to settle down, work, rest, feel at home, and meet other people. That space matters is also behind the metaphor of the ecological footprint, which suggests that the earth has a finite carrying capacity in terms of spatial units.

European policy—not only spatial policy—has to find its way through the maze of often conflicting demands and impacts of spaces and flows. Economic policy has to deal with international flows of capital and goods in globalized markets, but also has to help local economies survive in the face of competition. Social policy has to find a balance between open borders and the capacity of societies to accommodate immigrants. Transport policy has to find a trade-off between the benefits of unconstrained mobility and the need to prepare for imminent energy shortages. Environmental policy has to reconcile economic interests and the imperatives of protecting sensitive landscapes and reducing greenhouse gases.

All these are, or should be, elements of European spatial policy and are closely linked to its objectives of competitiveness, cohesion, and environmental sustainability. Nowhere are the conflicts between the three goals so clearly manifest as in the dichotomy of flows and places. The “space of flows” gets even higher prominence in the face of global competition of cities and regions. Accessibility at the global and European scales becomes a core element of competitiveness under the Lisbon Agenda. Already the European Spatial Development Perspective (ESDP) states, “Good accessibility of regions enhances the competitiveness of European regions but also the competitiveness of Europe at large” (CEC 1999, 69).

However, connectivity also has implications for two other major EU goals: cohesion and sustainability. Promoting international trade and transport flows may bring economic benefit to some regions and disadvantage to others and endanger the environment of all. Access to high-speed information and communication technology concentrated in corridors between the largest cities may enhance their position in the global market but also reduce the prospects of smaller cities and so run counter to the polycentricity objective. The growing mobility of people and goods over ever-longer distances, mostly by road or air, is one of the major reasons many countries fail to meet the Kyoto greenhouse gas emission targets. It also makes them vulnerable to future energy price shocks.

Transport

Transport flows provide the most apparent evidence of the inherently spatial nature of most social and economic activities. Globalization and European integration have vastly increased the importance of movements of people and goods within and between regions in Europe. In recent years, transport has received special attention in the political agenda of the European Commission. In 2001 its *White Paper on Transport* stated,

> *“Transport is crucial for our economic competitiveness and commercial, economic and cultural exchanges. This sector of the economy accounts for some 1,000 billion, or over 10% of the EU’s gross domestic product, and employs 10 million people. Transport also helps to bring Europe’s citizens closer together”* (CEC 2001, 3*).*

The White Paper also addressed the inherent goal conflicts of transport:

> *"However, there is a permanent contradiction between society, which demands ever more mobility, and public opinion, which is becoming increasingly intolerant of chronic delays and the poor quality of some transport services. As demand for transport keeps increasing, the Community’s answer cannot be just to build new infrastructure and open up markets. The transport system needs to be optimised to meet the demands of*

> *enlargement and sustainable development, as set out in the conclusions of the Gothenburg European Council. A modern transport system must be sustainable from an economic and social as well as an environmental viewpoint"* (CEC 2001, 11).

The contribution of the transport sector to energy consumption and greenhouse gas emissions is significant. The Commission's *Green Paper on Energy* states the following:

> *"It is indeed fortunate that industry has stabilised its consumption, thanks to modernisation investments. Transport, on the other hand, is without doubt the leader in energy demand. All the forecasts predict an explosion in the activity of this largest consumer of oil. . . . Transport accounts for 67% of the final demand for oil, on which it is totally dependent (98%). Energy intensity increased by 10% between 1985 and 1998. Growth forecasts from now to 2010 are phenomenal: +16% for cars, +90% for aircraft, and 50% more road traffic"* (CEC 2002,10–11).

Transport is also highly relevant for the debate about social and territorial cohesion. The quality of transport infrastructure in terms of such factors as capacity, connectivity, and travel speed determines the quality of locations relative to other locations—that is, the competitive advantage of regions. Investment in transport infrastructure leads to changing location qualities and may induce changes in spatial development patterns. If the growth objective of the Lisbon Strategy is interpreted as a call to improve the already high connectivity of the most advanced metropolitan areas, the increasing imbalances in transport provision are likely to further deepen the economic disparities between regions in Europe.

ESPON 1.2.1 (Transport Services and Networks: Territorial Trends and Basic Supply of Infrastructure for Territorial Cohesion) examined the present situation and the trends in transport in Europe with a view to how transport networks might contribute to more balanced, more polycentric, more sustainable spatial development and develop accessibility to increase the cohesion between regions (ESPON 1.2.1 2004). ESPON 1.2.1 developed three types of indicators: transport infrastructure indicators, traffic indicators, and accessibility indicators. Transport infrastructure indicators include information on supply, capacity, services, and vulnerability of transport networks to anthropogenic and natural hazards. Traffic indicators include information on traffic volume on network links and flows between origins and destinations. Accessibility indicators describe the location of an area (region, city, or corridor) with respect to opportunities, activities, and assets in other areas (Wegener et al. 2001). In addition, ESPON 1.2.1 presented innovative methods of visualizing and mapping transport supply and traffic volumes.

The overwhelming message from these indicators is that the European transport system is highly unbalanced for geophysical and historical reasons. The geophysical reason is the articulation of the European continent by peninsulas and mountain ranges. The historical reason is that the European transport system was essentially shaped by the distribution of cities, with large differences of patterns in monocentric (e.g., France) and polycentric (e.g., Germany) countries.

The consequence is that there is an enormous gap in accessibility between the central and peripheral regions. Certainly, in large part that gap is due to geographical location: A central region will always remain central and a peripheral region peripheral. However, as the central regions tend to be more densely populated and more affluent, their demand for transport is higher and their transport infrastructure is more intensively used and therefore more profitable. That has historically led to earlier and more extensive infrastructure provision and that in turn to more demand, so unless counteracting policies are implemented, the gap in accessibility is likely to grow. One example of measuring accessibility is potential accessibility. Potential accessibility accumulates all potential destinations that can be reached from a location weighted by a negative function of distance or travel time or cost. Figure 5.2 shows potential accessibility by road in 2006 from a recent update of the accessibility calculations for ESPON (ESPON 2007).

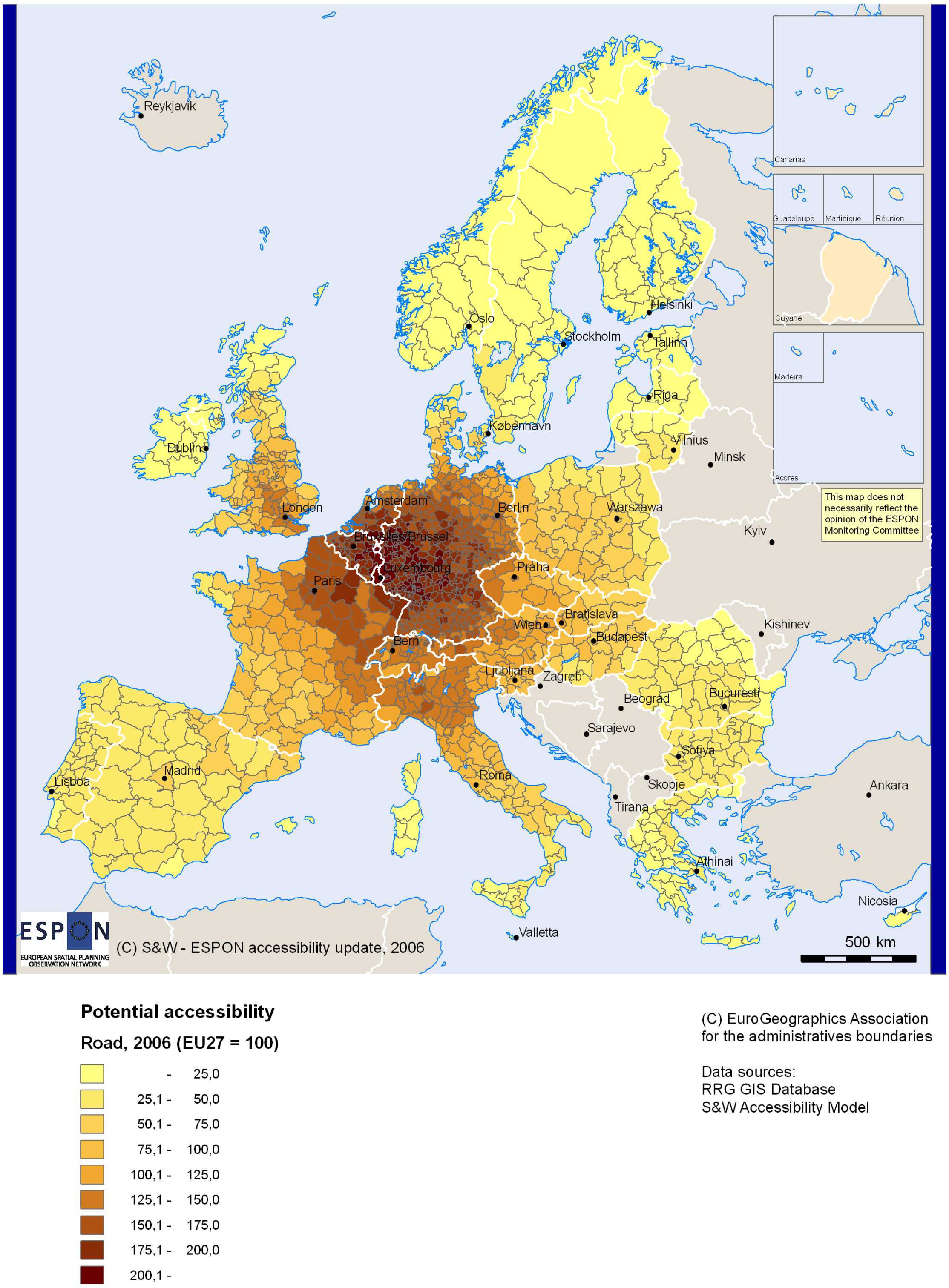

Figure 2. Potential accessibility by road 2006 (ESPON 2007, 16)

The concentration of high accessibility in western Germany, northern France, and the Benelux countries is obvious. Similar maps show accessibility by rail with the main nodes of the high-speed rail network standing out. Accessibility by air, however, is concentrated around airports and so is more evenly spread across the continent.

The imbalances in the European transport system are repeated with little variation if other indicators, such as access to the nearest cities, access to transport networks, network hierarchy, and transport flows, are considered. Needless to say, the negative impacts of transport, such as congestion, greenhouse gas emissions, and air pollution, are also unevenly distributed.

The policy recommendations of ESPON 1.2.1 include rigorous speed limits on roads and motorways to reduce fuel consumption, emissions, and traffic accidents; shifting goods transport to inland waterways and short-sea shipping; the creation of dedicated high-speed freight rail lines; internalizing external costs of road transport through road pricing; the reduction of network vulnerability by more modal and intermodal redundancy; and restrictions on movements of heavy vehicles in densely populated neighborhoods.

The project concluded (1) that the goal should be not to provide the same level of accessibility everywhere but to appreciate and preserve the heterogeneity and diversity of regions; and (2) that drastic measures are necessary to respect the environment and reduce congestion but at the same time avoid the relocation of firms by a polycentric spatial organization of settlements and a better organization of production systems.

Telecommunications

Information flows are the essence of the knowledge society. The rise of the information society is the result of technological progress. The Internet has brought many-to-many access, not only to large corporations but to virtually everybody. The implication for spatial analysis is that space loses part of its importance. Activities that needed to be close together can now be conducted at distant places. Why, then, are there still large cities? Why do people continue to travel to business meetings, conferences, and opera performances? Why is there still a rush hour every morning?

It seems that there are additional dimensions to face-to-face interaction that cannot (yet) be transported via technical networks. That is why it is important to disentangle the myths around telecommunications and to test hypotheses about the spatial impacts of telecommunications in the context of globalization, further European integration, urban-rural relationships, and the core-periphery dichotomy.

ESPON 1.2.2 (Telecommunication Services and Networks: Territorial Trends and Basic Trends of Infrastructure for Territorial Cohesion) analyzed the supply of and the demand for telecommunications, exploring both “mature” and “leading-edge” technologies in what is probably the most comprehensive and detailed analysis of the spatial dimension of telecommunications infrastructure and services undertaken in Europe.

The project started from the highly dynamic telecommunications environment created by the liberalization of telecommunications markets and the development and application of new technologies in the 1980s and 1990s and identified trends, which partly point toward a more even spread of technology and partly to continuing disparities. The overall message emerging from the project is that—notwithstanding the attempts to create a single market for telecommunications, a common regulatory framework, and a common basis for developing the information society—the situation of supply and demand for telecommunications in Europe is highly complex due to the wide range of socioeconomic circumstances in the EU member states, historical differences in patterns and trends in telecommunications development, different technologies exhibiting different geographical patterns, and particular national attitudes to intervention in the market. Despite those differences, however, some general patterns emerge:

- There is a north-south divide across the EU member states because of the strength of the Nordic countries, which lead the way in the uptake of almost all technologies.

- The European core-periphery dichotomy does not hold for telecommunications due to the strength of the Nordic periphery, but also because in mobile telephony and broadband technology the Mediterranean periphery outpaces the core.
- There is a west-east divide between the old and new EU member states across all technologies, though there is evidence of rapid progress in the new member states.
- There are differences in telecommunication diffusion in the new member states, with the most recent new member states, Bulgaria and Romania, lagging behind.

Based on the differences between countries in the adoption of telecommunications, the project identified distinctive “national telecommunications cultures,” such as high communication, high computing cultures (Sweden and Finland); high voice communication cultures (Greece, Italy, and the Czech Republic); high computing cultures (Netherlands and Denmark); and low telecommunications cultures with respect to both voice and the Internet (Germany and France). If different telecommunications technologies are examined, the following computing cultures emerge:

- High uptake of PCs and the Internet is generally associated with economic development and high GDP per capita.
- Adoption of broadband technologies is usually associated with high levels of GDP per capita, population density, and geographical position close to the European core.
- Diffusion of mobile telephones is highest in peripheral regions reflecting the north-south dichotomy noted above.

The report of ESPON 1.2.2 (2005) concludes by discussing how telecommunications policies can be used to enable all citizens to participate fully in the information society and knowledge economy and to overcome existing disparities in the supply of and demand for telecommunications networks and services within and between the EU member states. Three areas of intervention are discussed: liberalization of telecommunications markets, stimulation of demand by training and education, and stimulating supply by supporting the provision of telecommunications infrastructure. The authors argue that, in particular, broadband technology deserves to be a focus of policies, but they emphasize that for interventions to succeed, a greater symmetry of information between public authorities and private-sector telecommunications providers needs to be established. Finally, they make a plea for an improved and harmonized data collection system covering the ESPON space, which is needed because, as they point out, only through improved databases can truly evidence-based policy making occur.

Transport and Telecommunications and Spatial Development

The important role of transport infrastructure for regional development is one of the fundamental principles of regional economics. In its most simplified form this principle implies that regions with better access to the locations of input materials and markets will, ceteris paribus, be more productive, more competitive, and hence more successful than more remote regions.

However, today the relationship between transport infrastructure and economic development has become more complex than ever. There are successful regions in the European core confirming the theoretical expectation that location matters, but there are also centrally located regions suffering from industrial decline and high unemployment. On the other side of the spectrum, the poorest regions, as theory would predict, are at the periphery, but there are also prosperous peripheral regions such as the Nordic countries. To make things even more difficult, some of the economically fastest-growing regions are among the most peripheral ones. Figure 5.3 (ESPON 1.2.1 2004, 22) illustrates this complexity by showing the regions that perform better or worse than their geographical position would suggest.

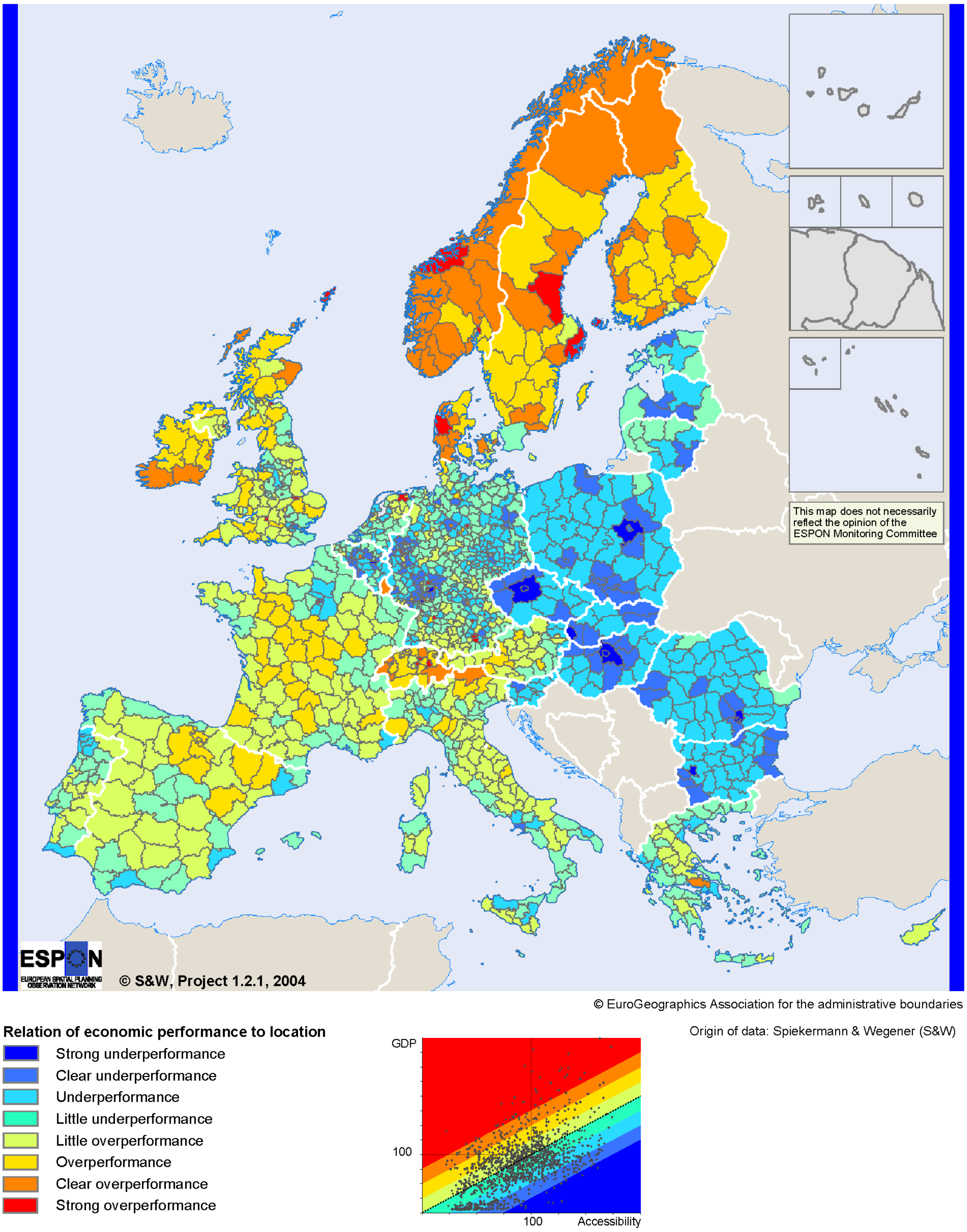

Figure 3. Accessibility v. economic performance, 2001 (ESPON 1.2.1 2004, 22)

The EU hopes to contribute to reducing the socioeconomic disparities between its regions by developing the trans-European transport networks (TEN-T) in the old member states and the Transport Infrastructure Needs Assessment (TINA) networks in the new member states. However, although they are two of the most ambitious initiatives of the European Community, the value of the TEN-T and TINA programs is not undisputed.

Critics argue that many of the new connections fail to link peripheral countries to the core and instead strengthen the ties between central regions, reinforcing their accessibility advantage.

Some argue that regional development policies based on the creation of infrastructure in lagging regions have not succeeded in reducing regional disparities in Europe, whereas others point out that it has yet to be ascertained that the reduction of barriers between regions has disadvantaged peripheral regions. From a theoretical point of view, both equalizing and polarizing can occur. A new motorway or high-speed rail connection between a peripheral and a central region, for instance, makes it easier for producers in the peripheral region to market their products in large cities; however, it may also expose the region to the competition of more advanced products from the center and so endanger formerly secure regional monopolies. These issues have received new attention through the enlargement of the European Union in 2004.

ESPON 2.1.1 (Territorial Impacts of EU Transport and TEN Policies) assessed the impacts of EU and national transport and telecommunications policies on regional economic development and cohesion in the enlarged European Union using three forecasting models:

- The SASI model is a multiregional recursive-dynamic model of regional socioeconomic development (population, migration, economy) of NUTS 3 regions based on regional production functions with accessibility as a production factor (ESPON 2.1.1. 2003, 52–70).
- The CGEurope model is a multiregional, spatial, computable, general equilibrium model of regional economic development at the NUTS 3 level, in which transport costs appear as expenditures for transport and business travel (ESPON 2.1.1 2003, 70–95).
- The STIMA model assesses the impact of information and communications technologies (ICT) on regional economic growth and distribution at the NUTS 2 level, based on regional production functions (ESPON 2.1.1 2003, 96–124).

Economic Development

These models were applied to transport and ICT policy scenarios up to the year 2021. The transport policy scenarios included different priorities of TEN-T infrastructure investments (e.g., all priority projects, all projects, only cross-border projects, or only projects in lagging regions), different options of transport pricing, and combinations of both.

The transport infrastructure scenarios were implemented using the GIS-based European road, rail, waterway, and air network database developed at the University of Dortmund and maintained by RRG Spatial Planning and Geoinformation (RRG 2007). The ICT policy scenarios included one in which financial resources are allocated indiscriminately among regions, one in which they are allocated to more advanced regions, and one in which they are targeted to less developed regions.

The main general result from the scenario simulations is that the overall effects of transport infrastructure investments and other transport policies are small compared with those of socioeconomic and technical macro trends such as globalization, increasing competition between cities and regions, aging populations, and increasing labor force participation and labor productivity. The second main result is that even large increases in regional accessibility translate into only very small increases in regional economic activity. However, that statement needs to be qualified, as the magnitude of the effect seems to depend strongly on the already existing level of accessibility:

- For regions in the European core with all the benefits of a central geographical location *plus* an already highly developed transport and telecommunications infrastructure, additional gains in accessibility bring few additional incentives for economic growth.
- For regions at the European periphery, however, which suffer from a remote geographical location *plus* an underdeveloped transport infrastructure, a gain in accessibility brings significant progress in economic development. But the opposite may happen if the new connection opens a formerly isolated region to external competition. Significant positive economic effects for the

new EU member states can be expected only if the TINA projects linking those countries to the major centers of economic activity in western Europe are implemented.

- Infrastructure policies have larger effects than pricing policies, and the magnitude of the effect is related to the number and size of projects. The effect of pricing scenarios depends on their direction: Scenarios that make transport less expensive have a positive, scenarios that make transport more expensive, a negative economic effect. Negative effects of pricing policies can be mitigated by their combination with network scenarios with positive economic effects, although the net effect depends on the magnitude of the two components.

ICT investments have analogous effects. As expected, promoting ICT in the most advanced regions is economically more efficient but increases the disparities in ICT adoption between regions, whereas its promotion in lagging regions reduces disparities.

Similar scenarios were calculated in ESPON 1.1.3 (Enlargement of the European Union and the Wider European Perspective as Regards its Polycentric Spatial Structure) for the new EU member states. There the scenarios examined the effects of enlargement as such and the associated reductions in border waiting times and different strategies of transport infrastructure investments in the new member states (ESPON 1.1.3 2006, part 2, 197–218). The results were in general agreement with those achieved in ESPON 2.1.1 indicating that transport infrastructure investments in the new member states could make a significant contribution to help those countries' economies catch up with those of the old member states. Figure 5.4 demonstrates this by showing the impact on GDP per capita in a scenario in which massive infrastructure improvements in the new member states are assumed in addition to the TEN and TINA implementation plans. However, the comparison between the two maps shows that, though in relative terms economic growth is faster in the new member states than in the old member states, the old member states gain much more in absolute terms.

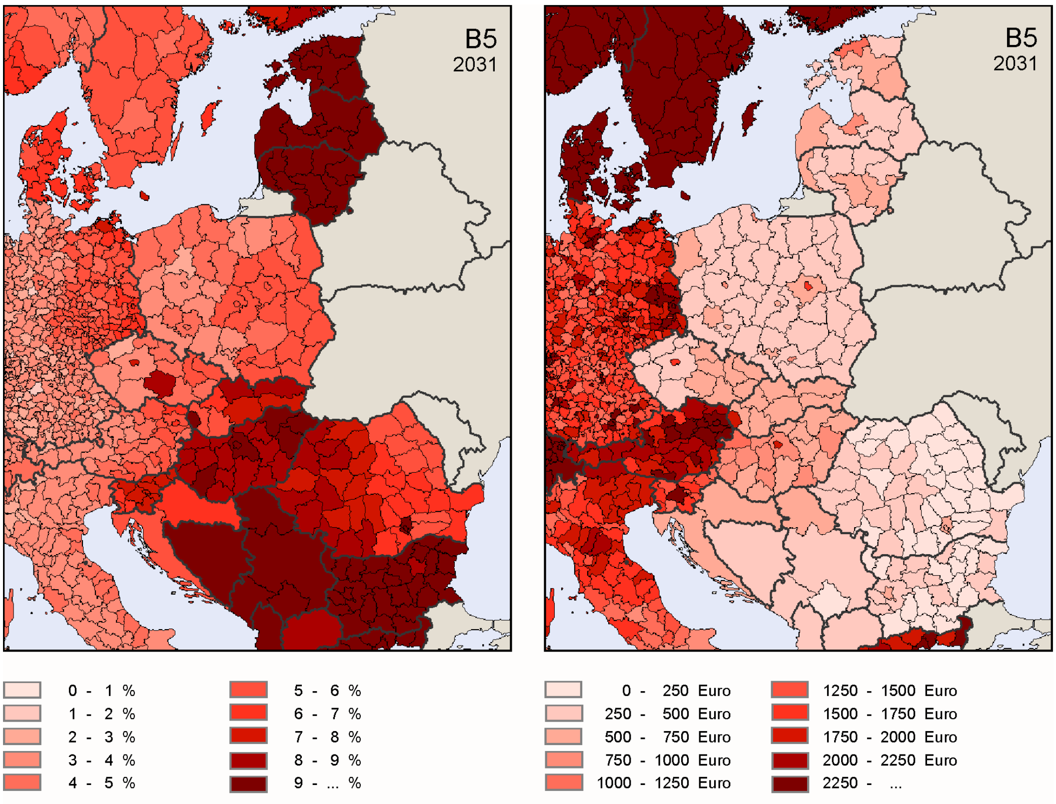

Figure 4. Relative (left) and absolute (right) GDP effects, Scenario B5, 2031 (ESPON 1.1.3 2006, Part 2, 208–209)

ESPON 3.2 (Spatial Scenarios and Orientations in Relation to the ESDP and Cohesion Policy) developed and applied the regional economic model MASST (ESPON 3.2 2006, vol. 4, 11–53). The MASST model differs from the three regional economic models used in ESPON 2.1.1 by its two-level construction, in which a national model taking account of macroeconomic factors, such as private consumption, investments, public expenditure, and imports and exports, drives the lower-level regional economic model of economic development, population, and migration. The regional economic model is based on regional production functions in which transport is represented by transport infrastructure endowment provided by the KTEN travel and freight transport model (ESPON 3.2 2006, vol. 4, 54–98). The scenarios examined in ESPON 3.2 assume different transport infrastructure programs, but the programs are packaged with many other assumptions so that their contribution to the changes in regional socioeconomic impacts cannot be identified.

The KTEN model also calculated accessibility indicators, which, together with the GDP forecasts of the SASI model and other variables, were used in an experimental application of the TEQUILA (Territorial Efficiency Quality Identity Layered Assessment) multicriteria evaluation model to a scenario assuming implementation of the priority projects of the TEN-T program (ESPON 3.2 2006, vol. 5, 87–97). The evaluation confirmed the results of ESPON 2.1.1, showing that the strongest economic effects can be expected in the western regions of the new member states and the Iberian peninsula, but that the environmental balance is likely to be negative all over Europe, particularly in already heavily congested metropolitan areas, with the exception of new rail corridors in which a modal shift to rail occurs.

Cohesion

The analysis of cohesion effects showed that different cohesion indicators give different results, and that the distinction between relative and absolute convergence or divergence is especially important. In particular, the most frequently applied indicators of cohesion (e.g., the coefficient of variation and the Gini coefficient) tend to signal convergence in many cases where in fact divergence occurs (ESPON 1.1.3, part 2, 211–214):

• If the whole European Union is considered, most scenarios contribute to convergence in relative terms in both accessibility and GDP per capita, except pricing scenarios that make transport more expensive. However, in absolute terms all scenarios increase the gap in accessibility and GDP per capita between the rich central regions and the poorer peripheral regions, again except pricing scenarios that make transport more expensive.

• If only the new member states are considered, only those infrastructure scenarios that strengthen the corridors between eastern and western Europe improve the accessibility of those countries. Other projects widen the gap between the capital cities and rural regions of the new member states. For GDP per capita, the general pattern is relative convergence and absolute divergence, except for the pricing scenarios that make transport more expensive. Scenarios that reduce the economic disparities between old and new member states may do so at the expense of larger disparities within the new member states.

The conclusions and policy recommendation of ESPON 2.1.1 (2005, 268–273) focus on the trade-offs between efficiency (“competitiveness”) and spatial equity (“territorial cohesion”). The findings that all infrastructure scenarios reduce disparities in accessibility and GDP per capita might lead to the conclusion that a re-orientation of European infrastructure policy is necessary. However, the caveat is that those findings are true only if conventional relative cohesion indicators are applied—that is, if convergence is measured in percentage terms. The optimistic picture disappears if absolute gains and losses are considered: A high gain in percentage terms in a poor region may be much less in absolute terms than a low percentage gain in a rich region.

The conclusions to be drawn from these results depend on one’s economic beliefs. If one follows the current neoliberal economic paradigm, the conflict between efficiency and equity should not be solved by revising the TEN and TINA plans to the disadvantage of the centers. Instead, the poorer countries should receive compensation transfers so that they can develop their secondary networks and allow their peripheries to gain from the spread effects of more rapid growth in their centers. If one fears that that will lead to even greater economic disparities, however, a policy to improve the accessibility of disadvantaged peripheral regions at the expense of central regions is more appropriate. Similar considerations apply to ICT policy.

Another trade-off between equity and sustainability arises in the case of pricing policies. There is a broad consensus that transport pricing is the right way to internalize environmental externalities. The conflict with the goal of balanced spatial development appears because that cost increase is most unfavorable for lagging, rural, and peripheral regions, which are in general less affluent than the centers. The political conclusion is that pricing scenarios should not be abandoned in favor of spatial equality objectives. Rather, policies deepening regional income disparities should be accompanied by transfers in favor of loser regions. Such an instrument mix of pricing and compensation is the right way to both protect the environment and avoid undesired spatial imbalances.

Polycentricity

The promotion of balanced polycentric urban systems is one of the major objectives of the ESDP (CEC 1999) and has been restated as a goal in the *Territorial Agenda of the European Union* (Territorial Agenda 2007, 4). Cities as nodes in networks and centers of regions are therefore important objects of investigation in ESPON.

However, until today the concept of polycentricity has remained largely at the level of rhetoric without a precise operational definition (which puts it in a class with similarly vague concepts such as “city networks” and “industrial clusters”). There exists neither a method to identify or measure polycentricity at different spatial scales nor a method to assess the impacts of polycentricity (or the lack of it) with respect to policy goals such as efficiency, equity, and sustainability. It is therefore not possible to determine an optimal degree of polycentricity between centralization and decentralization or, in other words, between the extremes of monocentricity and dispersal. That makes it difficult to formulate well-founded policy recommendations as to which cities should receive priority treatment.

That is why in ESPON 1.1.1 (Potentials for Polycentric Development in Europe) an index of polycentricity combining the three dimensions of size, location, and connectivity was proposed (ESPON 1.1.1 2004, 60–84):

- The *size* indicator measures the distribution of population and GDP and is based on the notion that a flat rank-size distribution is more polycentric than an urban system dominated by one large city.
- The *location* indicator measures the spatial distribution of cities and assumes that a uniform distribution of cities across a territory is better for a polycentric urban system than one in which all cities are clustered in one part of the territory.
- The *connectivity* indicator measures the distribution of accessibility across cities and assumes that an urban system with good connections between lower-level cities is more polycentric than one in which all connections are concentrated on the largest city.

Through the accessibility variable in the connectivity indicator the concept of polycentricity is connected with transport. As was pointed out in the introduction to this chapter, the European transport network is largely determined by the distribution of cities, but the transport system also determines the size and location of cities: Acceleration of transport creates new, larger hierarchies of cities superimposed over the small-scale urban network created at the time of the stage coach.

In ESPON 1.1.1 the index of polycentricity was calculated for the whole of Europe, all EU countries, and a case study region (ESPON 1.1.1 2004, 61–79). With respect to the connectivity indicator, Austria, Germany, and the Netherlands score highest, and the Baltic states Lithuania and Estonia score lowest. By correlating the index of polycentricity with GDP per capita, regional disparities, and energy consumption, it could be shown that countries with more polycentric urban systems are, in general, more economically efficient, equitable, and sustainable (ESPON 1.1.1 2004, 80–84).

In ESPON 1.1.3 the index of polycentricity of ESPON 1.1.1 was applied to the urban systems of the new member states in connection with the forecasts of the SASI model described above (ESPON 1.1.3 2006, part 2, 158–173, 214–217). A methodological difficulty here is that the SASI model is based on NUTS 3 regions as spatial units and not cities. With respect to the connectivity index, therefore, the assumption was made that the accessibility of an urban center changes in accord with changes in the accessibility level of the NUTS 3 region where it is located.

Figure 5.5 shows the effects of the scenarios examined in ESPON 1.1.3 on polycentricity of national urban systems in the old member states (EU15) and the new member states and accession countries (NMAC)—ESPON 1.1.3 was completed in 2006 and thus before the accession of Bulgaria and Romania. Figure 5.6 shows the effect of the same scenarios on polycentricity measured at the level of metropolitan European growth areas (MEGA) defined in ESPON 1.1.1 for the whole of the present European Union (EU27). The heavy black lines in both figures represent the development of polycentricity between 1981 and 2031 in reference scenario 00. The thinner blue and red lines indicate how the enlargement scenario A1 and the five transport infrastructure scenarios B1 to B5 deviate from the reference scenario between 2001 and 2031 (B5 is the scenario presented in figure 5.4).

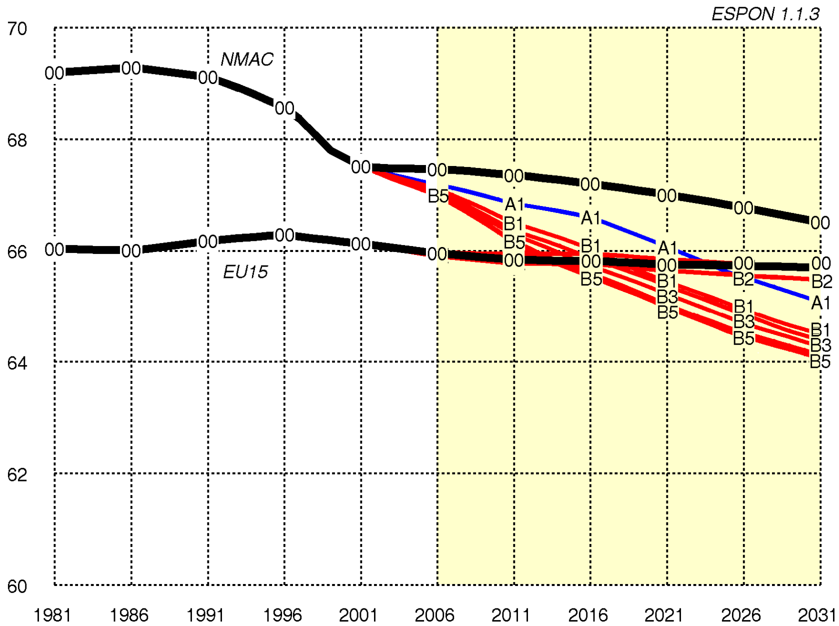

Figure 5. Development of polycentricity in the old member states (EU15) and in the new member states and accession countries (NMAC),1981–2031 (ESPON 1.1.3 2006, Part 2, 215)

Figure 5.5 shows that the urban systems of the new member states are today on average more polycentric than those of the old member states. They were even more polycentric in the past, probably because of their history as planned economies in which there was no market-driven spatial development. However, after the opening of the iron curtain in the early 1990s, their capital cities and major agglomerations attracted formerly suppressed rural-to-urban migration, with the effect that those cities grew at the expense of smaller urban centers. Polycentricity in the new member states is likely to further decline due to market forces and even become lower than that of the old member states. Polycentricity declines in the old member states, too, but much more slowly than in the new member states because of their longer experience with market-driven spatial development. This is possibly the reason why the transport infrastructure improvements in scenarios B1 to B5 have only little effect on polycentricity in the old member states—their transport networks are already highly developed and can be improved only marginally. Because there is still a great demand for transport infrastructure in the new member states, infrastructure improvements have much greater effects; also, they tend to be oriented toward the largest cities, with the effect that polycentricity declines in proportion to the volume of infrastructure improvements in the scenarios.

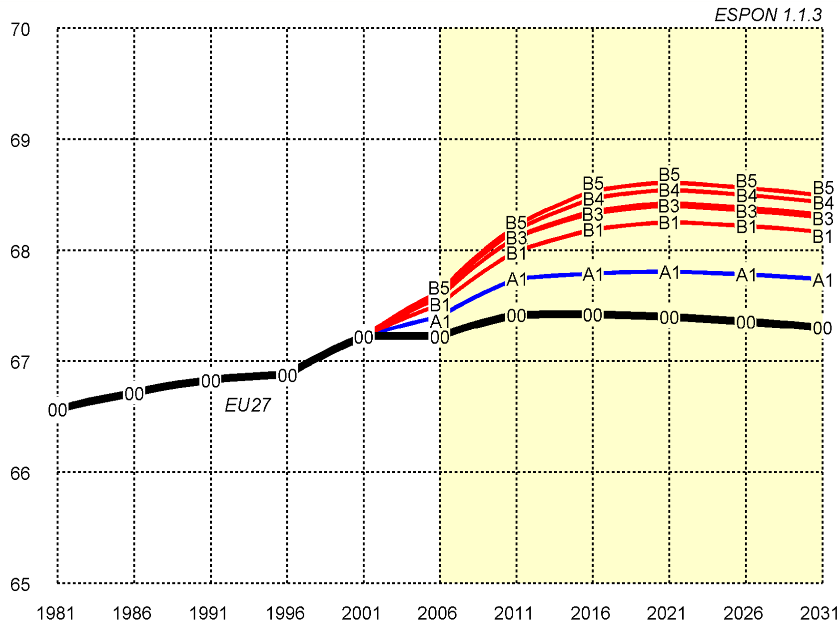

Figure 6. Development of polycentricity of metropolitan European growth areas (MEGA) in Europe 1981–2031 (ESPON 1.1.3 2006, Part 2, 217)

Figure 5.6, however, shows that at the highest level of the urban hierarchy in Europe polycentricity has increased in the past and is likely to increase in the medium-term future. This is mainly due to the fast economic growth of capital cities and other large cities in the new member states. Already the opening of the Iron Curtain in the 1990s and the integration effects of the EU enlargement in 2004 (scenario A1) have moved those cities up in the urban hierarchy. The transport infrastructure scenarios B1 to B5 add momentum to that process.

The comparison of the two figures shows that the goal of a balanced polycentric urban system at one spatial level tends to be in conflict with the same goal at other spatial levels. Table 5.1 illustrates the relevant policy options and their associated goal conflicts. For instance, strengthening major urban centers outside the "pentagon" would increase spatial disparities between the already too dominant capital cities and other large cities in countries such as the Baltic states, Hungary, and the Czech Republic. However, if the promotion of balanced urban systems in those countries is a common goal, more Structural Funds and transport infrastructure have to go to medium-size cities of the new member states, at the expense of their capital cities. It is the responsibility of the future spatial policy of the EU to find a rational solution to this goal conflict. The solution cannot be the pursuit of one goal at the expense of the other. Rather, the task is to develop a balanced strategy that is differentiated in both space and time and takes account of the specific needs of different types of regions.

Table 1. Goal conflicts of polycentricity policies (ESPON 1.1.3 2006, Part 1, 16)

Goal	Policy	Goal conflict
Competitiveness at global scale ('Lisbon')	Strengthen highest-level global cities in the 'pentagon'	Polarization between the global cities in the 'pentagon' and the cities in the rest of Europe will increase. The European urban system will be less balanced and polycentric.
Territorial cohesion at European scale	Strengthen major cities outside of the 'pentagon'	The competitiveness of the global cities in Europe may decrease. The urban systems of individual countries will be less balanced and polycentric.
Territorial cohesion at national scale	Strengthen medium-level cities in the new member states and accession countries	Competitiveness of major cities in the new member states and accession countries may decrease.
Sustainability ('Gothenburg')	Strengthen lower-level cities in the new member states and accession countries	Competitiveness of major cities in the new member states and accession countries may decrease.

Such a strategy starts from a *phase model* of spatial development, according to which the promotion of growth poles is appropriate in early stages of a country's economic development, whereas a polycentric spatial structure should be developed in later stages. This allows to set different priorities in old and new member states: Whereas in the old member states decentralized, polycentric spatial structures are promoted, in the new member states, for a limited transition period, the capital cities and other major cities may be strengthened until balanced polycentric spatial structures can be developed in these countries, too.

The rationale behind this is that scientific and technical innovations are not restricted to large agglomerations but can also be achieved, conceivably with even better results, in well-connected cities of medium size, as demonstrated by the fact that the economically most successful countries in Europe are those with the most polycentric urban systems (ESPON 1.1.1 2004, 80–84). Such a strategy is not in conflict with the competitiveness objectives of the Lisbon Strategy, but achieves them in a more sophisticated way than the one-sided promotion of the largest agglomerations.

The goal conflicts described are equally relevant for European transport and telecommunications infrastructure policy. If the competitiveness goal of the Lisbon Strategy has the highest priority, the already fast, high-capacity transport corridors between the largest agglomerations have to be upgraded even further. If, however, cohesion has the highest priority, then mainly the connections to and between the capitals of the new member states should be improved—at the expense of regional connections within those countries. Both strategies have the negative side effect of further traffic growth—in particular, of the transport of goods. To concentrate transport investment, however, on peripheral regions may lead to unacceptable congestion bottlenecks in the agglomerations both within and outside the pentagon.

A transport policy following the phase model differentiates between old and new member states: In the already highly developed and urbanized old member states, existing or emerging polycentric structures are strengthened mainly by improving the accessibility of medium-level central places and compensating for the accessibility deficits of rural and peripheral regions. In the still urbanizing new member states, however, a phased strategy is appropriate. For a transition period of 10 to 15 years it is justified to enhance the growth dynamics of those countries by fast and efficient transport connections between their capital cities and major agglomerations and the economic centers in western Europe. Thereafter, however, the risk of overdominance of those cities will have to be reduced by shifting investments, first to medium-size cities and later, as in the old member states, to rural and peripheral regions.

Both strategies have to be combined with Europe-wide coordinated measures to control the expected further rise of person travel and goods transport on roads. Those measures internalize the external costs of road transport and promote the use of environment-friendly transport modes and regional economic circuits, thus contributing to the sustainability goal of the EU and preparing Europe for future fuel scarcity and higher fuel prices.

Similarly differentiated principles apply to European telecommunications policy. Here, too, different priorities for old and new member states are appropriate. In the old member states telecommunications infrastructure of the highest standard is now almost universally available. European telecommunications policy can help to overcome deficits only in very low-density peripheral regions. In the new member states, however, the telecommunications infrastructure has to be developed from scratch. Just as in transport policy, it is justified to first help the new member states to provide high-level telecommunications services in their capital cites and major agglomerations and later to improve services in medium-size cities and rural areas.

From Research to Policy

The challenge of all applied research in planning is to proceed "from knowledge to action," to quote from the title of a seminal book by John Friedman (1987). That challenge is also central to ESPON. How does the research on transport and telecommunications live up to the challenge? Have its results found their way into the public domain of policy making?

If one counts publications, to a certain degree the answer is positive. A few examples of publications of ESPON results on transport and telecommunications follow:

- Accessibility maps of ESPON 1.2.1 were published in the *Third Cohesion Report* (CEC 2004b, 77–79)—although their updates (ESPON 2007), especially prepared for the *Fourth Cohesion Report* (CEC 2007), were not used.
- Transport network and accessibility maps of ESPON 1.2.1 were published in the *Interim Territorial Cohesion Report* (CEC 2004a, 52–53, 57–58, 60, 65–66).
- The results of ESPON 1.2.2 on telecommunications were published in the *Interim Territorial Cohesion Report* (CEC 2004a, 73–76).
- Results of the transport and telecommunications infrastructure scenarios of ESPON 2.1.1 were published in the *Interim Territorial Cohesion Report* (CEC 2004a, 67–70, 72, 77–81).
- A summary of the ESPON accessibility update (ESPON 2007) was included in the background document for the *Territorial Agenda* (Territorial State 2007, 29–33).

But beyond these publications, have the ESPON recommendations on transport and telecommunications influenced actual policy making? One way to find out is to look at official EU policy documents. However, the historical precedent under which a small group of researchers at the German Federal Office for Building and Regional Planning (BBR), under the previous German council presidency, succeeded in injecting the paradigm of decentralized concentration of German *Raumordnung* in the form of balanced polycentric development into the ESDP (CEC 1999) is not likely to be repeated.

The *Territorial Agenda* remains vague about transport and telecommunications, stating merely that "mobility and accessibility are key prerequisites for economic development in all regions of the EU" and that it is therefore important "to secure integrated and sustainable development of multi-modal transport systems" and "unhampered and socially fair access to information and communication technologies" (Territorial Agenda 2007, 6). However, the *Agenda* fails to set priorities for future transport and telecommunications investments in the light of the inherent goal conflicts between competitiveness, territorial cohesion, and sustainability. The background document to the *Territorial Agenda* (Territorial State 2007, 66–67) adds more detail but is in no way more concrete.

Maybe the ESPON results on transport and telecommunications influenced the awareness and problem perception of policy makers? To answer that question is difficult. To see one's ideas show up in two lines of a Commissioner's speech does not mean much. More important are the opportunities to interact with politicians and Commission experts at ESPON seminars, national ESPON workshops, and other conferences or disseminate research results through publications in books or scientific journals. However, the Commission experts working on spatial policies are exposed to many influences from the European parliament, the Council of Ministers and the Committee of the Regions, member states and regions, and lobbyists and interest groups, and they have to survive in the competition between different directorates and units of the Commission (see Jensen and Richardson 2004). On this contested playing field, one should not overestimate the influence of rational evidence—but one must try to make it as large as possible.

The interaction between researchers and Commission experts is of a dialectic nature. Researchers doing no more than echoing the concepts of the Commission will soon be found boring, but research results that always contradict the ideas of the Commission are not helpful, either. To maximize the impact of research on policy making, a narrow path between opportunism and obstruction has to be found. And there are value issues. In a fast-changing policy framework determined by the challenges of technological development, globalization, climate change, energy scarcity, and aging societies, researchers cannot leave values to their clients; they must take a position between the partisans of cohesion, sustainability, and efficiency in the different directorates of the Commission. This requires a degree of independence and self-respect, but sometimes also a dose of diplomacy.

The discourse between researchers and Commission experts has also a language dimension. Self-respect requires not slavishly adopting every fashion in Euro-Frenglish (e.g., "territorial" for "spatial") or obediently using monster terms such as "equitable and sustainable growth," but insisting on precise language. While researchers must recognize the need of politicians for a terminology vague enough to bridge the gap between contradictory concepts, they themselves are committed to using language that exposes rather than hides conflicts between goals and problem perceptions. Again, this requires prudence to avoid a purist, orthodox attitude. However, the possibility of influencing, in a subversive manner, the terminology in which policies are discussed should not be underestimated.

Another point is the need for mutual respect between researchers and policy experts. Too often policy makers evaluate research results only by whether they can serve as supporting evidence for policy decisions and do not care much about how they are achieved. This is reflected in the traditional organization of ESPON reports in which the "Scientific Summary" is appended to the "Executive Summary," as if it were an unavoidable nuisance. Too often in the past researchers were advised not to be "too scientific." On the other hand, researchers need to understand the situation of the political experts. Of course, the researchers always wish to have more freedom for solid analysis and try to squeeze it out of a project wherever possible, but they, too, have to recognize the legitimate expectation of the political experts to receive timely and problem-relevant results.

Finally, how about the theme of this volume—evidence? Is the recent buzzword of the European planning discourse (Faludi and Waterhout 2006; Davoudi 2006) just another short-lived fashion, or does it indicate a true "return of rationality" (Faludi 1985)? And what does it mean for ESPON? The statement "ESPON is all about data" (ESPON 3.2 2006, vol. 1, 44) reflects a gross misunderstanding. Data are only information—they need to be converted into knowledge by selection, transformation, and interpretation (Andersson 1985). The indicators and maps developed in ESPON are a necessary intermediate step in the right direction, but they are not sufficient: They indicate problems but do not provide solutions. The real focus of ESPON should therefore be on future-oriented decision support tools in the form of exploratory models, policy impact models, and policy assessment models.

A review of analytical and forecasting models in ESPON (ESPON 2006, 28–37) has shown that in a relatively short time enormous progress can been made in capturing the complexity of the large European territory in spatial models with high spatial resolution and great sophistication. The models applied have produced policy-relevant information in response to a variety of current policy issues. There is nothing comparable on other continents, not even in North America. A particularly advanced feature of the application of models in ESPON is that in some projects several models were applied to the same policy questions using the same data. The comparison between the results of different models contributed vastly to improving their reliability and credibility.

The review has also shown that in the field of transport and telecommunications the use of models is more advanced than in other research fields of ESPON. ESPON 1.1.1, 1.1.3, 1.2.1, 2.1.1, and 3.2 applied large state-of-the-art computer models, which more often than not were developed over many years in other project environments before their application in ESPON—examples are the SASI, CGEurope, and KTEN models. Only in a few cases were complex simulation models, such as the STIMA and MASST models, specifically developed in an ESPON project.

This underlines the point that complex research tools like these require an incubation and maturation period beyond the duration of an individual ESPON project. This has consequences for the relationship between subsequent projects. Reinventing the wheel in each project, as has been the practice in ESPON 2006, is extremely wasteful. That is not to say that duplication of effort is always bad. In particular in the early stages of model development fair competition between alternative approaches stimulates creativeness and innovation. In the long run, however, the best methods and models should be identified by rigorous cross-validation of their results. At the same time, to demand that all models used in an ESPON project be made available after the project for use in other projects would ignore their experimental character at the cutting edge, as well as the fact that they represent an important intellectual property of their authors.

The issue here is how to establish continuity and incremental learning from one project to the next. The project organization of ESPON, conditioned by its funding under the INTERREG program, is not ideally suited for that. The challenges to models in the public domain are enormous. They must be transparent and interactive and help the user to understand the behavior of the system under study. Together with their data they must be continually updated and improved and meet strict quality standards. It is likely that for all that a permanent institutional framework will be required.

Conclusions

Transport and telecommunications stand out among other fields of EU policy making by a number of unique characteristics: They are determined by rapid technological advances. They are intimately associated with economic development and hence the European goal of competitiveness. They have significant implications for two other major European goals, cohesion and sustainability, which tend to be in conflict with competitiveness. And last, but not least, they are policy fields in which the EU, through cofinancing under the Structural and Cohesion Funds, has above average competence and influence.

In this situation, scientific evidence, in the broadest sense of future-oriented decision support, can make a significant contribution to rational policy making serving multiple objectives. Fortunately, transport and telecommunications are also among the most advanced fields in spatial science in which sophisticated methods and models for forecasting and assessing the impacts of policy options exist. This speaks in favor of strengthening the role of models in ESPON 2013. However, that would require new ways of establishing continuity and incremental progress from one project to the other, which presently do not exist.

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