2. Thematic prospective scenario 'Transport'

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2.1 Scenario base 'Transport'

2.1.1 Present situation, trends and projections

The present situation of the European territory in the field of transport is characterised by :

- uneven levels of potential accessibility[20]. The most accessible regions by road to the population are quite identical with the Pentagon, while the least accessible are all located in the European periphery. It is remarkable that the largest part of the new member countries have an accessibility level similar to that of south-west France, northern Spain and Denmark, being largely higher than that of Portugal, Ireland, western and southern Spain. Considering accessibility by rail, the most accessible regions are largely contained in the Pentagon with some extensions towards East-Germany as well as towards the Rhone and Loire valleys in France. Areas with low accessibility by rail in the European periphery are more extended in the case of Spain, Bulgaria and Romania. Accessibility by air provides a completely different picture, compared with those on land transport accessibility. The map of Europe is converted into a patchwork of regions with high accessibility (those with one or more large airports) surrounded by regions with low accessibility. Low accessibility is not a concern only for a number of regions of the European periphery, but is also an issue for some regions located in the European core.

- imbalances of transport modes. European transport suffers from an imbalance between transport modes to the detriment of railways (mainly with regard to freight transport), of maritime and inland waterway transport. Road makes up 44% of the goods transport market compared with 41% for short sea shipping, 8% for rail and 4% for inland waterways. The predominance of road is even more marked in passenger transport with 79% of the market, while air with 5% is about to overtake railways which have reached a ceiling of 6%. Trends are favouring air and road transport. Between 1970 and 1998, the share of goods carried by rail fell from 21% to 8.4%. The emergence of low cost companies is a major factor in the revival of air transport. The map of air traffic flows in Europe has considerably changed in a few years.

- the predominance of national characteristics in the organisation of networks and corridors. It is possible to identify three main types of network and corridor morphology: centralised networks with a peripheral way (Iberian Peninsula), parallel networks (France, Italy, UK, Sweden, Finland), networks with a square pattern (Germany).

- the growing importance of East-West flows, complementing the traditional north-south pattern. While major flows of road and rail traffic used to show a pattern of corridor broadly

[20] Potential accessibility is based on the assumption that the attraction of a destination increases with size and declines with distance, travel time and cost (see ESPON Study 2.1.1. 'Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion'. Coordination CESA Tours 2004)

oriented in the north-south direction, a general re-orientation of new flows in the East-West direction has already begun during the 1990s. The recent EU enlargement has strengthened the East-West orientation of flows. It can however be observed that the cross-border permeability in central and eastern Europe, in particular along the external borders, sis still limited by a number of obstacles.

- the changing transport paradigm in the new member countries. During the 1990s, freight transport declined by 16% in the new member/accession countries, whereas freight transport activity in the EU-15 increased by 30%. Although the new member countries have inherited a transport system which encourages rail, road haulage increased between 1990 and 1998 by 43.5%. The rate of motorisation has sharply increased in the new member countries over the past 15 years.

- growing traffic congestion on major networks, in particular in the central regions. The past decade saw not only a worrying increase in traffic congestion in urban areas, but also a new phenomenon of congestion on the major axes of the Trans-European Transport Network, increasing the number and size of bottlenecks. Missing links in the infrastructure and a lack of interoperability within specific transport modes and for intermodal transport systems are all reasons aggravating congestion. While European integration and globalisation favoured the growth of exchanges and of traffic investments in transport infrastructure and systems declined over time. Overall investments in the TEN-T in the EU-27 amount to less than € 30 billion/year since 1996; so that more than 20 years would be needed to complete the network. All transport modes are affected by congestion.

As far as forecasts are concerned, various studies were carried out at EU level in recent years. Most studies contain several scenarios related to the nature and intensity of transport policies likely to be implemented in future. The baseline scenarios indicate both substantial increase of transport flows in the decades to come and significant evolutions in terms of modal shift. The transport forecasts of the TEN-STAC study (Trend+ Scenario)[21] reveal considerable growth rated of transport performance in the EU-27 countries between the base year 2000 and the year 2020: +31% for passenger x km and +75% for freight (tons x km). The study 'European energy and transport trends to 2030'[22] indicates that the structure of passenger transport is projected to undergo significant changes under baseline assumptions, with air transport being the fastest growing transport mode over the projection period, accounting by 2030 for 10.8% of passenger transport activity, compared to 5.4% in 2000. Public transport modes are projected to continue having a more important role in satisfying passenger transport activity in new member/accession countries over the projection period, compared with the EU-15, while the contribution of air transport activity will remain by 2030 at levels well below those projected for the EU-15. The structure of freight transportation is also projected to change considerably in future. Road transportation will gain significantly in terms of market share at the expense of rail. The share of rail transport will fall from 17.1% of total freight transport in 2000 to 11.2% in 2030. the share of inland navigation is also projected to exhibit a continuous, thought limited, decline over the projection period. Starting from a much higher share for rail freight transport in 2000, new member/accession countries are projected to remain heavily dependent on rail. In 2030, some 24% of freight transport activity in new member/accession countries will be satisfied by rail transport, whereas in the EU-15 the corresponding share will be just 9% According to these baseline scenarios, the costs caused by road congestion are expected to increase considerably in the coming decades at EU-27 level.

[21] TEN-STAC. Scenarios, Traffic forecasts and analysis of corridors on the Transeuropean Network. Coordination: NEA Rijswijk. 2004.
[22] European energy and transport. Trends to 2030. European Commission. 2003.

It must, however, be observed that in all EU-wide transport forecasts produced up to now, the sharp increase of oil price experienced over the past years, as well as future evolutions in this field, have not been taken into account.

2.1.2 Nature, evolution and impacts of EU transport policy

The EU transport policy is a multi-dimensional one. It refers to the development of transport infrastructure (mainly TEN-T), to the liberalisation of transport services, to the modernisation of transport technology, to the increase of transport security, to the development of sustainability etc. Although the EU transport policy was defined in the Treaty of Rome, it became really operational in the early 1990s.

The TEN-T was first agreed in the guidelines of 1996 as well as in the accession treaties in 2002. Total financial needs up to 2020 can be estimated at € 600 billion. Some major projects have now been completed, but in far too many cases, the national sections of networks are merely juxtaposed, meaning that they can only be made Trans-European in the medium term. The implementation of the TEN-T is confronted with considerable delays. As the White Paper on the European transport policy noted, six years after the adoption of the 1996-guidelines, barely 20% of the projects planned for the year 2010 have been completed. A crucial factor that has lead to delays has been the complexity of moving ahead with cross-border projects or cooperation. In order to speed up the process, the Commission has set up the 'Quick Start Programme' covering a range of decisions and immediate actions to develop the network.

The transport sector used to be one of the most protected economic sectors in the former European Economic Community. During the past two decades, the various transport modes were progressively liberalised: maritime transport, road haulage, inland waterway transport, air transport and presently rail transport. Generally speaking, transport liberalisation has generated numerous new transport services at lower price, as demonstrated by the low cost airlines.

The orientations towards a sustainable transport policy were first defined in the White Paper of 1993. The Gothenburg European Council of June 2001 asked that, in future, stress should be laid on the development of rail, maritime and river transport. The Commission's White Paper on European transport policy in 2010 also placed the re-balancing between different modes of transport at the heart of a sustainable development strategy. The implementation of the strategy involves a wide range of measures, such as market measures reducing the discrepancies in competitiveness between the modes (for instance road pricing, actions in favour of intermodality etc.). Despite the existence of numerous measures in favour of sustainable transport, the general evolution in the transport sector and the existing forecasts indicate that the level of success of the sustainable transport policy has so far been quite modest, as the fastest growing transport modes (air and road) are the least sustainable.

The EU transport policy also addresses more technical issues such as interoperability (mainly in the railway and air traffic control sectors), security, development of intelligent transport systems (ITS) etc. While a number of measures are efficient (ITS, security), others are facing serious delays (interoperability in particular).

At the level of national transport policies, a trend can be observed in a number of countries towards the development of new motorways, as a response to increasing demand in road transport. This is particularly true in the countries of central and eastern Europe which have important deficits in this field, but also in a number of western countries like Ireland, the Netherlands, France etc.

2.1.3 Main driving forces in the transport sector

a) Key factors behind the continued growth in demand for transport:

- for passenger transport, the determining factor is the spectacular growth in car use. The number of cars has tripled in the last 30 years, at an increase of 3 million cars each year. Although the level of car ownership is likely to stabilise in most countries of the European Union, this will not be the case in the candidate countries, where car ownership is seen as a symbol of freedom. By the year 2010, the enlarged Union will see its car fleet increase substantially.

- as far as goods transport is concerned, growth is due to a large extent to changes in the European economy and its system of production. In the last 20 years, we have moved from a 'stock' economy to a 'flow' economy. This phenomenon has been emphasised by the relocation of some industries — particularly for goods with a high labour input — which are trying to reduce production costs, even though the production site is hundreds or even thousands of kilometres away from the final assembly plant or away from users. The abolition of frontiers within the Community has resulted in the establishment of a 'just-in-time' or 'revolving stock' production system.

- the progress of the economic integration in the EU, including the successive enlargements;
- in the case of air transport, the main factors of traffic development are the recent liberalisation as well as the related development of low-cost companies.
- the introduction of new transport technologies, such as high-speed trains (induction effect).
- the fact that transport users do not always cover the costs they generate. Indeed, the price structure generally fails to reflect all the costs of infrastructure, congestion, environmental damage and accidents.

b) Main factors of increasing congestion on a growing number of transport axes:

- saturation on some major routes is partly the result of delays in completing trans-European network infrastructure.
- the poor organisation of Europe's transport system and failure to make optimum use of means of transport and new technologies.
- the increasing rate of motorisation in the countries of central and eastern Europe

c) Main factors of territorial imbalance in accessibility:

- market-driven development of infrastructure. In outlying areas and enclaves where there is too little traffic to make new infrastructure viable, delay in providing infrastructure means that these regions cannot be properly linked in.
- low level of intermodality and of adapted transport services in the more remote regions.
- selective development of major infrastructure axes in the new member countries of central and eastern Europe, favouring the accessibility of large cities and of western regions in these countries at the expense of that of the more rural and remote regions (tunnel effect)

d) Main factors of imbalance in transport modes:

- insufficient consideration of social and environmental costs generated by road traffic;
- insufficient competitiveness of alternative transport modes, such as railways, waterways and maritime transport.

- political priorities given to raod transport in a number of countries

e) Main factors likely to modify and even counteract present trends:

- Increasing energy price (mainly oil and oil products) which could have detrimental impacts on mobility, on economic development and especially on the road and air transport modes;

- The recent enforcement of the Kyoto Agreement which prescribes a reduction of greenhouse gas emissions;

- Population ageing which may modify the mobility patterns

2.1.4 Identification of scenario hypotheses

The evolution over the past decade has shown a significant discrepancy between the Community objective of sustainable transport and the real evolution of modal shift which is in favour of air and road transport, the least sustainable transport modes. Existing forecasts indicate that present and past trends are long lasting and will not converge with the objective of sustainable transport. The efficiency of the EU transport policy may therefore be questioned. New elements have to be added to this. The weakness of economic development in Europe since the end of the 1990s has weakened the objective of sustainable development, so that the national transport policies emphasize again the development of motorway networks. While this is understandable up to a certain extent in the new member countries where motorways hardly existed up to recent times, substantial motorway programmes are also being implemented in a number of old member states. In a context of sharply increasing oil price, such policies raise the question of their long-term impact, both in terms of accessibility and of environment. On the other hand, the lack of efficiency of the EU transport policy in terms of modal shift in favour of environmentally-friendly transport modes =calls for strengthening the tools, measures and procedures through which this policy is implemented. It seems therefore accurate to investigate the territorial impacts of two opposite policies:

- new EU/national transport policies focussing in priority on the development of motorway networks in order to better respond to present and future transport demand;

- strengthened sustainable EU/national transport policies which will emphasize environmentally-friendly transport modes and counteract road and short-distance air transport. Stronger decoupling between economic development and transport growth seems however to be a prerequisite for this scenario.

2.1.5 Sources of information

The transport scenario base is a compilation of information originating mainly from following documents and reports:

White Paper. European transport policy for 2010: time to decide. European Commission. 2001.

Energy and transport. Report 2000-2004. European Commission. 2004

Intelligent transport systems. Intelligence at the service of transport networks. European Commission. 2003.

Intelligent transport systems. Results from the transport research programme. European Commission. 2001./

Freight intermodality. Results from the transport research programme. European Commission. 2001.

European transport networks. Results from the transport research programme. European Commission. 2001.

Sustainable mobility. Results from the transport research programme. European Commission. 2001.

Communication from the Commission 'Cohesion and transport'. 1998.

Report of the high-level group on the Transeuropean Transport Network (Van Miert Report). 2003.

European energy and transport. Trends to 2030. European Commission. 2003.

ESPON Study 1.2.1. 'Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion'. Coordination: CESA Tours. 2004.

ESPON Study 2.1.1. 'Territorial impacts of EU Transport and TEN policies3. Coordination: Institut für Regionalforschung. University of Kiel. 2004.

TEN-STAC. Scenarios, Traffic forecasts and analysis of corridors on the Transeuropean Network. Coordination: NEA Rijswijk. 2004.

2.2 Thematic prospective scenarios

Transport scenarios

Under the theme 'Transport', two prospective policy scenarios are presented, corresponding to rather opposite hypotheses, one favouring road transport as a response to existing and forecast demand, the second being orientated, on the contrary, towards the objectives of the Kyoto Agreement and of the Göteborg Strategy. These scenarios aim at illustrating the contradictory context in which the EU and its member states presently are, with some countries developing strongly their motorway networks to alleviate traffic congestion while the Kyoto Agreement has just been enforced and efforts have now to be developed to ensure sustainable transport.

2.2.1 Scenario 1: 'More investments in motorways'

2.2.1.1 Scenario hypotheses

European integration has been characterised by rapidly growing transport flows, both in the freight and passenger sectors. Available projections indicate that this trend is long-lasting and will be strengthened by the recent EU enlargement and by the forthcoming ones. Considering that modal split towards rail and maritime transport has not really been successful and that there is a clear trend in favour of road transportation in general, but in the new member countries in particular, the EU and national policies decide to make maximum use of the existing capacities of road transport infrastructure and to expand it. The traffic forecasts of the TEN-STAC study are considered as realistic and investments in the road sector should contribute to alleviate congestion with regard to strongly increasing transport flows. The scenario assumes that increase in fuel price will be moderate after 2005 and will not be detrimental to the development of road transport. This means that either increase of crude oil price will be moderate or, in case the price of crude oil will seriously increase, it will be compensated by a corresponding decrease of taxes on oil products.

2.2.1.2 Driving forces

Factors leading to the increase of road transport flows are, among others:

- the increasing mobility of people and the increasing rate of motorisation, in particular in the new member states of Eastern Europe;

- EU enlargements and further globalisation (intensification of economic exchanges); relocation of economic activities in the new member countries;

- delays in the extension and improvement of the TEN-T;

- insufficient competitiveness of alternative transport modes (railways, maritime transport;

- lack of success in decoupling economic growth from growth of transport flows

In the policy field, the driving forces are related to the expansion of the European motorway network and, more generally, to the optimisation of the use of the road/motorway networks as a response to the increase of traffic demand.

2.2.1.3 Contextual elements of the decision to increase investments in motorways

By 2006, the EU had for the fifth year a low rate of economic growth. The mid-term assessment of the Lisbon Strategy had revealed at the end of 2004 that the targets of European competitiveness were not to be reached without a serious reconsideration of the efficiency of EU policies, following in that some conclusions of the Sapir Report published in early 2003. the increase of the unemployment rate resulting from the progress of globalisation and in particular from the acceleration of enterprise relocation towards low-wage countries outside Europe, was a determining factor for the reconsideration of all EU policies as to their economic efficiency.

The EU Transport Policy was carefully and extensively examined. This examination revealed paradoxical aspects. On the one hand, the realisation of a Transeuropean Network and the liberalisation of transportation had been considered at the time of the adoption of the Single Act in 1986 as a key element of European economic development. This had been confirmed by the Commission's 1993 White Paper on growth, competitiveness and employment. The Brussels European Council of December 1993 had adopted a series of important decisions to speed up the implementation of the TENs, leading to the priority projects defined in Corfou and Essen in 1994. The Decision of July 1996 on Community Guidelines for the development of the TEN-T had enlarged the list of priority projects of Community interest. By 2003, total investment needs (including the Pan-European corridors) were estimated at more than 600 billion Euros.

On the other hand, assessments had revealed considerable delays in the implementation of the TEN-T, despite the fact that a number of ambitious projects had been realised. Another important issue was also that the 'ideological' change in the EU Transport Policy which occurred in 1992 in favour of a more environmentally-friendly transportation in Europe (introduction of the concept of 'sustainable mobility' in the White Paper of 1992) had not led to convincing results. Despite significant policy efforts (promotion of maritime, railway and waterway transport, introduction of road pricing etc.), road transport continued to increase at much higher speed than the other transport modes. Available forecasts had shown that this trend was long-lasting and that road transport flows would continue to increase at high rates, whatsoever conventional policy measures would be.

A tense debate took place at EU level and also within the member states involving those wishing to protect the environment and quality of life along the lines of the Göteborg Strategy of 2001 and of the Kyoto Agreement and those considering that present and future congestion of the transport networks would severely handicap the economic development. A determining argument was that the revival of the economy in the new member states of central and eastern Europe was precisely based on (or at least largely conditioned by) the accelerated development of road transportation, departing from the use of the dense, but obsolete railway transportation systems. In 2007, a EU Decision was finally taken to rapidly develop the European motorway network through ambitious investments. Member states would play a decisive role in the implementation of the strategy.

2.2.1.4 The motorway investments strategy

Main objectives of the motorway investments strategy adopted in 2007 was to reduce and prevent congestion on the European main networks (motorways and dual carriage ways). This included the elimination of bottlenecks, mainly in urban regions and in border areas, but also the connection of peripheral and/or landlocked regions to the European markets. An additional objective was therefore to contribute to improving accessibility of the whole European territory through motorways.

The expansion of the European motorway network was accompanied by measures aiming at limiting the environmental impact of road traffic, in particular the introduction of stricter norms for engine emissions and significant R&D efforts in the development of new vehicle propulsion technologies, using less fuel as well as other types of fuels (hydrogen, electricity, biofuels). Other accompanying measures aimed at strengthening the development of Intelligent Transport Systems in a variety of fields, but mainly in order to improve the guidance of traffic with a view to reduce bottlenecks and to increase security.

The strategy considered that one of the main causes of traffic congestion was the superposition on the same networks (motorways, dual carriage ways) of long-distance and regional and local traffic. It therefore encouraged the lower-tier authorities (regions, municipalities) to promote public transportation and to improve secondary networks in order to divert as much as possible local and regional traffic from the motorways, in particular during the peak hours.

The key element of the strategy was the financing system. When the first estimates of the investment volume were realised (end of 2007), the figures obtained were much higher than those previously envisaged for the completion of the TEN-T (around 600 billion Euros). In addition to the projects of 'Community interest' which had a clear cross-border or transnational dimension, the strategy also included numerous motorway projects in highly urbanised and densely populated regions, because the reduction of congestion in these areas would be highly beneficial to long-distance transit transport of European significance. This is why the total investment volume estimated nearly reached 1500 billion Euros.

Needless to say that public resources alone would enable the implementation of only a tiny share of this investment volume. It was therefore necessary to develop a highly sophisticated system of financial engineering based on public-private partnerships. This made possible to maintain the principle of road pricing. Its objective was less to divert traffic from the motorways than to ensure the viability and profitability of investment projects. Tariffs for users were conceived as flexible and highly dependent upon the context. In the cohesion countries, EU subsidies (structural funds, cohesion fund) were used in public-private partnerships to reduce the level of tolls charges to users. This was considered as particularly important to ensure the viability of projects in countries with a low purchase power. In West-European countries, the level of EU subsidies was either very low or even non-existing, but the EU provided a public guarantee to loans in order to motivate banks, investment funds and other financing institutions to join the programme. The European Investment Bank also played an important part in the implementation of the strategy. Bonds were issued to mobilise a broader financial basis, both inside and outside the EU. A Regulatory Authority was set up, composed of representatives of the public sector (EU, states) and of the PPPs to monitor the implementation of the strategy, the economic viability and profitability of projects, the level of tolls and to provide advice and solutions to emerging problems.

The main idea was however to maintain road pricing at a moderate level in order not to divert traffic towards the secondary networks. There where EU subsidies were not available, national resources were injected into the PPPs, in order to limit the level of tolls. The system of financial engineering also comprised an instrument of financial equalisation between the PPPs, making possible for the Regulatory Authority to transfer a certain amount of revenue resources from the most profitable PPPs to those which were facing difficulties in terms of viability, while maintaining moderate levels of tolls.

2.2.1.5 Implementation of the strategy

The first steps of the strategy consisted in the concentration of EU support to motorway projects, at the expense of other transport infrastructure, in order to accelerate the realisation of projects which were already in the pipeline. The development of new motorway projects, from the planning phase to the end of realisation was however very time consuming. The first projects envisaged in 2007/2008 were not yet concretely implemented in 2015. Almost a decade was devoted to the planning and construction activities before the real benefits of the strategy became noticeable. In densely populated regions, specific difficulties arose at the stage of planning new motorways. Strong protests were expressed by the local population concerned by the potential environmental impacts of the projects. Negotiations took a long time and numerous specific (and expensive) solutions had to be elaborated (underground motorway sections, specific equipments against noise etc.).

During the period before 2015, a number of projects which had been launched in the early 2000s were completed, but this was not sufficient to absorb congestion. The saturation of various major corridors increased, generating a series of problems. Long-distance traffic used more and more the secondary networks and night traffic of trucks became generalised. The environmental impact on densely populated regions was high. People and enterprises stated relocating out of the most congested areas. They chose locations with still satisfactory accessibility, but outside the densest areas.

After 2020, the speed of projects realisation increased and new motorway sections were opened to traffic every year. Only the most ambitious projects (basis tunnels under the Alps, the Pyrenees, the Carpathian mountains) needed more time for their implementation. In maritime basins, (Baltic, Mediterranean, North Sea, Atlantic, Black Sea), the new motorways reached most medium-sized and large ports, so that numerous new ferry lines were developed.

2.2.1.6 Impacts

- **Impacts on the transportation systems**

As indicated above, the real impacts of the strategy were noticeable only after 2015, while up to 2015, traffic flows had continued to regularly and substantially increase. Two phases can therefore be identified. Up to 2015, the transportation system in Europe worsened because of increasing congestion on a growing number of axes and corridors. After 2015, congestion progressively decreased, but to a lesser extent than expected, because the induction effect of new infrastructure on traffic generation went on increasing, in particular in the new member states. Traffic intensity (measured in tons x km or passenger x km) increased substantially because of higher trip generation and, in particular, growing trip lengths. European society became more traffic dependent: increasing individual mobility reflecting the preference for variety in leisure occupation, shorter working weeks and more frequent -although shorter – holidays with a larger transport content, multiple car ownership in households leading to greater freedom. In freight transport, the average volume or weight of consignments diminished, creating an increasing fragmentation of flows, including the growing incidence of direct home delivery from telephone and Internet purchasing. The progress of globalisation in the world production and trade system, reinforced by increasing integration and regional specialisation in the European Union's Single Market, provided additional elements in the growing transport intensity.

By 2030, the traffic situation on major axes and corridors had improved, compared with the situation in 2010 and 2015, although a number of bottlenecks remained. Much worse was the situation on secondary networks. These had hardly been improved, because financial resources were concentrated on the motorway network. The general increase in mobility and transport intensity created serious congestion and environmental problems in wide areas of the European territory, also quite far away from the motorways.

- **Macro-economic impacts**

The macro-economic impacts of the strategy have been quite significant and they started rather quickly after the decision about the strategy was taken in 2007. The huge investment volumes carried out generated a large amount of construction works which in turn generated employment, turnover and tax revenue. Traffic demand being high, tolls revenue made possible the re-reimbursement of loans and the refunding of bonds without major difficulty.

Another dimension of the macro-economic impacts, which developed however only after 2015, was the reduction of congestion and the higher efficiency and productivity of transportation which acted economically as a reduction of transport costs in the whole production systems and therefore increased the GDP of the European Union and of individual countries. Along the same line, the improvement of accessibility of peripheral and landlocked regions contributed to integrate them better into the European single Market and to increase global European output. Positive macro-economic impacts were also noticeable in the sector of motor-car industries, including R&D and new technologies.

The positive aspects of macro-economic impacts were however somewhat outweighed by the increasing imports of oil in a context where the external energy dependency of Europe was seriously increasing.

- **Regional, environmental and territorial impacts**

Considered from a Europe-wide perspective, the strategy favoured in the long range the development of more peripheral regions and therefore, polycentricity. Discrepancies in accessibility were seriously reduced, even if the density of motorway networks remained much higher in the Pentagon than in European peripheries. The strategy made also possible the development of motorway networks linking various maritime basins and avoiding the Pentagon. North-South axes were built between the Baltic States/Poland and the Adriatic and Black Sea basins. East-West axes were strengthened linking the Atlantic/North Sea ports to the new member countries of central and eastern Europe.

At meso-scale, the situation worsened up to 2015. The number of congested axes and corridors increased, mainly in the Pentagon, but also in and around urban regions in more peripheral areas. Transit countries like Germany, Denmark, France, Switzerland were particularly affected. In the productive sector, increasing congestion constrained intra-sectoral exchanges, access to final markets as well as the just-in-time approach. A number of changes in the productive and logistic structures became necessary. Productive activities progressively left dense urban and metropolitan regions to relocate in intermediate regions in and around the pentagon, from where main markets as well as suppliers were still accessible through less congested main and secondary networks. As such strategies prove not to be sufficient, the splitting of production structures over large (sometimes Europe-wide) areas is progressively being given up by more and more companies. Main enterprises, subsidiaries and suppliers are being regrouped again in locations which are easily accessible from each other. This evolution benefited to the economy of areas with intermediate centrality, but was detrimental for peripheral regions. It was also detrimental to main ports which had not sufficiently developed railways and waterways as hinterland connections.

As far as the population of dense urban and metropolitan regions as well as corridor areas is concerned, it was more and more inclined to move away. Most favoured locations in less congested areas were however locations near public transport stations. More and more retired people left urban and metropolitan areas to relocate in attractive rural areas.

After 2015, a number of improvements in the networks had considerable impacts, in particular in densely populated and congested regions, but also in the countries of central and eastern Europe. Thanks to the new motorways, the level of traffic congestion decreased in the English Midlands and the South-East, in the Benelux, in the Rhein-Ruhr and Rhein-Main regions, in the densely urbanised East-West corridors north and south of the Alps, in the corridor linking the Benelux to the Paris region, in the Rhone valley, in the corridors along the Mediterranean coast etc.

At local level, the crossings and access points of the modernised motorway network became preferred locations for new activities. Increasing rates of motorisation favoured however the progress of suburbanisation and dispersal of settlements. Congestion on secondary networks accentuated this trend, in particular in densely populated regions. Adjacent rural areas with less traffic density became attractive locations for both people and activities, provided reasonable access to the motorway network was ensured.

Impacts of the strategy on the environment have been far from positive. As far as the emission of greenhouse gas was concerned, the evolution went in a direction totally opposite to the Kyoto Agreement. Despite technological progress which significantly reduced the fuel consumption and gas emission of engines, the considerable increase of traffic flows, which had doubled and even tripled on numerous corridors by 2030, compared with the situation in 2005, resulted in strongly growing CO^2 and NOx emissions. Emissions were not limited to areas bordering the motorway networks. Increasing traffic and congestion on secondary networks disseminated emissions widely throughout the European territory.

In addition to gas emissions, the strategy generated important damages to natural areas. Because of protests from the population as to the location of new motorways, these were mainly built in rural and natural areas, where population density is low. A number of new motorways were also built in mountain regions, affecting the natural heritage of numerous valleys. Coastal regions were also damaged, in particular in Mediterranean regions, where the mountainous character obliged to build the new motorways rather close to the coastline, generating pressure on settlements and on highly valuable landscapes.

2.2.1.7 Final images

The scenario provides two different images:

- an intermediate image around the year 2015 with increasing traffic congestion, in particular in densely populated regions, resulting in deteriorated living conditions. Concentration of population and activities in and around the Pentagon had progressed. Areas with intermediate accessibility, adjacent to urban regions or not too distant from them were becoming prosperous in terms of business location, but were facing increasing land-use conflicts and emerging environmental problems. This included also the hinterland of main and second-rank ports.

- a final image around 2030 with quite different characteristics. Growth and wealth have progressed towards the European peripheries along the most important corridors, as a result of increased accessibility through more developed motorway networks. In the countries of central and eastern Europe, only major corridors and related large cities (in particular in the western regions) have benefited from an increase in accessibility, while more remote regions in the east as well as rural areas largely dependent upon obsolete secondary networks remain weakly accessible. The volume of investments carried out has had a significant impact on the revival of he European economy. Economic development is widespread along the grid of the motorway networks, favouring the crossings and access points to motorways. Suburbanisation and dispersal of settlements have further developed. Secondary networks are quite saturated. The environmental impacts are strongly negative, both as far as emissions and damages to natural areas are concerned.

2.2.1.8 Main issues resulting from the scenario

The scenario shows which spatial evolutions would result if the projected increase of road traffic throughout the EU (demand projection) would be made possible through a substantial development of the motorway network throughout Europe. The scenario shows clearly that significant economic benefits would result from such a strategy, which would however be considerably outweighed by the intensity of resulting environmental problems. The scenario points out that benefits in terms of transport situation would not really emerge before 2015. In between, the increase of traffic congestion would however have wide territorial consequences: deterioration of the environment and quality of life, reduction of mobility, increase of transportation costs in production/distribution processes, changes in location patterns, both for enterprises and population and therefore impacts on inter-regional disparities. The scenario suggests the existence of traffic thresholds (and therefore of congestion thresholds) which are likely to generate 'chain reactions' in the behaviour of economic actors, in particular as far as location patterns are concerned. According to existing traffic projections, such thresholds could be reached on numerous corridors between 2010 and 2015, while the situation will improve afterwards when the implementation of the motorway strategy shows its first substantial results.

2.2.1.9 Impacts for EU policies

The scenario is based on the assumption that a considerable change takes place in the EU Transport Policy, backed by similar orientations in the transport policy of all member states. Based on alarming traffic forecasts, in particular as far as demand for road transport is concerned and considering the very insufficient results of the policy of 'sustainable mobility' carried out since the mid 1990s (promotion of environmentally-friendly transport modes), the EU decides in 2007 to implement an ambitious programme of motorway construction. Key instrument of this strategy is a sophisticated system of financial engineering based on public-private partnerships. The implementation of the strategy calls for coordination with EU regional and environment policies, in order to optimise the economic benefits (productivity of new infrastructure) and to minimise the environmental impacts (Natura 2000 Network in particular)

2.2.1.10 Summary

The scenario is based on the hypothesis that EU and national policies decide to make maximum use of the existing capacities of road transport infrastructure and to expand it, considering that modal split towards rail and maritime transport has not really been successful and that there is a clear trend in favour of road transportation in general, but in the new member states in particular. An ambitious motorway investments strategy is adopted in order to reduce and prevent congestion on the main European networks. Specific financial engineering based on public-private partnerships was developed. Considered from a Europe-wide perspective, the strategy favours in the long range the development of more peripheral regions and therefore polycentricity. At lower levels, a significant reduction of traffic congestion can be observed, in particular in highly urbanised regions, accompanied however by a significant progress of suburbanisation. The impacts of the strategy on the environment are far from positive, with a strong increase in greenhouse gas emissions and with significant damages to natural areas.

2.2.2 Scenario 2: 'Decoupling economic development from the mobility of people and goods'

2.2.2.1 Scenario hypotheses

The scenario is based on a combined strategy which aims on the one hand at enforcing the provisions of the Kyoto Agreement and of the Göteborg Strategy (reduction of greenhouse gas emissions and further environmental protection) and on the other hand at moving the European economy towards more knowledge-based components according to the Lisbon Strategy. A clear complementarity exists between these two dimensions: decoupling economic development from the mobility of people and goods works undoubtedly in favour of the environment, but cannot rely exclusively on transport policies. It has to integrate economic policy elements along the lines of the Lisbon Strategy. Policy measures are taken to limit road and short-distance air transport and to promote alternative transport modes.

2.2.2.2 Driving forces

In the field of transport policy, the main driving forces are the policy measures taken at all levels to discourage the use of cars and trucks, both for long-distance and for regional and local transportation of people and goods as well as those taken to reduce air transport on short distances. Specific policy measures encourage and promote alternative transport modes with lower environmental footprint.

In the field of economic policy, a series of measures are taken along the lines of the Lisbon Strategy in favour of a competitive knowledge-based economy likely to develop more immaterial economic functions and to have a positive impact on the reduction of freight flows.

In the field of trends, the main driving forces are the continuation of the globalisation and European integration processes generating significant increases in transport flows.

2.2.2.3 Contextual elements of the strategy

The strategy consists of the implementation of decisions taken long before the year 2005, but which had not been successful earlier. This is the case for the Kyoto Agreement, the Göteborg Strategy and the Lisbon Strategy. Surveys and assessments carried out for the period 2000-2005 indicated that the reduction of greenhouse gas emissions in Europe had not been sufficient, largely because of the strong increase of transport flows. The Kyoto Agreement having been ratified, its enforcement called for efficient measures aiming at the reduction of greenhouse gas emissions.

A similar situation prevailed in the case of the Lisbon Strategy. The mid-term assessment carried out in 2004 clearly showed that progress of the European economy in terms of growth rate was weak, compared with that of other large economies (USA, China) and that the move towards knowledge-based activities was too slow. It was considered that Europe urgently needed acceleration in the process towards a more immaterial economy in order to reduce the negative impacts of globalisation which materialise in increasing unemployment and enterprise relocation outside Europe.

This context led from 2005 onwards to a series of decisions related to significant changes in the EU transport and economic policy (including its industrial, technological and regional dimensions), along the lines of Kyoto, Göteborg and Lisbon. The decisions were prepared during the 2005-2007 period and their implementation started in 2008.

The EU policy measures were backed by similar initiatives within the member states, at the various politico-administrative levels. Respecting the principle of subsidiarity, the vertical harmonisation of policy measures resulted mainly from conviction and consensus.

2.2.2.4 Elements of the strategy

At EU level, the main measures taken in the field of transport policy concerned the revision of the TEN-T. A new list of priority projects was established, focusing on the development of the HST network, on the rehabilitation and modernisation of conventional railways, in particular in the new member countries of central and eastern Europe, on the promotion of rail, waterway and maritime freight transport, as well as of intermodal transport. Projects concerning motorways or related to regional air transport were excluded, with the exception of those which were already under construction. In addition to the budget of the TEN-T, resources from the structural funds and from the cohesion fund were allocated to the implementation of the revised list of priority projects. In the case of particularly large projects likely to generate revenue, EU resources were also used to support public-private partnerships. The volume of EU resources allocated to technological development and R&D in the field of new transportation systems and less polluting engines was significantly increased.

Joint agreements were concluded between the EU level and the member states concerning matters of national competence, but necessitating for efficiency reasons, a good harmonisation at EU-wide scale. In this context, it was decided to apply high levels of road pricing, not only on motorways, but also on numerous roads of national and regional importance, where the introduction of road pricing was technically possible. In addition to this, it was decided to increase taxes on fuel, gasoline and kerosene, which came above the natural price increase of crude oil. Specific taxes were also introduced on short-distance air transport.

It was agreed that the additional revenue from road pricing and taxes would be allocated to the development of public transport networks and systems and to the promotion of transport modes with lower environmental footprint (support to investments; application of low tariffs).

Finally, the EU and the national authorities decided to jointly organise large-scale awareness-raising campaigns about the negative environmental impacts of road and air transport, targeting both European citizens and enterprises.

The lower-tier authorities (regions and municipalities) were invited to promote public transportation at regional and local levels through positive measures (development of public transport networks), benefiting from subsidies of the EU and national levels. They were also invited to discourage motor-car traffic in cities through the introduction of high tariffs for motor-car parking in city-centres, while the park-and-ride systems were promoted.

The link between the new transport policy and the economic policy along the lines of the Lisbon Strategy was ensured by a strong promotion of ICTs and related services. The objective was not only to give impetus to economic development, but also, with equal importance, to substitute e-services to physical mobility. Campaigns for the development of home-working ware also carried out. In this respect, specific EU actions were to define a regulatory framework for electronic communications, to encourage the spread of ICTs, to create conditions for efficient e-commerce and to support European leadership in mobile communication technologies.

The promotion of the knowledge-based economy implied also a number of other policy measures. These aimed first at boosting EU, national and private spending on R&D up to 5% of GDP. In this respect, one of the related objectives was also to make Europe more attractive for high-level researchers and to avoid that many young scientists continue to leave Europe on graduating, notably for the US. A system of mutual validation of national quality assurance and accreditation processes was developed, reducing the administrative obstacles to mobility of researchers in Europe. Measures were also taken to facilitate the entry of researchers and their dependants from outside the EU through simplified, fast-track work permit and visa procedures. The funding of research institutions and universities was reconsidered and substantially improved. Measures were taken to promote and strengthen the creative interaction between universities, scientists and researchers on the one hand and industry and commerce on the other, in order to drive technology transfer and innovation. The strategy included also measures related to education and qualification, aiming at adapting education and training systems for the knowledge society and at fostering lifelong learning.

2.2.2.5 Implementation of the strategy

The implementation of the measures decided in 2007/2008 was not immediate. Some measures could be implemented in the short-term, others needed a quite long period before they became effective. In fact, it was a process that developed and intensified during the period considered.

In the field of transport policy, the first measures to be implemented concerned the progressive increase of prices and tariffs: road pricing, taxes on gasoline, fuel and kerosene, tariffs for car parking in cities. Such measures, which were by far not popular and created numerous tensions, had a quite rapid impact on the behaviour of people and economic actors and influenced directly the transportation market. Their progressive intensification convinced the transport users that the new policy was long-lasting and that it was worth envisaging long-term solutions, notably in terms of locations, activities etc.

Among the changes which could be rapidly observed, there was in first place a more intensive use of public transportation, both at local/regional level and also for long-distance trips. The income of public transportation companies increased and they could invest more in expanding the networks and improving the quality of services. A second important change was the intensification of e-commerce, e-services and home-working. This contributed to significantly reduce mobility at local/regional level.

Modal changes were less rapid in freight transport. Although all manufacturing industries and trade companies had noticed a significant increase in transport costs for their products, modal changes, departing from road transportation, implied the availability of equivalent services in other transport modes or in the field of intermodal transport. Such services were not immediately available. Structural evolutions had to take place in the organisation of railway and maritime companies. Important investments were necessary in infrastructure development and modernisation as well as in rolling stock. A favourable factor was that the increase in costs of the road transport mode made the other transport modes more competitive and therefore profitable. After 2015, freight transport in Europe had taken a different shape. The share of road transport had started to decline, in particular for long-distance haulage.

Structural changes in the European economy were driven by both the progress of globalisation and the new economic policy. The importance of traditional activities, using heavy raw materials, declined significantly. This affected mainly the new member countries of central and eastern Europe, but also a number of regions with traditional manufacturing industries in western Europe. The European economy specialised more and more in products with high added value and technological content as well as in immaterial production. The requirements in terms of transportation were significantly modified. Speed, flexibility, reliability became very important factors. Capillarity in the final access to customers was also an increasing requirement. New transport services had to be created, in which logistics, combined and intermodal transport had a growing importance. High speed freight trains were operated, as well as high speed maritime transport.

2.2.2.6 Impacts

- **Impacts in the transport sector**

Up to 2015, the nature of transport flows did not change significantly. The impact was mainly concentrated on the volume of flows and on transport modes used. The increase of transport costs, which was soon observable after the new policy was adopted, had a rather quick impact on the volume of road passenger transport, which decreased. In general terms, the mobility of people also decreased. The period up to 2015 was more problematic for freight transport, because the transport volumes continued to increase in a context which was constraining in the field of road transport (higher costs, strong decrease of infrastructure investments). Traffic congestion on the road and motorway networks continued to increase during that period, although this was attenuated by the fact that more and more people used public transport and much less their motor-car for daily commuting and also for long-distance trips. This increased somewhat the capacity of roads and motorways for freight transport. Another factor which worked in the same direction up to 2015, was the lower level of economic development which resulted from the new transport policy in relation to freight transport costs.

After 2015, the transport situation became more sustainable. This resulted from a combination of various factors. The new policies in transport and economy had generated structural changes. The move towards a more immaterial economy has contributed to moderate the volume of freight transport flows. In addition, the nature of flows also had changed, with more products having lower weight and higher added value. A number of significant investments in transport systems had been carried out (infrastructure, rolling stock, intermodal facilities etc.). The HST network had strongly expanded, at least on connections enabling profitable services. In the UK, the Midlands as well as the cities of Edinburgh and Glasgow were connected. In the Iberian Peninsula, the HST network connected Barcelona, Madrid, Sevilla, Lisbon and Porto to the rest of Europe through two connections on both sides of the Pyrenees. In the Nordic countries, the HST triangle Copenhagen, Oslo, Stockholm was completed and connected to the rest of Europe through the 'Vogelfluglinie' bridge. The HST connection from Munich to Vienna, Bratislava and Budapest was in operation, as did the HST line from Berlin to Warsaw. Zagreb and Ljubljana were connected to Milan through Trieste and Venice. A number of HST connections had replaced former short-distance air connections. The public transport networks of metropolitan areas and medium-sized towns had been modernised and enlarged. The motorways of the sea had finally become a reality, thanks to new technologies in the maritime sector which made this transport mode competitive.

In the new member states of central and eastern Europe with more traditional manufacturing industries, specific problems arose because transport needs increased while the railway networks were obsolete and the motorway networks were weakly developed.

Priority was given to the rapid modernisation of railways and this factor played an important part in the development of long-distance rail freight transport and intermodal transport at Europe-wide scale, especially on East-West corridors.

At the end of the period considered (around 2030), the spiral of exponentially growing traffic flows had lost of its energy and the situation had stabilised in quantitative terms, while significant qualitative changes had taken place in the transport systems themselves.

- **Macro-economic impacts**

Various elements of the new policies had macro-economic impacts, sometimes in opposite directions. The increase of transport costs had negative macro-economic impacts for a number of years until the necessary structural adaptations in terms of production, locations, alternative transport systems etc. were made. This created difficulties for numerous enterprises for which transport costs represent a significant share of turnover and brought additional constraints to the existing challenges of progressing globalisation.

These negative macro-economic impacts were however progressively outweighed on the one hand by the important investment volumes made in alternative transport systems, which generated employment, tax revenue and progress in transport technologies and, on the other hand, by the emerging knowledge-based economy which generated numerous innovations and patents as well as significant amounts of added value in economic outputs.

At the end of the period considered, economic development was progressing at a satisfactory rate and the growth differential with the USA had become smaller, while the transport situation was under control. The decoupling strategy between economic development and the growth of transport flows, in particular on roads and motorways, had been rather successful.

- **Regional, environmental and territorial impacts**

At Europe-wide scale, the regions which were most advantaged (or less disfavoured) in economic terms by the new transport and economic policies, were those easily accessible by long-distance railways, HST, waterways and maritime transport. These are mainly regions with large metropolitan areas within the Pentagon, but also outside of it. In the European periphery, regions and cities with large ports were comparatively less disfavoured.

The regions most disfavoured were those the large-scale accessibility of which was largely dependent upon road and air transport. Numerous peripheral regions belonged to this category (Ireland, Scotland, parts of the Iberian Peninsula, southern Italy, Greece, northern periphery, eastern parts of the new member countries), but also a number of more centrally located large rural areas (such as the French Massif Central, the French and Belgian Ardennes), quite distant from main axes and corridors. In the new member countries, the new transport policy was a particular economic handicap in the short and medium-range. Economic development could not progress as strongly as expected, also because the penetration of the knowledge-based economy was less rapid than in Western Europe. The modernisation of the railway network and the development of intermodal and maritime transport progressively favoured the accessibility of large and medium-sized towns as well as the development of port regions.

All this resulted in an increase of disparities related to large-scale accessibility at European level and worked generally against polycentricity.

At meso-level, regions with dense railway networks or important commercial ports have been favoured. Intermodal platforms developed there, connected to the railway, waterway networks and ports. Networks of towns and cities emerged under the effect of improved inter-urban public transportation. In the productive sector, the spatial de-concentration of manufacturing and service activities (back office functions) out of metropolitan areas slowed down. Activities concentrated in locations with good accessibility by railway, but also around large ports, along waterways etc. Important innovation-oriented clusters developed in numerous European regions, but mainly in the Pentagon. Migration of population towards rural areas (retired people in particular) did not significantly slow down (although dependence upon road transportation is higher in rural areas), because the price of dwellings in cities strongly increased (push effect). The major pattern of territorial evolution at meso-scale has been one of nodal densification along corridors.

At more local level, and in particular in urban areas, motor-car related suburbanisation slowed down. In the periphery of large cities and metropolitan areas, a concentration of residential and productive functions took place around the stations of public transportation networks. These networks were significantly expanded. The concentration of settlements generated strong increase in land value. Demand for housing in urban areas increased significantly and prices also, because commuting by car became very expensive. Urban derelict land was rehabilitated. There was also a strong demand for nature and recreation areas at immediate proximity of cities.

In remote or peripheral rural regions, small and medium-sized towns were much less prosperous. Being largely dependent upon road transportation, their attractiveness decreased. A number of them were negatively affected by the relocation of activities induced by the need to reduce transportation costs.

The new transport and economic policies were highly beneficial to the environment and quality of life, in particular in the long range. The level of greenhouse gas emissions was significantly reduced and natural areas were better protected against further developments of the road and motorway networks as well as against suburbanisation and dispersal of settlements. There was however stronger pressure from recreation and leisure activities on natural areas located in the vicinity of cities. Because of less widespread use of motor-cars in tourist activities, these tended to become more spatially concentrated. This was somewhat detrimental to the development of soft tourism and to rural areas which were used to draw additional income from their natural and cultural heritage.

2.2.2.7 Final image

In the long range (around 2030), the final image of the European territory shows networks of compact cities well interconnected through high-capacity and high-speed railways. These cities are surrounded by nature and recreation areas. Long-distance commuting by car to large cities has become the exception. Suburbanisation trends also have been strongly reduced.

Rural areas are generally less populated than they were in 2005, with the exception of those which are particularly attractive for retired people. Settlements in rural areas are however less dispersed, to take advantage of public transportation services.

Considered at a wider scale, disparities among European regions are stronger than in 2005. Growth has favoured the cities of the pentagon as well as a number of other large cities outside of it, in particular those with large ports or good railway connections at reasonable distance from main markets. Numerous regions of the European periphery have a weak development rate and even decline. The peripheral regions of central and eastern Europe are however less disadvantaged because of their extensive railway networks which have been substantially modernised.

2.2.2.8 Main issues resulting from the scenario and impacts on EU and other policies

The scenario is a policy scenario aiming at discouraging the development of road and short-distance air transportation through strong policies including a wide range of measures. It does not rely only upon transport policy, but also upon efficient instruments to implement the Lisbon Strategy, because transport policies alone will never achieve the decoupling between economic development and the growth of transport flows. The scenario shows that success in this field can be achieved up to a certain extent and in the long range if coherent and substantial policies are applied at all levels. As numerous items among the measures envisaged are not really popular (at least for some segments of the European population) the question can be raised in how far such a scenario is politically realistic. The scenario shows also that the impacts of such policies go far beyond the reduction of air pollution and greenhouse gas and the limitation of climate change. Impacts can also be observed on the relative accessibility of the respective European regions and therefore on the evolution of inter-regional disparities in Europe. In order to avoid negative evolutions in this field, transport and economic policies should be accompanied by other public policy measures, in particular in the field of regional policy (in order to counteract territorial imbalances), urban planning (in order to counteract land price speculation, to promote better integration of urban functions and to limit short-distance mobility etc.), governance (stronger cooperation between local authorities, administrative levels and sectoral administrations).

2.2.2.9 Summary

The scenario is based on a combined strategy which aims on the one hand at enforcing the provisions of the Kyoto Agreement and of the Göteborg Strategy (reduction of greenhouse gas emissions and further environmental protection) and on the other hand at moving the European economy towards more knowledge-based components according to the Lisbon Strategy. Policy measures are taken at all levels to discourage the use of cars and trucks, both for long-distance and for regional and local transportation of people and goods and to reduce air transport on short distances. Specific policy measures encourage and promote alternative transport modes with lower environmental footprint. The transport strategy is accompanied by measures of economic policy likely to favour the knowledge-based economy and to develop more immaterial economic functions. The implementation of the strategy shows negative macro-economic impacts in the short-term (increase of transport costs), but high competitiveness in the long-term. At Europe-wide scale, the regions most advantaged are those easily accessible by long-distance efficient railways, H.S.T., waterways and maritime transport. These are mainly regions with large metropolitan areas within the Pentagon, but also outside of it. The regions most disfavoured are those the national and European accessibility of which is largely dependent upon road and air transport, numerous peripheral regions belonging to this category. At meso-level, regions with dense railway networks or important commercial ports are favoured. At more local level, the evolution is in favour of compact cities, suburbanisation trends slowing down. The new transport and economic policies are highly beneficial to the environment and quality of life, in particular in the long range.

2.2.2.10 Possible ESPON Indicators for the transport scenarios

Numerous ESPON core-indicators can be used in the context of these scenarios, such as:

- Income per capita, GDP per capita
- Population growth
- Net migration rate
- Unemployment rate

- Passengers in airports
- Transport network by mode
- Transport node by mode
- Travel time by spatial level and transport mode
- Daytime accessibility by transport mode
- Network distance to linear distance ratio
- Proportion of main lines connected to digital exchange
- ADSL lines as a proportion of total main lines
- Proportion of exchanges with co-located equipment
- Availability of Internet services with local rate charges/unmetered access
- ADSL subscribers per 10 000 inh.
- Proportion of households with broadband Internet access
- ICT tele-communication
- Tourist capacity
- Market accessibility potential by spatial level and transport mode
- Travel time by spatial level and transport mode
- Travel costs by transport mode
- Average speed to markets
- Average time to markets
- Impact of accessibility change on GDP per capita
- Impact of accessibility change on Equivalent income measure of user benefits
- Impact of accessibility change on employment.