TRANSPORT IN FUNCTION OF ECOLOGICAL SUSTAINABILITY

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ABSTRACT
In the analysis of strategic goals of the transport development some non-transport syllabuses can be observed, e.g. ecological and social. These are subsidiary goals that indirectly dictate the targeted transport development based on the sustainability principles, concretely induction of the transport demand as function of ecological balance and poly-centricity of transport network.

KEYWORDS: transport strategy, transport policy, subsidiary objectives, sustainability

INTRODUCTION

The economic and social benefits of transport industry are doubtless. At the European Union level the transport sector participates with a share of about 4 percent of the European Union workforce are employed directly in the transport sector and another 1.4 percent work in the manufacture of transport equipment. Additional jobs are provided by infrastructure maintenance and construction and sales and repair of vehicles. The value added by the transport sector amounts to about 4.0 percent of gross domestic product. Vehicle manufacturing in addition contributes 1.7 percent and sales, maintenance and repairs of vehicles a further 1.6 percent. 13.6 percent of household spending is on transport.
The negative aspects of transport, however, regarding accidents, pollution and congestion have managed to reach or to exceed the level of positive effects. These transport caused social and environmental costs that have not been internalised in transport sector are articulated in the notion of external costs.
Recent studies have brought, unfortunately, the estimate of the external transport costs (without congestion costs) in the amount of about eight percent of the gross domestic product for 15 EU countries, i.e. fourteen percent of the gross domestic product for the transition countries of the Central European Initiative.
Considering that the road transport has a share of more than 80 percent in the generation of external costs, consequently the strategic guidelines of further transport development are no longer based on the demand-orientation, but rather on goal-orientation i.e. targeted induction of the desired transport demand.
The regional approach to regulatory harmonisation, infrastructure planning and management in the transport sector, contributes to faster implementation of the instruments of Common Transport Policy. In this sense the subsidiary objectives of transport system development are articulated by the notion of sustainability.

SUBSIDIARY OBJECTIVES OF TRANSPORT DEVELOPMENT

Strategic transport planning understands identification of relevant goals of long-term development that serve as input-guidelines of the transport policy and the origin of adopting the development guidelines and decision-making in the governmental executive bodies.

Strategic goals of the transport development in Europe are – integration into the Trans-European transport network, fair pricing in transport, environmental protection, transport safety, social cohesion and strengthening of the transport market.

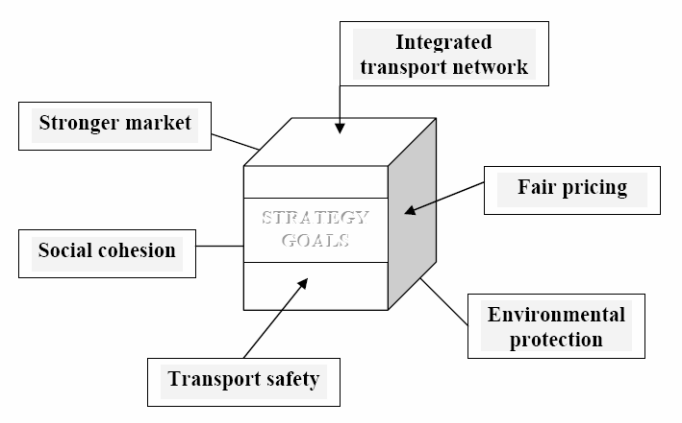

Fig. 1 Strategic objectives of European transport development

In the analysis of strategic goals of the transport development some non-transport syllabuses can be observed, e.g. environmental and social.
These are subsidiary goals that indirectly dictate the transport system development – targeted development based on the sustainability principle, concretely induction of the transport demand as function of ecological balance and poly-centricity of transport network development.
The role of the transport system in keeping up with the requirements for free movement of goods, people (labour), services and capital is irreplaceable.
Therefore, the main function of the transport system is to insure spatial integration and social cohesion, as well as economic integration.
The problem of social cohesion was actualized in the eighties by Greece and Spain joining the European Union, so that the establishing of the so-called cohesion funds insured extra means for the transport connection of these allocated or peripherally located member countries, in order to establish equal conditions of market competition and basic movement freedoms of people, goods, services and capital.
Implementation of goals of the transport development primarily assumes regulatory autonomy of the transport sector and consistent inter-sector cooperation, in order to insure efficiency in the key aspects: regulatory policy, transport management, investment policy, tax and price policy, physical planning and social policy (Steiner, 2006).

TRANSPORT POLICY AND SUSTAINABILITY

In process of strategic transport planning, special request refers to the sustainability of current and emerging land use and transportation patterns. This topic reflects both the significant impacts that current patterns of transportation have on the environment and the complex interactions between transportation, land use, and activity systems.
„Sustainable transport is seen as transportation that meets mobility needs while also preserving and enhancing human and ecosystem health, economic progress, and social justice now and for future. Planning for sustainable development aims to attain all three objectives simultaneously and in a just manner, considering access as well as mobility in the process“ (Deakin, E., 2001).
Problem issue of strategic transport planning is closely connected with insufficient sector's co-ordination within state administration and executive function delegated to bottom level.

This is indicative weakness both for policy making in developed EU countries and transition countries. In 2002 OECD initiated MONIT (Monitoring horizontal innovation policy) project aimed to consider relationship between innovation policy and four policy areas – regional development, ITC, transport and sustainable development. With regard to limitations of single goal policy making, the prerogative of co-ordinate and coherent policy is horizontal approach with cross-sector interfaces.

According to the assumptions of EU common transport policy, as well as the ECMT strategy of sustainable transport development, the main guidelines of complementary transport policy should be:

- target planning and managing of traffic flows;
- reduction of the harmful influence of transport on the environment;
- improved transport safety;
- increased efficiency of transport system;
- compensation of the transport market deregulation and liberalisation consequences.

Some of mentioned guidelines, especially those related to environmental protection, seem to be insensitive to the criteria of satisfying the real transport demand, but in the long run they ensure optimal integration of transport sector into the national and international frames of progressive economic development (Steiner, S., Bozicevic, J., 2008).

The Renewed EU Sustainable Development Strategy (EU SDS, 2006) identifies seven key challenges and corresponding targets, operational objectives and actions.

One of them, titled Sustainable Transport, has overall objective to ensure that transport systems meet society's economic, social and environmental needs whilst minimizing their undesirable impacts on the economy, society and the environment.

Operational objectives and targets in great extend refer to subsidiary condition of future transport development:

- decoupling economic growth and the demand for transport with the aim of reducing environmental impacts target planning and managing of traffic flows;
- achieving sustainable levels of transport energy use and reducing transport greenhouse gas emissions;
- reducing pollutant emissions from transport to levels that minimize effects on human health and/or the environment;
- achieving a balanced shift towards environment friendly transport modes to bring about a sustainable transport and mobility system;
- reducing transport noise both at source and through mitigation measures to ensure overall exposure levels minimize impacts on health;
- modernizing the EU framework for public passenger transport services to encourage better efficiency and performance by 2010;
- in line with the EU strategy on CO_2 emissions from light duty vehicles, the average new car fleet should achieve CO_2 emissions of 140g/km (2008/09) and 120g/km (2012);
- halving road transport deaths by 2010 compared to 2000.

Concrete actions have been predicted at the level of the European Union and member states, which include following measures (European Commission EU SDS, 2006):

- improvement the economic and environmental performance of all modes of transport and, where appropriate, measures to effect a shift from road to rail, water and public passenger transport including lower transport intensity through production and logistic process reengineering and behavioral change combined with a better connection of the different transport;
- improvement of energy efficiency in the transport sector by making use of cost-effective instruments;

- focusing on possible alternatives to road transport for freight and passengers including the appropriate development of the Trans-European Network and inter-modal links for freight logistics, inter alias by implementing measures envisaged in the Commission action programme for inland waterway transport "NAIADES" and the "Marco Polo II" Programme;
- usage of infrastructure charging for all modes of transport drawing on new opportunities arising with new satellite, information and communication technologies. In the framework of the Euro-vignette Directive, a generally applicable, transparent and comprehensible model for the assessment of all external costs is prepared by the Commission to serve as the basis for future calculations of infrastructure charging;
- striving to make progress towards effective global solutions for the reduction of harmful impacts of international maritime and air traffic;
- increasing road safety by improving road infrastructure, by making vehicles safer, by promoting common European-wide awareness campaigns with a view to changing road user behaviour as well as by establishing cross-border enforcement;
- development and implementation of the urban transport plans and systems by local authorities, in line with the thematic strategy on the urban environment, taking into account the Commission technical guidance for closer co-operation between cities and surrounding regions;
- development of a long term and coherent EU fuel strategy.

Progress inventory analysis shows that Europe is not yet on a sustainable transport path. Energy consumption by transport, used as a proxy for transport demand, grew at an average rate of 1.3% per year between 2000 and 2005 in the EU-27, only slightly less than the 1.7% average for GDP over the same period, showing no real signs of decoupling.

Transport greenhouse gas (GHG) emissions are still growing, with an average annual growth rate of 1.2% between 2000 and 2005 in the EU-27. In 2004, domestic transport was responsible for 21% of total GHG emissions in EU-15. It grew by 26% between 1990 and 2004 whereas emissions from most other sectors decreased during the same period. Average CO_2 emissions emitted per kilometre from new passenger cars have decreased steadily from 2000 to 2004 in the EU-15, at an average annual rate of 1.3%, but this is not sufficient to reach the 2008/09 target, or the 2012 target.

The objective of achieving a balanced shift towards environmentally friendly transport modes has not been achieved. The EU-27 share of road in inland freight transport has continued to increase, albeit relatively slowly, since 2000 to reach 76.5% in 2005. Passenger-kilometres by car showed a relative stabilisation in the EU-15, but still reached 84.8% of total inland passenger transport in 2004. Road congestion has been increasing (European Commission Progress Report, 2007).

Progress has been made on reducing pollutant emissions from transport, with emissions falling by 4.4% per year on average between 2000 and 2004 for ozone precursors, and by 4.2% for particulates.

Despite the increase in road traffic, there has been a steady reduction in the numbers killed in accidents in both the EU-27 and the EU-15. The EU-15 is well on track to meet the proposed target of halving the number of deaths by 2010 compared to 2000, but the EU-27 lags slightly behind.

Key EU policy developments include the Commission's mid-term review of the Transport White Paper; the Green Paper on Urban Mobility, the adoption of Regulations known as Euro 5 and 6 standards, which setting stricter standards for cars and light commercial vehicles; and Commission proposals to amend the fuel quality directive and Directive 2003/96 regarding minimum excise rates for road diesel and to include aviation within the EU emissions trading

scheme. A railway liberalization package has been adopted and the legal framework for public transport services has been revised.
Relevant measure of SDS implementation within EU member states refers to promotion of technology for fuel efficiency, greener propulsion and environmentally friendly, less energy intensive modes of transport; tightening of pollutant emission standards and greenhouse gas intensity for all transport modes; continuing the development of noise mapping and measures to reduce transport noise at source; launching action on urban mobility and making optimal use of logistics; and development of methodologies for infrastructure charging.
Economic justification of implementing the planned goals of transport policy within the enlarged European Union is based on the estimate of the amount of external transport costs, which is in transition countries, due to the low quality transport system, almost doubled than the average at the European Union level.
Besides capital investments in environmentally friendly transport infrastructure, the transport policy can additionally stimulate these transport modes by various mechanisms - e.g. by subsidising and through benefits, but also by higher taxes on road vehicles, which is a significant method of compensation for external costs of road transport, and by expansion of the toll charging and higher tolls on road infrastructure.
With regards to undesired trend of "automobile booming", transport policy has to show special sensitivity for solving the issues of urban transport management, so that mixed instruments in co-operation with health, social and other departments should primarily influence the following:

- shift of transport demand from individual to public and non-road transport modes, and
- prevention of superfluous traffic by reducing travel distances, by using information and communication technologies, and especially for the reduction of peak loads.

The accompanying measures of implementing the mentioned guidelines refer to:

- preparation of the expanded plans and financing for public passenger transit;
- promotion of ecologically friendly transport modes, mainly walking and cycling, as well as at the same time healthier transport modes;
- programme of restrictions in using motor vehicles in the urban area;
- programme of integral adaptation of transport infrastructure and public transit means to the enabled persons and senior users needs.

FACTS ON EU SDS IMPLEMENTATION DYNAMICS – 2009 MONITORING REPORT

Between 2000 and 2007, the energy consumption of transport in the EU-27 increased by 11 percent whereas GDP grew somewhat faster 2.1 percent per year on average, and as a result the consumption of energy per unit of GDP decreased by 0.6 percent per year on average, indicating only minor decoupling.

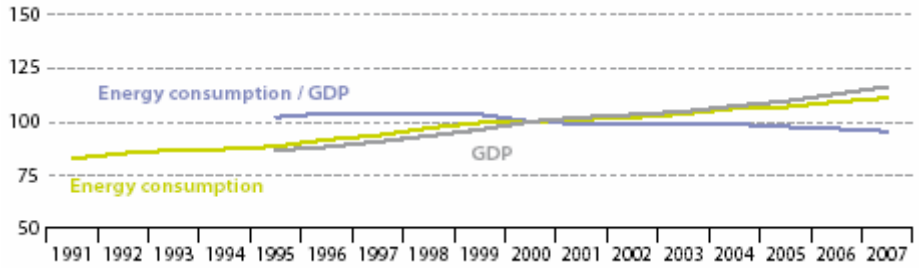

Fig. 2 Ratio of energy consumption of transport to GDP, EU27 (index 2000=100)
Source: Eurostat

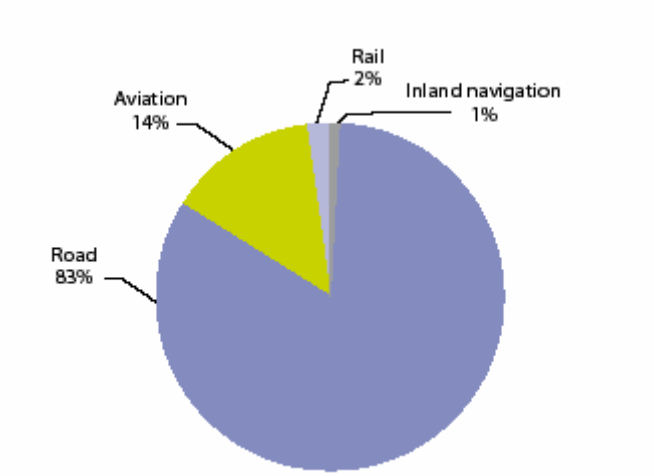

Fig. 3 Energy consumption of transport by mode, EU27 (2007)
Source: Eurostat

In 2007, road transport accounted for about 82 percent of transport energy consumption. Between 2000 and 2007 its energy consumption increased by 1.4 percent per year on average. However, due to even higher growth rates of air transport energy consumption amounted 2.3 percent per year, the share of road transport in total transport energy consumption slightly decreased by 0.2 percent per year between 2000 and 2007.
Air transport reached a share of 14.2 percent in total transport energy consumption in 2007. Over the previous decade, annual growth rates had been even higher (4.6 percent per year), but following the terror attacks in New York in September 2001, civil aviation significantly slowed down, only picking up again between 2004 and 2007.
In 2007 rail transport and inland navigation had shares in total transport energy consumption of 2.5 percent and 1.4 percent respectively. Despite an increase in volumes of both passenger and freight transport, the energy consumption of rail transport decreased by 0.4 percent per year between 2000 and 2007, as did inland navigation.

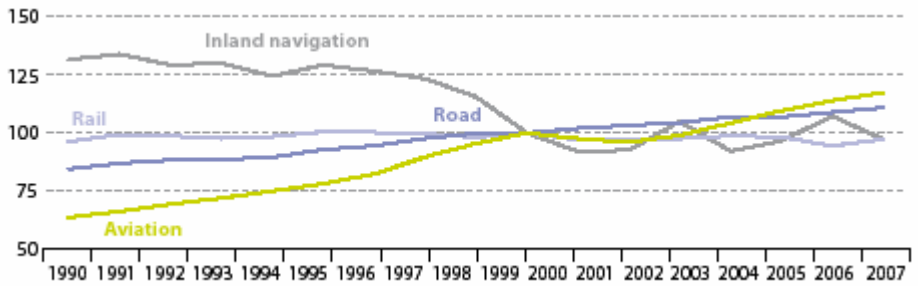

Fig. 4 Energy consumption of transport by mode, EU27 (index 2000=100)
Source: Eurostat

Transport is an important emitter of greenhouse gases, responsible for a share which has grown from 14 percent of total EU-27 emissions in 1990 to 19.5 percent in 2007. It is the only major source category currently producing considerably more greenhouse gas emissions than in 1990.
Between 2000 and 2007 the average growth rate of total greenhouse gas emissions from transport in the EU-27 fell to 0.98 percent. Road is the most important driver for this development with a growth rate of 1 percent per year, and a share which grew to 94 percent of the total in 2007.

Greenhouse gas emissions from other transport modes as a whole have grown by 0.6 percent per year since 2000. This rise was due to increases in emissions of domestic aviation and inland navigation as emissions from rail transport continued to decline.
Under the Kyoto Protocol, transport emissions do not include international aviation and shipping. Their emissions have risen rapidly and between 2000 and 2007, despite a slowdown in international air traffic following the 11 September 2001 attacks, emission from international air transport grew at 2.8 percent per year, and emissions from international maritime have grown at 4.1 percent per year since 2000.
Total emissions from these sources amounted to about 315 million tonnes of CO_2 equivalent in 2007, nearly double their level of about 176 million tonnes in 1990.

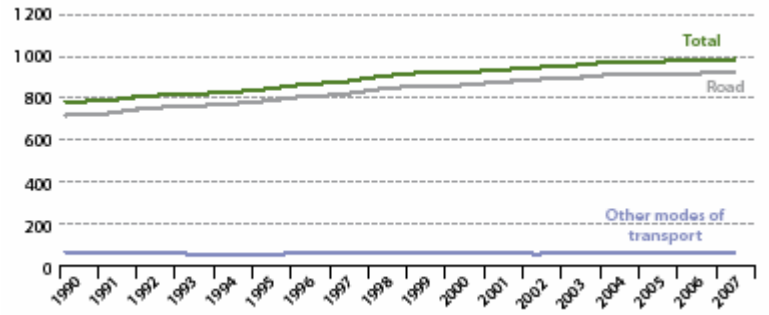

Fig. 5 Greenhouse gas emissions from transport, EU27 (million tones of CO_2 equivalent)
Source: European Environment Agency, Eurostat

The average CO_2 emissions per km of new passenger cars in the EU-15 decreased by 2.1 grams per year on average between 2000 and 2007, reaching 158 grams in 2007. Data for the EU-25 over the period 2004 to 2007 are similar. The current rate of progress is insufficient to reach the 120 gram target by 2012.
Despite a shift towards diesel, which produces less CO_2 per km for the same engine power, and the efforts of car makers to improve fuel efficiency, the average greenhouse gas emissions per km of new passenger cars have not been enough reduced. The reasons for this include user preferences for comfort and safety features and consequent increasing vehicle weights, increasing engine power and four-wheel drives and SUVs.

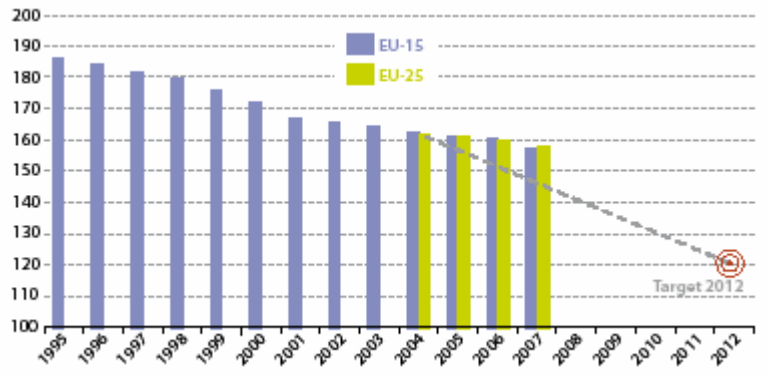

Fig. 6 Average CO_2 emissions per km from new passenger cars (g CO_2 per km)
Source: Eurostat

In 2007 the Commission made a legislative proposal to ensure target implementation, along with other technological improvements and an increased use of biofuels, the Community target of 120 g/km would be met by 2012 (Commission communication, 2007). Legislation has also been adopted (EC Regulation, 2009) on future targets for CO_2 emissions from cars. A target of 130 g/km is to be reached by improvements in vehicle motor technology by 2015,

following a gradual phasing-in period from 2012. A further 10 g/km reduction should be obtained by using other technical improvements. Different phasing-in requirements have been defined for each car manufacturer. In addition a long-term target of 95 g CO_2/km for 2020 was introduced.

Emissions of ozone precursors from transport have been steadily decreasing since 1990. The decrease has been driven by the EURO emission standards for new cars and lorries, the introduction of catalytic converters for cars, improvements of fuel quality, and reduction of evaporation losses during refuelling.
Total ozone precursor emissions from transport in the EU-27 were reduced by 4.9 percent per year between 2000 and 2006. Since 1990, total EU-27 ozone precursor emissions from transport have been reduced by more than 50 percent and stood at 11 million tonnes in 2006.
Emissions from road transport fell to 8.3 million tonnes in 2006 representing an annual average decrease of 6.3 percent since 2000. Despite this considerable reduction in ozone precursor emissions from transport, there are still air quality problems, especially in urban areas.

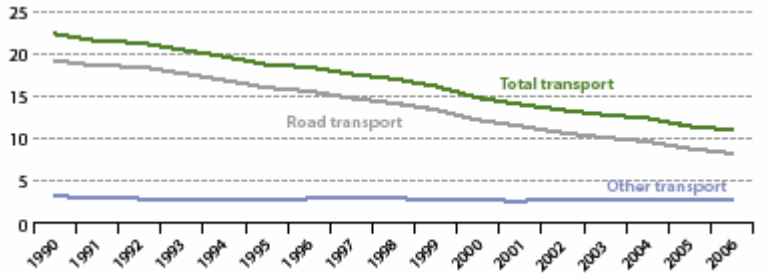

Fig. 7 Emissions of ozone precursors from transport, EU-27 (million tones tropospheric ozoneforming potential)
Source: European Environment Agency, Eurostat

Emission of particulate matter from all transport means in the EU-27 decreased by 3.0 percent per year between 2000 and 2006. Road emissions decreased at the ever higher rate of 4.2 percent. Other transport modes increased by 0.5 percent per year. The decrease of particulate emissions by road transport is the result of more rigorous emission standards for cars and lorries, the greater use of low-sulphur fuels and the gradual, but accelerating, introduction of diesel oxidation catalysts and diesel particulate filters.
Despite the reduced exhaust emissions from road transport, there has been no significant improvement in concentrations of particulate matter in urban areas with high traffic levels. In 2007 the Commission proposed tightening some of the emission standards for buses and lorries as well as requiring manufacturers to take the technical measures necessary to ensure that exhaust emissions comply with these limits under normal conditions of use for the normal life of the vehicle (Proposal for a Regulation, 2007). Future emission standards for diesel cars i.e. Euro 5 and Euro 6 standards, which will take effect in 2011 and 2015 respectively will only be met with a particulate filter.

The ‘Greening Transport’ package was launched by Commission communication in 2008. It is accompanied by Commission strategy for the internalisation of external costs of transport and related document (Maibach, M., Schreyer, C., Sutter, D., van Essen, H.P., Boon, B.H., Smokers, R., Schroten, A., Doll, C., Pawlowska, B., Bak, M., 2008), and a proposal on the charging of heavy goods vehicle for infrastructure use, which will lead to more efficient and greener road tolls for lorries, using the revenue to reduce environmental impacts from transport. Electricity used in rail transport has been included in the EU Emission Trading

Scheme (EU ETS) since 2005. Regarding aviation, emissions from flights with origin or destination within the EU will be covered by the EU ETS from 2012.
Measures to improve fuel quality and a binding target of 10 % share of renewable energy sources in transport by 2020 are part of the Climate and Energy package.
The Fuel Quality Directive was amended to introduce a mandatory target for reducing greenhouse gas intensity of fuel used in road transport. In addition, a Directive has also been adopted to reduce energy consumption, CO_2 and pollutant emissions from public service road vehicles (Directive 2009/33/EC).
As part of the integrated approach to reducing CO_2 emissions from light-duty vehicles, the average CO_2 emissions from new passenger cars has been set at 130 g CO2/km by 2012-2015 and 95 g CO_2/km by 2020.
The Commission intends to publish a new White Paper in 2010 and in preparation has recently launched a consultation outlining the main challenges for the next decade (Commission Communication, 2009).

CONCLUSION

The transport system development, apart from the physical dimensioning of the infrastructure network, needs to be harmonized with the referent strategic provisions of the European Union common transport policy, which assume incorporation of the principles of integrity, interoperability and sustainability into the national transport policies.
Transport is predicted to profound changes in its main framework conditions. The unpredictability of fuel prices, together with the financial crisis, has brought car manufacturers, airlines and related industries into substantial economic difficulties. To respond the increasing demand for transport fuels, biofuels have been promoted, but there are serious concerns about the sustainability of biofuel production and the possible conflicts with food production for a rising world population. In a number of EU cities road pricing schemes have been introduced to fight urban congestion and pollution and to promote public transit. Although a substantial part of daily trips refers to walking, human powered mobility is often in conflict with motorised transport and struggles for space and safety especially in urban areas. These are some of the reasons why transport is one of the key challenges of the EU Sustainable Development Strategy.

The instruments of the transport policy, especially in urban transit, should be used to stimulate the alternative to road motorized transport – non-motorized transport, high-speed railways, and modal shift of demand from individual to public transport.
An important aspect in transport planning and designing, especially of capital transport infrastructure, is the standardization of conditions for efficient transport sector management, i.e. standardization of the application of intelligent transport systems in the network design.
Apart from the special sensitivity in (re)modelling of the chronically lagging behind facilities in the transport system development – public local transport and ITS applications, there is one more segment of transport development that is strategically dominant – intermodal transport.
The implementation of the interoperability principle dictates the development of intermodal transport options with the aim of optimizing the usage of natural resources. From the aspect of sustainability, transport development is marked by coordinated approach to modelling the economic growth, ecological balance and social development.
The problems of transport development, and especially the development of the transport infrastructure, similar to other important infrastructure sectors – energy and water supply, has been marked by extremely specific features, that directly address the role of the government and private sector in their development and management:

- At national and metropolitan levels the transport infrastructure correlates closely with the spatial arrangement and has high effect on the spatial structuring of the total economy. These are the fields of highest government responsibility, which require pro-active planning together with adequate price and tax policies;
- The transport activity, especially in the road branch, has substantial negative external effects – congestion, pollution, and accidents that are reflected with greater seriousness than the generated externals in other sectors directly in the structure of prices and charges. This means that the government interventions in improving the allocation of financial resources are necessarily;

There are huge differences of transport infrastructures in terms of property, investment provisions, types of activities and traffic volume. Therefore, it is not possible to provide a mutual model of environmental management but in practices there are several environmental management systems (EMS) that provide procedures and specifications in a systemized and applicative manner to meet environmental objectives.

The best environmental practices include procedures that (Comtois, C., Transportation Environmental Management, 2009):

- match transport facilities, operations or projects with environmental components,
- link environmental components with regulatory requirements,
- assess risks, impacts and responsibilities,
- identify environmental issues to be addressed,
- consider commercial strategies and operations of private and public sector organization,
- introduce best practices,
- undertake continuous monitoring and auditing.

The most often mentioned environmental management systems are Eco-Management and Audit Scheme EMAS, which has been developed to stimulate and synchronize European environmental policies and ISO 14 001 as main industrial reference in terms of environmental management systems and sustainability, which offers three categories of indicators to measure the environmental performance that could be applicable to the transport industry..

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