

ENVIRONMENTAL SUSTAINABILITY OF TRANSPORT

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Abstract

Further growth of mobility cannot continue in the same manner as in the past, i.e. without gradual introduction of new environmentally-friendly transport policies, growth may soon become of unsustainable dimensions. Technological innovation may contribute to reorganisation of the transport system in order to make it able to fulfil a growing demand for mobility and, at the same time, ensure energy savings and greater respect for the environment.

Key words

environment, mobility, technological innovation

Introduction

In respect of the age and historical position of rail transport, the newest data on the European level show that railways can offer major social and environmental advantages in terms of energy consumption, atmospheric emissions, transport burdening, and accident rate, etc.

Concept of a sustainable development

A recent notion of human development that identified only with the economic growth has now been corrected so that it would lead also to fulfilment of social goals, in particular to reduction of poverty, enhancement of the quality of life, improved opportunities for better education and health. This change of orientation requires a comprehensive approach to the development of management of mutual relations between nature and humans, branches and structural aspects of development on all levels [10]. As a result of this changed orientation,

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the concept of sustainable development was created, which is further developed and internationally applied. Since the 1960s the knowledge that unlimited or uncontrolled growth, whether of human population, consumption, or pollution etc., is not sustainable under the circumstances of real, existing and limited resources is becoming more wide-spread.

It is, therefore, necessary to replace the model of industrial civilisation by a more sustainable and just concept. The sustainable development concept is nowadays considered as a possible solution for the adverse consequences of global trends in societal development and their negative impacts on the environment. The emphasis is put on the need to base this concept on healthy ecosystems, strong economy and well-functioning social issues.

In its draft on Sustainable Development (SD) Principles, the EU has declared that SD is the key factor of all EC policies stipulated by the Treaty. This document determines the crucial objectives such as environmental protection, social equity and cohesion, economic prosperity and the meeting of international responsibilities. In fulfilling these objectives the EU is guided by the following political principles: promotion and protection of fundamental human rights, solidarity within and between generations, open and democratic society, involvement of citizens, involvement of social and business partners, policy coherence and governance, policy integration, use of best available knowledge, use of the precautionary principle, and the “polluters pays” principle [1].

Transport as one of the major climatic threats

The topic of climatic changes is becoming increasingly urgent. It is implied that the cause behind environmental degradation is mainly *energy production*, while little or no attention is paid to its *use*. In this respect it is important to pay more attention to transport and mobility.

Economic and technological progress keeps contributing to an increase in the volumes of transported goods and passengers all throughout the planet.

Different transport modes are responsible for approximately 30 % of global warming, which is a share larger than that of energy production or industry. In Europe, even despite increasingly cleaner engines, the carbon dioxide emissions have not decreased, but keep growing (+ 25 % since 1990).

According to the European Environment Agency, it is necessary to re-think the whole mobility concept. The Agency also claims that the two main factors which have historically dominated decision-making regarding transport issues (time and costs) now have to be considered alongside a third, equally significant factor, which is environmental sustainability. This new factor has to be taken into consideration at the beginning of infrastructure planning [7].

Transport policy of the EU

Transport is one of the key factors of development in every modern society, while in itself it is not a goal but a means of economic progress and a precondition for achieving social and regional solidarity. The aim of transport policy is to establish transport conditions and minimize the risks related to access to the transport market and transport infrastructure, and ensure continuously growing demand for transport in the society (transport of goods and

passengers) in the required time and quality, while at the same time reducing negative effects of transport on the environment. The framework for achieving these objectives has to be sustainable development, which includes economic growth, social solidarity and ecological acceptability.

The objective of the Common EU Transport Policy is to remove obstacles at the borders between the Member States so as to facilitate free movement of persons and goods between the Member States of the European Union [4]. Its prime objectives are to complete the internal market for transport, ensure sustainable development, make innovations in the transport sector, and increase safety standards. In an ideal case, all European regions should be mutually interconnected by Trans-European railway and road corridors, the construction of which, however, lags behind due to insufficient funding [3].

The EU Transport Policy should ensure the meeting of two contradictory goals: transport development and protection of the environment. It is necessary to propose a European strategy for a reasonable regulation of transport flows, connections of various carriers, and a strategy of transport limits. Railway transport shall play an important role in the future [8].

Interoperability of the Trans-European conventional railway system

The existence of differences in national regulations and technical conditions of railway administrations in Member States of the European Union, which are the result of separate development of railway industries, prevent the international railway transport from unlimited operation of trains on the whole Trans-European railway network. Due to forced stops of trains at borders when they are taken over between individual railway managers and carriers, the transport periods are prolonged and thus the competitiveness of rail transport as compared to road transport is reduced. In the last decades these differences caused reduction of the share of railway transport on the European transport market down to 28 %, with an anticipated further reduction down to 11,2 % by 2030 in case the problem with railway heterogeneity is not solved.

Smooth, obstacle-free train operation on the Trans-European railway network requires comprehensive compatibility of infrastructure characteristics, rolling stock characteristics and efficient interconnection of information and communication systems of various infrastructure managers, carriers and business partners. In order to enhance competitiveness of the Community railways in comparison to other transport modes, which are operated without obstacles thanks to technical compatibility of infrastructure and vehicles; in order to reduce ecological impacts of transport on the environment, to reduce overloaded traffic on European roads, and in order to establish a pan-European transport system, the characteristics of which would ensure fast and safe fulfilment of transport needs of the Community, on 23 July 1996 the European Parliament adopted Directive 96/48/EC on inter-operability of Trans-European high-speed railway system. As Directive 96/48/EC deals with interoperability only within the high-speed railway system, and as the results of the study on integration of national railway systems showed the need for integration in the rail sector as a whole, on 19 March 2001 the European Parliament adopted Directive 2001/16/EC on interoperability of the Trans-European conventional railway system, including further directives and regulations stated below with a direct effect on the overall interoperability of the Community railways:

- Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certificates,
- Directive of the Council 2004/49/EC of 29 April 2004 on safety on the Community's railways and amended Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC,
- Directive 2004/50/EC of 29 April 2004 amending Directive 96/48/EC and Directive 2001/16/EC,
- Regulation no. 881/2004 of the European Parliament and the Council of 29 April 2004 establishing the European railway agency,
- Communication from the Commission to the European Parliament and the Council of 4 July 2005 COM (2005) 298 on the deployment of the European rail signalling system ERMTS/ETCS.

Inter-operability is the main precondition for a well functioning Trans-European conventional railway system. It means the ability of the transport system to ensure safe and smooth movement of transport vehicles on the infrastructure and to reach specific performance levels determined for the system. This ability lies in implementation of managing, technical and operational conditions while meeting the basic requirements.

The European Association for Railway Interoperability (AEIF), acting as a common representative body for infrastructure managers, railway undertakings and industry, was granted a mandate to elaborate technical specifications for inter-operability (TSI) separately for each of the mentioned subsystems with regard to:

- safety, whereby all components used have to meet strict criteria ensuring safe movement of vehicles on transport infrastructure, including safety for servicing personnel at points of operation management,
- reliability and availability, whereby monitoring and maintenance of fixed and movable components, being part of train movement, have to be organised, performed and quantified so as to keep their operability under conditions stipulated in advance,
- health, whereby individual materials and components made of them cannot impose risks to the health of the personnel,
- protection of the environment, whereby individual materials and components made of them cannot impose risks to the environment,
- technical compatibility, whereby the technical characteristics of components of infrastructure and fixed installations have to be mutually compatible with the components built into trains operated on the Trans-European railway network [2].

In 2002 the Commission adopted the following TSI for the Trans-European high-speed railway system:

- rolling stock,
- energy,
- control and command,
- operation and maintenance.

Technical specifications of inter-operability for the Trans-European conventional rail system were divided into three categories, the first TSI category dealing with rolling stock,

telematic applications for freight, noise, control and command, operation and maintenance adopted by the Commission on the turn of 2005 and 2006. TSI of the second and the third category shall be adopted gradually in the following years. TSI define the basic parameters for components and parameters of interfaces connecting subsystems into a whole, and other specific cases which are necessary in order to ensure correct functioning of the whole system, including the technical and geographical scope of application of the given TSI providing for inter-operability of the Trans-European railway system. The adopted TSI apply to new or renovated lines and rolling stock, i.e. TSI:

- Noise subsystem – deals with noise parameters caused by freight wagons, passenger coaches, locomotives and multiple-unit sets when starting, passing through, and standing still and parameters of inner noise in the driver’s cabin.
- Rolling stock subsystem – deals with parameters of construction and mechanical components, track interaction and rolling stock measurements, braking, communication, environment conditions, system protection and maintenance in order to ensure technical compatibility not only within the subsystem, but also within the whole system. The focus is on ensuring inter-operability in the rolling stock fleet management subsystem with respect to ensuring required performance when delivering transport services.
- Traffic operation and management subsystem – governs the rules for notices exchanged between infrastructure managers and railway undertakings, the scope of documentation, which the service personnel should have at disposal in order to ensure train operation, as well as physical and professional capabilities.
- Control-command and signalling subsystem – aimed at ensuring safe movement of trains of the Trans-European railway network.
- Telematic applications for freight – commercial operation of trains, wagons and intermodal transport units within the Trans-European railway network requires efficient exchange of information between different infrastructure managers, railway undertakings, service providers, forwarders, authorities and other parties to the transport process [5].

Transport of passengers and goods in the Slovak Republic

The transport sector includes entities providing for public and commercial transport. Public transport includes entities providing transport services by rail, road, water, air or pipe and other auxiliary transport services. Commercial transport is carried out for its own needs or the needs of other parties which belong to different industries of the Slovak economy. The transport sector contributed 6,0 % to the creation of GDP in 2006 [6].

SHARE OF TRANSPORT IN GDP CREATION (%). SOURCE: STATISTICS OFFICE OF THE SLOVAK REPUBLIC - NOTE: ANALYTICAL FRAMEWORK OF THE PUBLISHED DATA ON NATIONAL ACCOUNTS IS BASED ON THE METHODOLOGY OF THE "EUROPEAN SYSTEM OF NATIONAL AND REGIONAL ACCOUNTS ESA 1995"

Table

| 1993 | 1996 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|------|------|------|------|------|------|------|------|------|------|
| 6,1 | 8,3 | 7,8 | 7,5 | 7,6 | 7,6 | 7,1 | 6,8 | 7,2 | 6,0 |

Public passenger transport by road and rail has continued to indicate a long-term trend of declining number of transported passengers and overall performance. Transport volumes in passenger road transport reduced by more than 30 % as compared to 1993; in the case

of rail transport the decrease amounted to even more than 50 %. Volumes of waterborne passenger transport were reduced by more than 40 %. In the monitored period (1993-2006) the volumes of air passenger transport rose substantially (from 37 million passenger-km in 1993 to 2,829 million passenger-km in 2006).

Transport of goods and transport volumes of road freight keep growing. Road transport has the major share in freight transport volumes – ca. 67 %. Performance of rail freight transport decreased in 2006 by more than 30 % as compared to 1993, and volumes transported by water grew in 2006 by ca 11 % as compared to 1993.

Transport Policy of the Slovak Republic by 2015

The fundamental principle of the Transport Policy of the Slovak Republic is sustainable development, which is based on promoting sector balance, oriented on transport users, promotion of equal opportunities, efficient use of land and resources, open access and gradual shift of costs to those who cause them. Stemming from the White Paper, this approach is reflected in the basic principles leading to proportional and structurally balanced sustainable transport development and to the establishment of new, mutual relations directed internally as well as abroad. Sustainable mobility development was defined as a global objective for transport policy of the Slovak Republic, i.e. establishment of conditions to satisfy constantly growing transport needs of the society (transport of goods and persons) in required time and quality, while simultaneously reducing negative impacts of transport on the environment. The global objective contains eight specific goals, which are: (1) ensuring competition within the transport sector, (2) modernisation and development of transport infrastructure, (3) ensuring sufficient resources to fund transport, (4) reduction of negative impacts on the environment, (5) increasing the quality and development of transport services, (6) increasing safety and protection, (7) promotion of research and development in transport and (8) coping with transport globalisation.

Modernisation and development of transport infrastructure

The Priority 2.1 (Specific aim 2 of the Transport Policy of the Slovak Republic) – Modernisation and Development of Railway Infrastructure, states that the technical basis of railway transport in Slovakia is not sufficiently ready for changing conditions and the structure of the transport market due to a low technical level and quality of the technical basis of railway transport, and due to neglected maintenance and insufficient upgrading. The risk posed by low-quality transport infrastructure lies in a decrease of transit volumes and a decline in domestic transport and passenger volumes transported by regional and long-distance services, whilst the existing situation has the advantage of sufficient density of lines, stations and stops (high transport coverage of the territory), high capacities, good qualitative and structural basis of infrastructure and good connectivity of the rail network of ŽSR to the neighbouring networks [9].

Funding of transport sector

The Slovak Republic adopted the concept of modernisation of its rolling stock with the aim to renew the obsolete RS fleet (Priority 3.3, Specific aim 3 of the Transport Policy of the

Slovak Republic – Renewal of Rolling Stock Fleet). In relation to passenger rolling stock renewal, the financial-need formulation takes into consideration investment incentives that would remove the lag of the Slovak Republic behind neighbouring railway administrations. As the state budget and financial possibilities of ZSSK would not allow for modernisation of the rolling stock fleet for passenger transport, it was concluded that it is necessary to make use of a contribution from the state, self-governing authorities and villages to the funding in the following period. The following measures were proposed:

- on the level of central state administration bodies/higher territorial units/municipalities – to support renewal of rolling stock for public transport providing long-distance services (under the condition that RS is used to fulfil public service obligations); taking into account transport needs of given stakeholders on the level of state and regional bodies/higher territorial units and municipalities.
- on the level of private entities:
 - provide for rolling stock renewal for delivery of services in the public interest on the basis of public order and ensuring basic transport services covering the territory so as to meet ecological requirements,
 - provide for renewal of rolling stock delivery transport services by integrated transport systems within passenger transport.

Greening of transport and technical condition of the vehicles

The Transport Policy of the Slovak Republic (Priority 4.3 Greening of transport, Specific aim 4) comes to the conclusion that, in regards to greening of transport, it is necessary among others to introduce stricter assessment of technical condition of vehicles and gradually discard vehicles not meeting the defined limits for noise and emissions.

Reduction of negative effects causing increased adverse climatic changes

It was calculated that shift of transport volumes from public road transport and individual transport to rail could reduce negative effects causing a growth of adverse climatic changes in the amount of EUR 496,422 per year. The total present value is EUR 4,574,147.

Increasing qualitative parameters of transport infrastructure

In respect to enhancing the quality of transport infrastructure, it is necessary to carry out its modernisation and development (Specific aim 5, Priority 5.1). From a technological point of view, the emphasis is put on enhancing transport quality especially by traffic organisation, ensuring a transport process that would be economical, safe and environmentally-friendly.

Conclusion

Slovakia currently sees a tendency towards increased road transport, in particular freight and individual car transport, whilst rail transport, suburban, bus and urban public transport face a decline. This unfavourable situation in transport contributes to an increasing burden on the environment, including residential areas, by emission of harmful substances and noise from traffic.

At the same time reduction of negative impacts on the environment has to be ensured also by optimal balance of using the potential of individual transport modes, via shifting transport volumes to environmentally-friendly transport modes, including rail transport. Development

of suburban rail transport may be considered an efficient way of greening big suburban centres in accordance with the experience from abroad.

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