Slovak Environmental Agency
Banská Bystrica

Transport and its Impact on the Environment in the Slovak Republic 2009

Indicator Report

2010

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Content

Foreword

Report *Transport and its Environmental Impact in the Slovak Republic as of 2009* is one of task outcomes listed in main task program of the Slovak Environmental Agency and Ministry of Environment of the Slovak Republic that is titled as **Assess Effects of Selected Sectors in Economic Activities on Environment and Implementation of Environmental Aspects into Sector Policies.** This has been already the third report. The first report was completed in 2005.

Within the task in 2005, sets of indicators and indicative sectors 'reports were completed for agriculture, forestry, transportation, energy, industry, and tourism. The reports, in full, assess a correlation between economical sector and environment through environmental indicators and are focused on key questions and issues. Document was submitted for comments within relevant resort, other resorts, and at routine daily meeting of Ministry of the Environment. Further work procedure was approved and adopted at the daily routine meeting. The Slovak Environmental Agency was instructed to proceed in the assessment through updating of indicators database in a year interval and summary sector reports in two-year intervals. At the same time, an obligation to publicize the indicators and reports on the webpage was laid.

The front page photo: Section D1 – Považská Bystrica, Source: Internet

Summary

What is the current state and development of transport in the SR?

Trends in the transport sector

- Transport performance of the road freight transport and air freight transport have been continuously growing since 1997 (performance of the road freight transport increased more than 79% in comparison with 1997). On the contrary the rail freight transport has been constantly recording a decrease and in 2009 it decreased by more than 56% in comparison with 1997. In 2009, performance of the water freight transport stayed at the level of 1997. The road transport (approximately 77%) remains to be the greatest proportion on performance of the freight transport.

Indicator *Freight transport performance*

- In 2009 a slight decrease of freight goods volume transported by the road and rail freight transport was recorded in comparison with 2008. The volume of transported goods via the road freight transport decreased by 23% and via the rail freight transport by 37% in comparison with 1997. An increase in the volume of transported goods via the water freight transport continued and in 2009 this volume represented an increase of 59% in comparison with 1997.

Indicator *Freight goods volume*

- Long-lasting decreasing trend of transport performance continued in transport performance development of the road and rail passenger transport. In comparison with 1997 a decrease of more than 133% occurred in transport performance of the road passenger transport and more than 74% in the rail passenger transport. Performance of the water passenger transport decreased by more than 33%. Performance of the air passenger transport increased dramatically (from 231 mill. passenger-km in 1997 to 3 501 mill. passenger-km in 2009) during the monitoring period (1997 – 2009).

Indicator *Passenger transport performance*

- Proportion of individual types of transport on freight transport performance was monitored in 2009: road transport – 77%, rail transport – 20%, water transport – 3%.
- Proportion of individual types of transport on passenger transport performance was monitored in 2009: private motoring – 70%, public road transport – 12 %, rail transport – 6%, city public transport – 3%, air transport – 9%
- In transport performance terms a decreasing trend of the city public transport has been constantly continuing in all applied modes of the city public transport since 1996. Over the 12 year period (1997 – 2009) a decrease of 26.3% in number of transported passengers occurred at transport undertakings. During the monitoring period, bus transport maintained the top position in the passenger transport followed by the tram and trolleybus transport.
- Development of the passenger transport via road and rail transport recorded long-lasting decrease in number of transported passengers (approximately 55% decrease in 2009 in comparison with 1997). A number of transported passengers via water transport in 2009 range approximately at the level of 1997. A number of the air passenger transport increased dramatically (from 177 thous. in 1997 to 2 288 thous. in 2009) during the monitoring period (1997 – 2009).

Indicator *Number of transported passengers in the passenger transport*

- Despite of slight year-to-year incremental decrease in number of road motor vehicles, in 2009 a total number of motor vehicles increased by 37% during the whole monitoring period.

Indicator *Size and average age of the fleet by transport types*

- Over the last 12 years, a number of modes of transport decreased by approximately 20% in the rail and water transport (environmentally-wise the most suitable types of passenger and goods transport).

Indicator *Percentage of passenger engine vehicles fitted with a catalyst within the fleet*

- The road transport (95%) takes a share in the final consumption of liquid fuels (97%), representing the greatest proportion of energy consumption in the transport sector. On the contrary a proportion of the final consumption of electricity in the transport sector falls on the rail transport (95%).

Indicator *Final energy and fuel consumption in the transport sector*

- Development trend of petrol consumption is growing, but in terms of year-to-year periods, an increase alternates with stagnation and a decrease. The diesel oil consumption trend has been significantly growing which is not accompanied by year-to-year consumption drops as it is in case of the petrol consumption.
- Development of gas services - fitting petrol engine passenger vehicles with a LPG burning equipment brings improvements of environmental parameters in passenger vehicle fleet. While in 2002 approximately 46 215 passenger vehicles fitted with a LPG burning equipment were under operation, in 2009 their estimated amount was 57 495. Only slight increase in number of vehicles was recorded after 2005.
- The consumption increase of alternative LPG fuel multiplied in the Slovak Republic even though it fluctuated after 2004. While in 1997, the LPG consumption in Slovakia represented only 510 t per year, in 2009 it was 24 348 t per year.

Indicator *Use of ecological fuels in transport*

- In 2009, the transport network of the Slovak Republic comprised 17 776 km of roads and motorways out of which motorways represented 384 km. The length of railroads under operation was 3 592 km out of which 1 577 km were electrified. The length of navigable waterways (250.8 km) as well as the length of canals (38.45 km) is stable in the territory of the SR.

Indicator *Length of the transport infrastructure*

- In terms of the transport infrastructure density, the Slovak Republic belongs to average within the EU countries. In 2005, the road network density was 876.87 km/thous. km^2 and the railroad network density was 74.58 km/thous. km^2.

What is the environmental impact of transport in the SR?

Air

- In 2008, COPEERT IV started to be used in processing emissions of road transport operation and all the emission figures since 2000 were calculated according to this software. In 2008, emissions of the basic polluting substances coming from transport recorded a minimum decrease in comparison with 2007.
- Percentage of CO emissions from transport reached 26% in 2008.
- Percentage of NO_x emissions from transport reached 51% in 2008.
- Percentage of NM VOC emissions from transport reached 14% in 2008.

Indicator *Emission of the basic polluting substances by transport*

- Percentage of CO_2 emissions from transport reached 2.5% in 2008.
- Percentage of N_2O emissions from transport reached 4.5% in 2008.

Indicator *Greenhouse gas emissions by transport*

Waste

- In total 169 151 t of waste was produced in 2009. Percentage of transport on the total volume of waste production is low in comparison with other economic sectors.

Indicator *Waste generated by transport*

Infrastructure on land resources

- In infrastructure terms, 0.075% of railroads, 0.893% of road infrastructure and 0.004% of navigable waterways participated on land reserves in 2008.

Indicator Infrastructure on land resources

Traffic accident rate

- In 2009, a significant decrease in development of traffic accident rate occurred in comparison with 2008 (change of the methodology at the SO SR */The Statistical office of the Slovak Republic/).* Identical development was recorded also in terms of analyses of traffic accident consequences, finding a decrease of fatalities, serious and minor injuries in comparison with 2008.

Indicator *A number of traffic accidents and a number of fatalities, serious and minor injuries as a result of traffic*

Has been eco-efficiency of transport in the SR improving?

- The transport efficiency with respect to indicators of the passengers and freight goods transport performance does not declare a positive trend. A negative trend of number of transported passengers or the passenger transport performance began to show after 2002 (the passenger transport performance increased and the gross valued added decreased). In relation to the freight goods transport performance, the greatest performance increase was recorded in the road and air transport.
- Environmental efficiency of transport related to the basic polluting substances and to the gross value added has been fluctuating since 2004. A positive effect of GVA to CO, NO_x and NM VOC emissions began to show after that year. The PM emissions had the worse development as they recorded an increase after 2000 resulting in worsened environmental efficiency.
- Transport takes part approximately 15% when concerning greenhouse gas emissions (CO_2, N_2O and CH_4). Worsened environmental efficiency of transport is caused by the CO_2 proportion which has been significantly growing since 2000.

Indicator *Environmental eco- efficiency of transport*

1. Introduction

Sector Indicators Report **Transport and its Impact on Environment in the Slovak Republic as of 2009** is a third report and it is focusing on evaluation of environmental impact of the transport as one of the most important economic sectors in Slovakia, and environmental aspects, which are in the process of being implemented in the transport policy.

Integration of environmental policy into sector policies commenced at the European Council Summit in Cardiff. It represents an all-European process, in which environmental policy purposes and goals are reflected in the sector policies and which aims to provide a permanently sustainable development.

Indicators sets – measurable indicators that are evaluated through **sector reports** are an effective tool to assess integration of the environmental aspects into the transport policy.

Assessment of the impact of the transport sector on the environment respects a creating and evaluating process of the indicators, which is ensured by activities of European Environment Agency (EEA), Organization for Economic Co-operation and Development (OECD), and Statistical Office of the European Commission (EUROSTAT) and development of sector reports at the European level.

A purpose of such formulated report for a sector of transport in Slovakia is to gain:

- Basic document to identify the impact of the power engineering on the environment;
- Grounds to assess effectiveness of environmental measures application into the energy policy;
- An initial document at implementation of Cardiff process and Lisbon process under conditions of the Slovak Republic;
- An effective tool to assess strategic objectives or long-term priorities of National Sustainable Development Strategy.

Primary, the report is focused to asses a correlation between transport and environment. It contains a marginal assessment of some economic and social factors that have a significant but indirect impact on the environment. It includes environment experts´ opinions as well as opinions of experts from the transport sector.

The report is to serve mainly politicians as an appropriate tool for decision making process, experts and pedagogues from the environment field and power engineering, and finally to students and public engaged in environment matters.

2. Methodology

The sector indicators report is based on a methodology implemented by the European Environmental Agency, established in Copenhagen (EEA). It is a process; in which implementation of the environmental aspects into economic activities sectors and sector's impact on the environment is assessed through the indicators analyses. The evaluation process is focused on two stages:

1. Stage: Preparation and processing of a list of aggregated and individual indicators by D-P-S-I-R model;
2. Stage: Writing the indicators sector report.

2.1. Preparation and processing of a list of aggregated and individual indicators by D-P-S-I-R model

Chain of causal indicator links according to the DPSIR model is a methodological tool for integrated assessment of the environment. Within individual chain links, the aggregated and individual indicators are defined as following:

- **Driving forces (D)** – they are starting mechanisms of processes in a society and they initiate
- **Pressure (P)** with an negative impact on the environment (contamination, depletion of mineral sources) or a positive impact, which is an immediate cause of changes in the
- **State of the environment (S)**. Deterioration of the environment's state - its elements usually cause a negative
- **impact (I)** to human health, biodiversity, functions of eco-systems, and it logically leads to formulating of measures and tools concentrated on elimination or remedy of environmental damages in the last chain link- and it is
- **Response (R)**

The analyzed individual transport-environmental indicators of the Slovak Republic in the D-P-S-I-R structure are in detail available at the web page www.enviroportal.sk/indikatory/. It includes description of the indicator, trend assessment, and identified political objectives in relation to indicator, international comparison, and reference to topics.

The set of environmental indicators, arranged by D-P-S-I-R model, serves as a theoretical base for preparation of **indicators sector report.** The main priority of the report is to understand **causal-consequential correlations** between an activity of human being and state of the environment by means of D-P-S-I-R causal chain link and in such way to offer an innovative view of the state and trend in the environment through the integrated assessment.

The indicators sector report is focused to answer four key political questions:

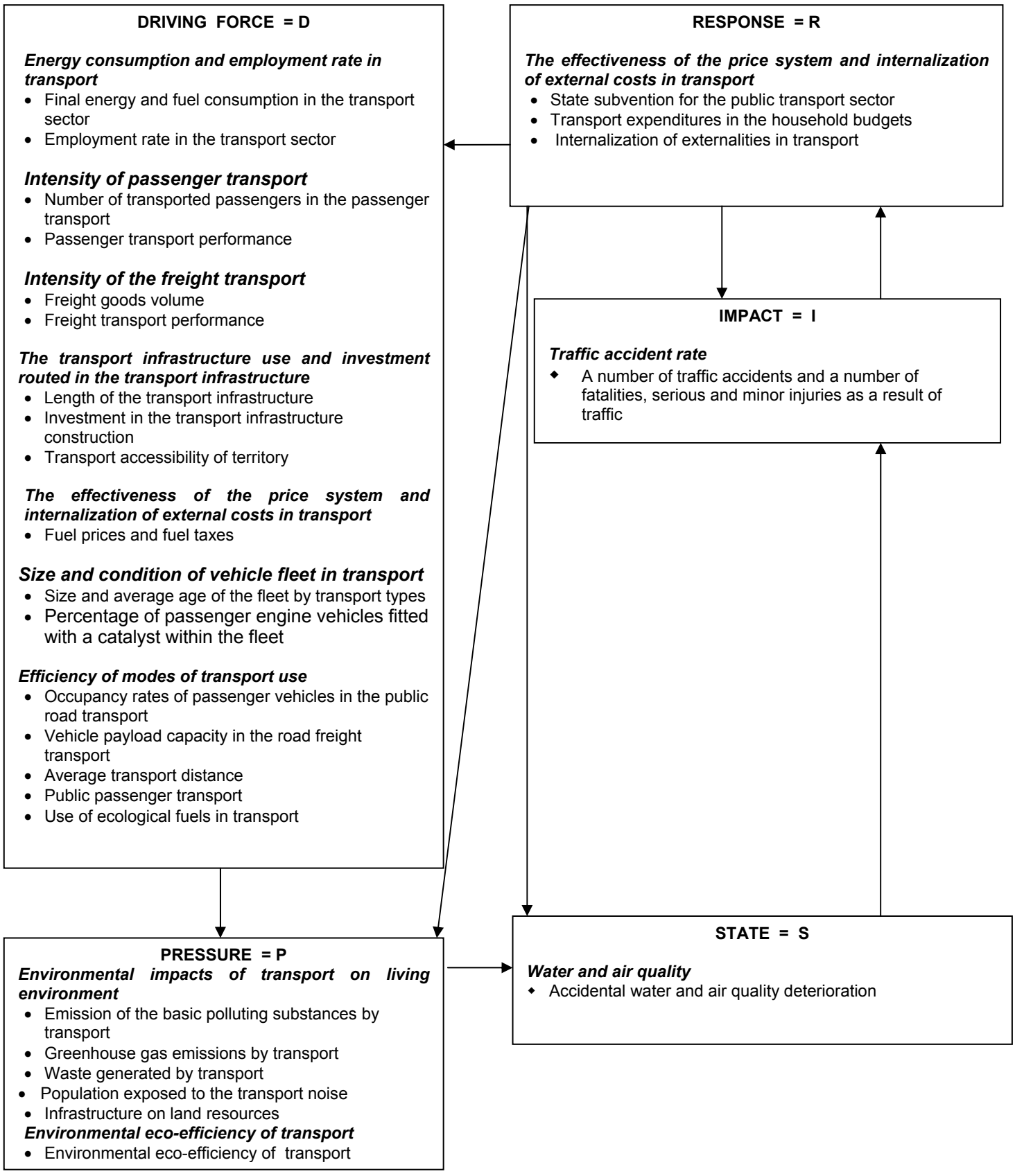
1. What is current status and trend of transport in the Slovak Republic?
2. What impact does transport have on environment in the Slovak Republic?
3. Does environmental effectiveness of the transport in the Slovak Republic increase?
4. Do actual legislative and financial mechanisms support the implementation of environmental measures into energy in the Slovak Republic?

The D-P-S-I-R model for the power engineering is a simplified formulation of reality. There are more existing correlations and factors (e.g. social and economic), which have significant effects on the environment and they are not included within the model.

Set of aggregated and individual Transport sector indicators in the SR according to the D-P-S-I-R model

D-P-S-I-R* position in the structure	Aggregated indicator	No.	Individual indicators
Driving force	**Energy consumption and employment rate in transport**	1.	Final energy and fuel consumption in the transport sector
		2.	Employment rate in the transport sector
	Intensity of passenger transport	3.	Number of transported passengers in the passenger transport
		4.	Passenger transport performance
	Intensity of the freight transport	5.	Freight goods volume
		6.	Freight transport performance
	The transport infrastructure use and investment routed in the transport infrastructure	7.	Length of the transport infrastructure
		8.	Investment in the transport infrastructure construction
		9.	Transport accessibility of territory
	The effectiveness of the price system and internalization of external costs in transport	10.	Fuel prices and fuel taxes
	Size and condition of vehicle fleet in transport	11.	Size and average age of the fleet by transport types
		12.	Percentage of passenger engine vehicles fitted with a catalyst within the fleet
	Efficiency of modes of transport use	13.	Occupancy rates of passenger vehicles in the public road transport
		14.	Vehicle payload capacity in the road freight transport
		15.	Average transport distance
		16.	Public passenger transport
		17.	Use of ecological fuels in transport
Pressure	**Environmental impacts of transport on living environment**	18.	Emission of the basic polluting substances by transport
		19.	Greenhouse gas emissions by transport
		20.	Waste generated by transport
		21.	Population exposed to the transport noise
	Environmental efficiency of transport	22.	Environmental efficiency of transport
State	**Water and air quality**	23.	Accidental water and air quality deterioration
Impact	**Traffic accident rate**	24.	A number of traffic accidents and a number of fatalities, serious and minor injuries as a result of traffic
Response	**The effectiveness of the price system and internalization of external costs in transport**	25.	State subvention for the public transport sector
		26.	Transport expenditures in the household budgets
		27.	Internalization of externalities in transport

Causal chain of transport indicators in Slovakia according to the D-P-S-I-R model



2.2. Completing the indicators sector report

At the Cardiff summit in 1998, foundations of coordinated Community action plan were laid on environmental protection requirements; EEA initiated the work on preparation of the transport and environmental indicators. Subsequently the Transport and Environment Council invited the Commission and EEA to set up **TERM** (the **T**ransport and **E**nvironment **R**eporting **M**echanism), which should enable and help the progress and effectiveness of their integration policies within transport and environment. The main aim of TERM (indicators-based report, elaborated according to the Transport and Environment Reporting Mechanism) is to monitor the progress and effectiveness of transport and environment integration strategies on the basis of a core set of indicators (EEA, 2002).

The indicator sector report **Transport and its environmental impact in the SR** was elaborated for Slovakian requirements focusing to address seven key policy questions:

1. What is environmental impact of transport in the SR?
2. Is quality of managing transport demands and the transport modal split improving?
3. Is environmental effectiveness of transport improving?
4. Are we optimalizing the use of the existing transport infrastructure capacity and moving towards a better balanced intermodal transport system?
5. Are we moving towards a fairer and more efficient pricing system which ensures that external costs are internalised?
6. How rapidly are new technologies being implemented in the transport sector and how efficiently are vehicles being used?
7. How effectively are environmental management tools being used to support transport policy making?

3. Policy framework of environmental policy implementation in transport

Environmental policy implementation in transport is running as on European so on the national level. Transport belongs amongst the economic sectors that the EU pays a considerable attention to in the sphere of environmental aspects implementation.

3. 1. Policy framework of environmental policy implementation in the European Union

A **White Paper** on the future development of **the Common Transport Policy** was written in 1992, followed by a **Green Paper on transport and environment** – on sustainable transport.

A document the **Green Paper: Towards Fair and Efficient Pricing in Transport** (EEA, 2004) was adopted in **1995**.

The **Green Paper - Security of energy supply towards alternative fuels need in transport** was elaborated in 2000 when **Third set of emission limits for passenger engine and freight vehicles** was adopted (EURO III) (EEA, 2004).

EC published the **Green Paper – TEN-T: A policy review – Towards a better integrated trans-European transport network at the service of the common transport policy"** in 2009. The document outlines three ways how to link the existing TEN-T projects with climatic changes issues and reinforce relationships between neighbouring countries.

In 2001 a document the **White Paper: European transport policy for 2010 – Time to decide** was elaborated, Direction on operation of the traditional railway transport was adopted. Clean Air For Europe (CAFE) Programme was launched in this year, **national emission ceilings** were adopted. SEA directive – **Strategic Environmental Assessment** came into effect. Strategy of the European Union on emissions from water freight was created in **2002**, sulphur content limits in sea freight fuels were introduced in 2003. New set of emission limits for heavy freight vehicles was adopted (EURO IV) in 2005. By the end of 2010, the Commission shall adopt the **new White Paper on transport policy** that shall contain action plan for transport until 2020.

The Lisbon Strategy set an aim to make the European Union „the most dynamic and the most competitive knowledge-based economy". The SR government approved **The Competitiveness Strategy of the Slovak Republic until 2010** (The Lisbon Strategy for Slovakia) in order to join the Lisbon Strategy and to achieve the Slovak competitiveness improvement by mobilising innovations in the national economy and developing scientific-educational activities. From the transport sector point of view, it concerns acceleration of modernisation and development of the high quality transport infrastructure on the whole territory of the country. (CEC, 2005)

The objectives of **the 7th framework programme (2007 – 2013)** are also linked to the Lisbon strategy and it shall contribute to the EU gaining a leadership in research area worldwide. Its objective in the transport sector is to develop safer, more ecological and more intelligent European transport systems for benefit of all the citizens, communities and climate policies that save natural resources and environment. (Resolution of EC and Council No 1982/2006/EC).

In March 2010, the European Commission approved a new strategy **Europe 2020** proposed by the European Commission aiming to overcome crisis and get the EU economy ready for challenges of the upcoming decades. The adopted Strategy replaced the original Lisbon Treaty.

3.2. Policy framework of environmental policy implementation in the Slovak Republic transport

Vision of the transport policy strategy of the Slovak Republic is to ensure the high quality, accessible and integrated transport infrastructure, competitive services, user friendly transport and ecology and energy efficient and safe transport. (MDVaRR, *2010 / Ministry of transport, construction and regional development of the Slovak Republic/)*

The Government of the Slovak Republic approved a document **The Strategy of the Slovak Republic for Transport Policy till 2020** by the Resolution No 158/2010 of 3 March 2010, defining a vision, objectives, priorities and measures in the sphere of the transport development. The Strategy objectives are defined in four basic groups and are focused on:

- to build and modernize the transport infrastructure
- to ensure balanced development of the transport services
- rights and duties of the transport users
- and to decrease the environmental impacts from transport

The main tools for the strategy objectives implementation are measures, which ensure to spend financial resources effectively, to finance the transport infrastructure by additional resources, to develop the individual modes of transport in balance and to protect interests of the Slovak Republic at law-making in the SR (MDVaRR, *2010 /Ministry of transport, construction and regional development of the Slovak Republic/).*

The National Strategic Reference Framework for the SR for the period of 2007 – 2013
The NSRF was approved by the SR Government's Resolution No 457 on 17 May 2006. The objectives of the NSRF will be implemented through ten operational programmes within the framework of individual objectives of the EU cohesion policy. **The Operational programme Transport** 2007 – 2013, approved on 11 January 2008, is one of the operational programmes.
The global objective of this operational programme is to support sustainable mobility through development of the transport infrastructure.
The OP Transport primarily focuses on completion of construction and modernisation of the transport infrastructure of the SR and its integration to the TEN-T network. Secondarily it also represents a mean of gradual elimination of unsatisfactory parameters of the transport infrastructure in the regions and addressing the urgent issues of safety, reliability and quality of transport.
The transport policy of the Slovak Republic until 2015
The global objective of the transport policy is to ensure sustainable mobility development, perceived as long-lasting ensurance of constantly increasing transport demands of the society (transport of goods and people) in a required time and to a desired quality with a simultaneous decrease in the negative impact of transport on the environment.

Basic development and conceptual documents of the SR transport policy

The Public passenger transport development instead of private transport, this material focuses on the current state analyses, refers to challenges coming from passenger transport development and measures to solve public transport support in a form of an Action plan.
The Programme of Intelligent Transport System Development is based on establishing the National traffic information system (NaTIS). The objective is to establish a comprehensive national traffic information system based on implementation of information and communication systems and technologies into the road traffic in Slovakia.
The Concept of modernisation and development of the mobile fleet of Železničná spoločnosť Slovensko, a.s. / *Railway Company Slovakia/* for the period of 2008 – 2010

(2012). The Conceptual material focuses on the proposition of the strategy for renewal and modernisation of mobile modes in fleet of ZSSK / *Railway Company Slovakia/* including questions of its financing.

The Strategy of Železničná spoločnosť Slovensko a.s. */ Railway Company Slovakia/* – is a document of the company focusing to fulfill the basic objectives of the strategic plans of ZSSK / *Railway Company Slovakia/* such as competitiveness on domestic and international markets in particular, quality improvement and transport services offer, customer satisfaction improvement, sustainable financial stability and development.

The Programme of the railways infrastructure modernisation and development *for 2007 – 2010* – the programme defines time schedule of modernisation of rail transit passages, rail junctions, stops and stations as well as interoperability implementation towards 2013.

The Concept of development of the combined transport is focused on legislative, organisational and economic assumptions for the combined transport development, a proposal of lines and their routes, a proposal of financial provision and ecological, safety and quality assumptions.

The Programme of motorways and expressways planning and construction for 2007 – 2010 – defines volume of motorways and expressways, time schedules of their construction and the construction planned hand-over dates, financial frameworks of the programme as well as development tendencies for the coming years.

The Programme of the 1st class roads network planning and construction for 2007 – 2010 – focuses on 1st class roads modernisation, the material includes the programme strategy, its priorities, time schedule of commencement and completion dates of the construction process as well as the specified list of the constructions.

The Programme of the 1st class roads network maintenance and repairs for 2007 – 2010 specifies activities and financial requirements to ensure maintenance works execution, including winter maintenance as well as repairs of the road-related structures and the roadside facilities.

The Concept of the air transport development in the SR elaborates strategic objectives in the transport policy of the civil air services aiming to harmonize conditions of economic competition on the transport market.

The Concept of the water transport development in the SR addresses mainly legislative, organisational and economic assumptions for the water transport, development and modernisation of the transport infrastructure, information and logistic assumptions for the water transport.

The Concept of the passenger bus and rail transport emphasising systematic solutions to finance performance in public interest in 2005 and for the following years. Concept of Bratislava Integrated Transport – represents the global principles for planning of the integrated transport system in the Bratislava Self-Governing Region.

4. What is the current state and development of transport in the SR?

Transport is one of the key factors of any modern society development whereas the transport itself is not an objective, but a tool for the economic development. The transport-driven GDP in the Slovak Republic has been fluctuating on level of 6% for a long time. Economic impacts from the transport are directly demonstrated in individual industry sectors producing modes of transport, in building industry constructing the transport infrastructures and indirectly in all industry sectors producing raw materials, fuels, intermediate products, components and facilities for transport.
Economic development impacts of transport in the SR are currently proved mainly by growth of the building industry performance induced by motorways construction, road network maintenance and rehabilitation of the main railroads of the international importance to higher operating speed. There are two basic aspects of negative environmental impacts of transport: the transport infrastructure construction and harmful waste in terms of traffic operation. The state and development of the transport in Slovakia can be characterized by means of individual indicators describing the given trends.

Set of aggregated and individual transport and environmental sector indicators relevant to characterize the main trends in transport

D-P-S-I-R position in the structure	Aggregated indicator	Individual indicators
Driving force	**Energy consumption and employment rate in transport**	Final energy and fuel consumption in the transport sector
		Employment rate in the transport sector
	Intensity of passenger transport	Number of transported passengers in the passenger transport
		Passenger transport performance
	Intensity of the freight transport	Freight goods volume
		Freight transport performance
	The transport infrastructure use and investment routed in the transport infrastructure	Length of the transport infrastructure
		Investment in the transport infrastructure construction
		Transport accessibility of territory
	The effectiveness of the price system and internalization of external costs in transport	Fuel prices and fuel taxes
	Size and condition of vehicle fleet in transport	Size and average age of the fleet by transport types
		Percentage of passenger engine vehicles fitted with a catalyst within the fleet
	Efficiency of modes of transport use	Occupancy rates of passenger vehicles in the public road transport
		Vehicle payload capacity in the road freight transport
		Average transport distance
		Public passenger transport
		Use of ecological fuels in transport

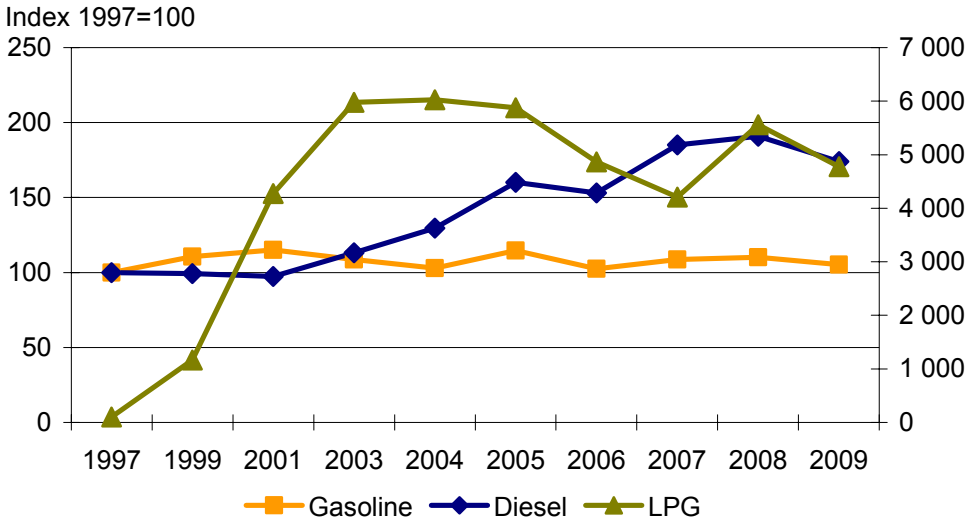
4.1. Trends in the transport sector

Growing volumes of transport result in environmental pressure increase especially in relation to climate changes and loss of biological diversity. Current efforts to counteract those trends at best slow down their increasing speed only. On the positive note technological improvements ensure a decrease of air pollution from the road transport despite of its growing volumes.

4.1.1. The final energy and fuel consumption in the transport sector

The final energy consumption in the transport sector has multiplied by many times over a period of 12 years. The liquid fuels final consumption (97%) makes the greatest energy consumption proportion of the final energy consumption in the transport sector, whereas the final consumption proportion of solid fuels, gas fuels and electricity is small. On the contrary the total electricity consumption in the transport sector falls on the railways transport (95%); the railways transport proportion on the final liquid fuel consumption is small.
Over the period of 1997 – 2009 the trend of petrol consumption is growing, but in terms of year-to-year periods an increase alternates with stagnation and a decrease. In 2009 the consumption dropped by 4.4% in comparison with the previous year, however it increased by 5.3% in comparison with 1997. The diesel oil consumption trend is constantly increasing and is not accompanied by year-to-year consumption drops as it is in case of the petrol consumption. Despite of year-to year decrease of 8.9% recorded in 2009, it represents an increase by 73.4% in comparison with 1997. The transport sector belongs amongst important factors of energy and environmental issues as it is one of the greatest consumers of the fossil energy resources. Statistics quote that the transport and the transport industry in Europe consume 38% of the total amount of energy out of which the road transport consumes up to 72%.

Development of the total fuel consumption in the road transport (Index 1997=100)



*(*since 2001 the data are quoted according to the renewed methodology of the SO SR */the Statistical office of the Slovak Republic/*)
Source: WRI; Processed by: SEA
(Indicator Final energy and fuel consumption in the transport sector)

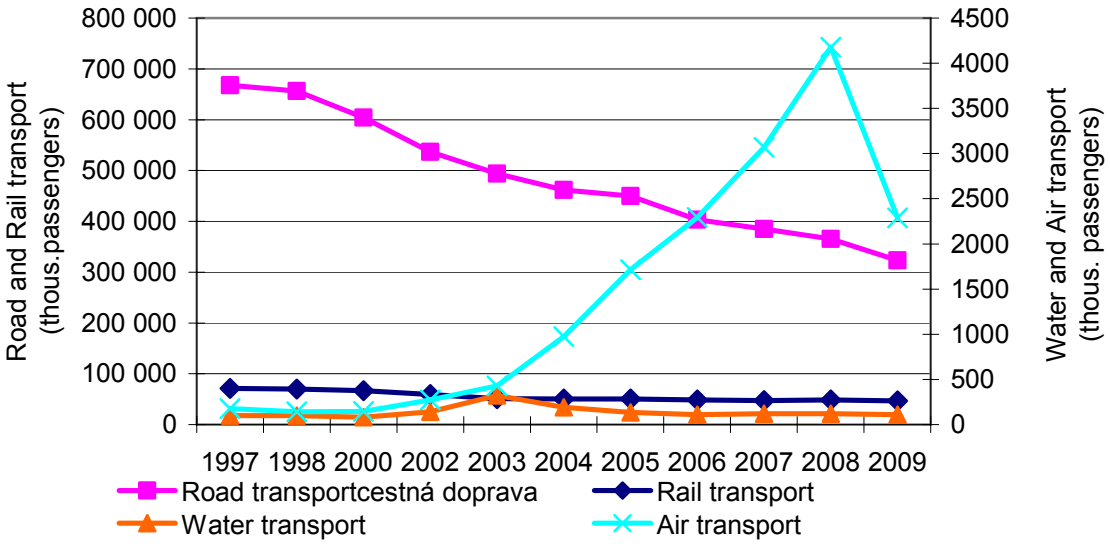
4.1.2. Employment rate in the transport sector

Even though an average number of recorded employees has been noting a decrease since 1997, a gradual increase of the employee number could have been stated since 2005. In 2009 the average number of recorded employees in the transport sector was 95 416 representing a decrease of 9.3% in comparison with 1997. In terms of the transport types the greatest employee number persisted in the railway transport (54%) and the road transport (23%), on the contrary the lowest employee number was in the air transport (a number of employees was also reduced as two major airlines terminated their operations) and the inland water transport.
(*Indicator Employment rate in the transport sector).*

4.1.3. Number of transported passengers in the passenger transport

Long-tasting decreasing trend of transport performance continued in transport performance development of the road and the rail passenger transport. A number of transported passengers by the road transport and the railway transport decreased by more than 52% during the monitoring period (1997-2009) and has been decreasing since. In 2009 a significant decrease of the number of transported passengers as well as performance in the air passenger transport occurred (a number of transported passengers decreased by 45% and performance by 25% in comparison with 2008). This drop was caused not only by the economic crisis but also since two major airlines terminated their operations in Slovakia.

Development of transported passengers in the passenger transport by transport types



Source: SO SR; Processed by: SEA
Indicator Number of transported passengers in the passenger transport

4.1.4. Passenger transport performance

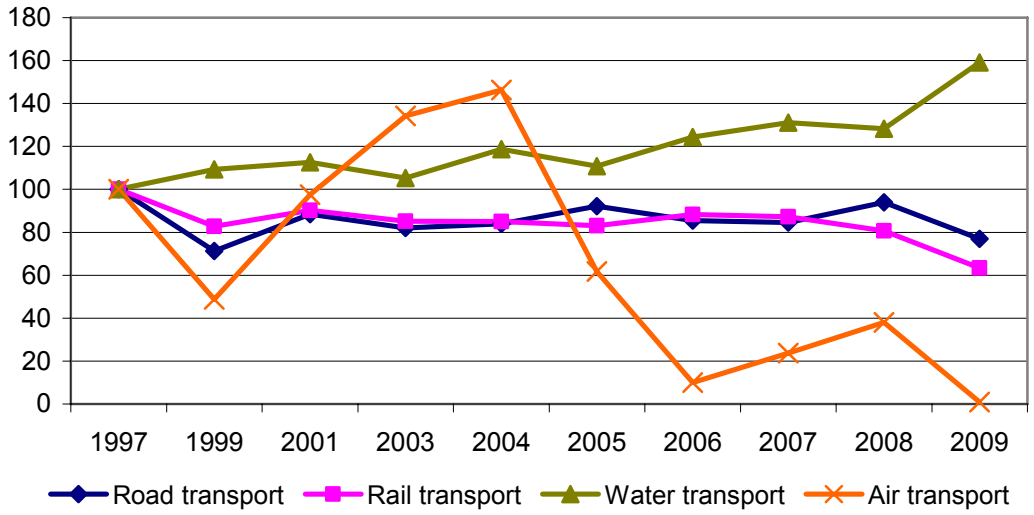
Long-tasting decreasing trend of the total transport performance continued in transport performance of the road and the rail passenger transport. Performance of the road passenger transport significantly dropped and in 2009, the decrease represented 54.5% in comparison with 1997. Performance of the rail transport recorded a decrease of 26% in comparison with 1997, but there was a minimum year-to-year decrease in recent years. In 2009, a transport performance decrease of up to 30% also occurred in the air passenger transport in comparison with the previous year.

Currently there is a growing tendency of the road transport, freight transport and private motoring in particular (70% proportion of the total passenger transport performance), while the rail transport, commuter bus service and the city public transport recorded a decrease. It is evident that in terms of transport performance of the passenger transport, the greatest transport performance was carried out by private passenger transport (41%) and private motoring (41%), while the public passenger transport reached only 18%.
(*Indicator Passenger transport performance*).

4.1.5. Freight goods volume

The volume of transported goods via the road freight transport fluctuated.
In 2009, a year-to-date decrease represented 12.4% in comparison with a decrease of 23.1% in 1997. On the contrary the volume of transported goods via the rail freight transport remained on the same level, without any noted fluctuations, even though in 2009 a decreased of 37% in comparison with1997 and a decrease of 21.6% in comparison with 2008 were recorded.
This drop could have been caused by the economic crisis that had an impact on majority of sectors. The volume of transported goods via the water freight transport has been constantly recording an increase and in 2009 it represented 24% in comparison with 2008 (an increase of 59% in comparison with 1997). The greatest fluctuations of goods freight have been recorded in the air transport noting a decrease since 2004. The road freight transport reached the greatest market proportion within the transport sector. This proportion was growing due to the higher quality services (greater flexibility, reliability, quick delivery, smaller demands on goods packaging and smaller probability of damaging goods).

Development of transported goods in the freight transport by transport types (Index 1997=100)



Source: SO SR; Processed by: SEA
Indicator Freight goods volume

4.1.6. Freight transport performance

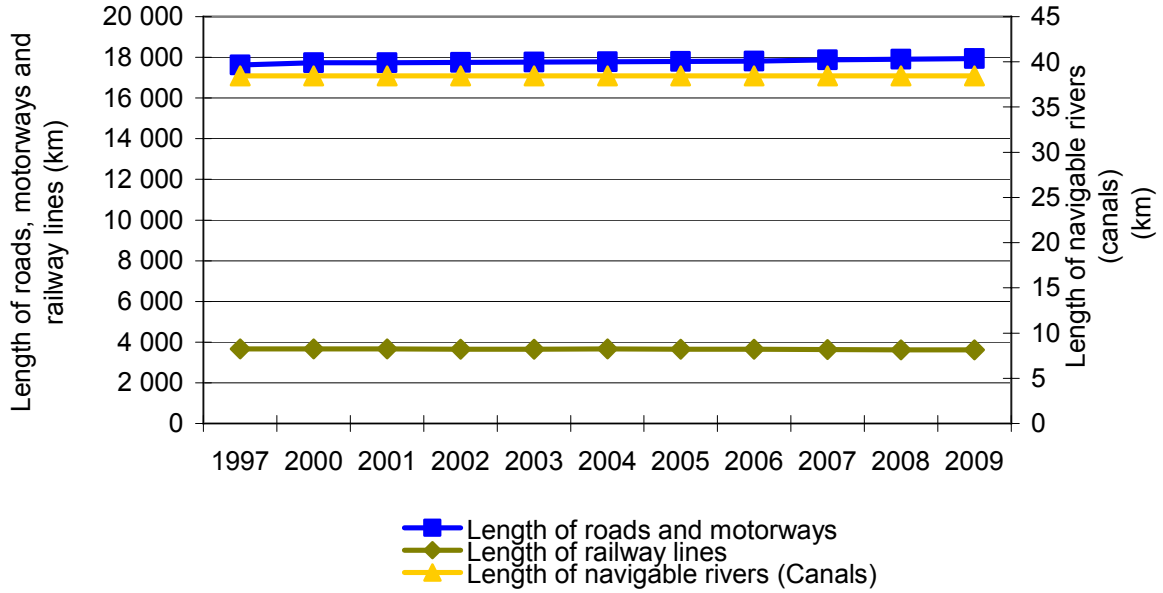
Transport performance of the freight transport has been growing since 1997 also with regard to a year-to-year increases-decreases fluctuation in all the transport types. In 2009 performance of the road freight transport increased by more than 79% in comparison with 1997 despite of a year-to-year decrease of 5.6% in 2008. Even though performance of the rail freight transport recorded a slight year-to-year decrease in comparison with 1997, in 2009 it represented more than 44%. Performance of the water freight transport recorded a

decrease from 1997 till 2003, it has been gradually increasing after that and in 2009 it reached 1 230 mill.tkm. Performance of the air freight transport was recording an increases-decreases fluctuation and in 2009 it reached only 25 thous.tkm. The road freight transport (approximately 77%) represents the greatest proportion on performance of the freight transport followed by the rail freight transport (19.5%) and the water inland freight transport representing 3.45% only.
(*Indicator Freight transport performance).*

4.1.7. The length of the transport infrastructure

In 2009, the transport network in the Slovak Republic comprised 17 776 km of roads and motorways out of which motorways represented 391 km and the length of expressways represented 179 km. The greatest increase of the motorways length in comparison with the previous years has been recorded since 2007, when „ The programme of motorways and expressways planning and construction for 2007 – 2010.“ was approved. The length of railroads under operation was 3 623 km out of which 1 578 km were electrified. The length of navigable waterways comprised 251 km (Danube and Váh) and the length of canals reached 38.45 km.
Current state of the road infrastructure is characterized by relatively dense road network, however with a low proportion of motorways and expressways whilst exceeding existing road capacity especially on the main international road corridors. The rail transport infrastructure does not meet requirements for requested ground speed of 160 km/h on the railway tracks included in the AGC and AGTC Agreements, which apart from other decreases competitiveness of railway transport in comparison with the direct road freight transport.
There are no intermodal transport terminals in the SR – modern transition points between rail and road freight transport linked to logistic centres that would allow transfer of goods from road to rail freight transport. Existing transhipment point for containers in the SR do not meet new technical and technological requirements of international trade.

Development of the length of the transport infrastructure (km)

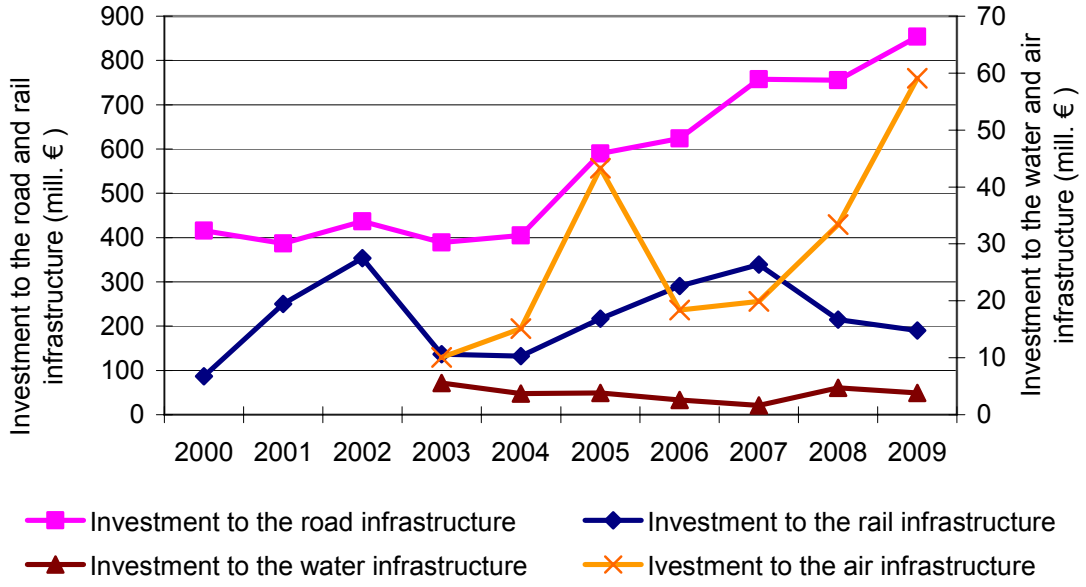


Source: SO SR; Processed by: SEA
Indicator Length of the transport infrastructure

4.1.8. Investment in the transport infrastructure construction

In 2009 total expenditures for the transport infrastructure amounted to 1 072.2 mill.Eur. In 2009 the greatest volume of investment, at 854.0 mill.Eur, was determined for the transport infrastructure. The investment intended for railway infrastructure was fluctuating in a way noting a year-to-year decrease since 2007. In 2009 investment in the railway infrastructure amounting to 190.3 mill.Eur represented a decrease of 11.3% in comparison with 2008. In 2009 investment in the air infrastructure amounting to 59.1 mill.Eur also recorded an increase. In 2009 the least investments amounting only to 3.8 mill.Eur were invested in the water infrastructure.

Development of investment in the transport infrastructure at current prices (mill. Eur)



Source: SO SR; Processed by: SEA
Indicator Investment in the transport infrastructure construction

4.1.9. Transport accessibility of territory

According to MDPaT – KURS 2011 / *Ministry of Transport, Posts and Telecommunication – Concept of territorial development 2011/* only 614 389 inhabitants (11.42%) or 13.06 % of inhabitants had transport connection with the capital of the SR within 30 min. Approximately 50% of the total number of inhabitants of the SR had transport connection with the capital within 120 min. Approximately 32% of inhabitants only had transport connection with the regional cities within 15 min and up to approximately 75% of inhabitants had connection with the regional cities within 45 min.
(*Indicator Transport accessibility of territory).*

4.1.10. Fuel prices and fuel taxes

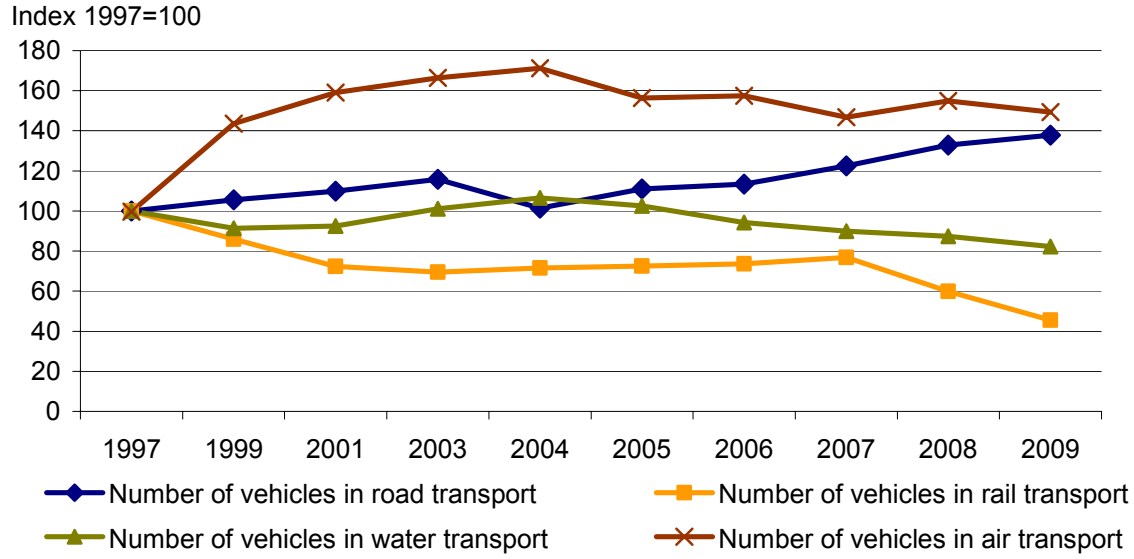
Average prices of all the engine fuels decreased over 2009. This decrease was caused by several factors out of which the crude oil price decrease is the most significant one being a side-effect of the global economic crisis in the oil and refinery industry. The global economic crisis, liberal, highly competitive world-wide oil market and responsible price policy led to a year-to-year diesel oil decrease of 21% and engine petrol decrease of 14%. The liquefied petroleum gas (LPG) price has decreased by 32%. Total year-to-year diesel oil consumption has decreased by nearly 12% mainly due to lower demand of industry, building,

trade and dispatch services. Motor petrol sales to households also decreased namely by around 7.5%, being influenced by a growing unemployment rate in particular and related households´ concerns about future incomes. The proportion of bio elements in fossil engine fuels influences price-setting as well and in 2009 it constituted 3.4%. Tax burden or the amount of consumption tax and VAT (19%) is not of a fewer importance. In 2010 the government is planning to raise the consumption tax rate on fuels and it will concern several exceptions cancellation (e.g. tax burden on bio elements in fuels, liquefied propane-butane (LPG), as well as compressed natural gas (CNG)).
(Indicator Fuel prices and fuel taxes).

4.1.11. Size and average age of the fleet by transport types

In 2009, the total number of motor vehicles increased by 37% during the whole monitoring period, despite of slight year-to-year incremental decrease in number of road motor vehicles. On the contrary over the last 12 years, a numbers of modes of transport decreased by approximately 25% in the rail and water transport (environmentally-wise the most suitable types of passenger and goods transport).
In 2009, the most significant increase in number of road motor vehicles occurred in the category of trucks and vans (an increase of 137% in comparison with 1997) and passenger vehicles (an increase of 140% in comparison with 1997). So called „scrappage scheme" significantly influenced the renewal of passenger vehicles fleet having used 39 270 grants.
The scrappage scheme significantly influenced also the import of used cars that decreased by 12%.
The fundamental modernisation of the bus public transport took place, having the fleet quality constantly increasing, which is also related to stricter emission limits (EURO) as well as to the need to make public passenger transport more attractive for the passengers, i.e. to increase its competitiveness against private motoring. In terms of the fleet, 37% of buses are from 10 to 20 years old and 15 % of buses of the total number are older than 20 year.
The size of the rolling stock exceeds the railway operating needs. A serious problem of the rolling stock is its technical and moral obsolesce related to age structure of old locomotives, freight wagons as well as passenger carriages demonstrated in more than 70% of railroad cars. Fleet of water transport is mostly suitable only for navigation on the Danube.

Developments in the size of the fleet by type of transport (Index 1997=100)



Source: SO SR; Processed by: SEA
Indicator. Size and average age of the fleet by transport types

4.1.12. Percentage of passenger engine vehicles fitted with a catalyst within the fleet

A number of passenger engine vehicles fitted with a catalyst was increasing during the whole monitoring period, a year-to-year increase represents 12%. Percentage of passenger engine vehicles fitted with a catalyst is increasing in passenger engine vehicles within the all categories of engine capacities.
(*Indicator Percentage of passenger engine vehicles fitted with a catalyst within the fleet).*

4.1.13. Occupancy rates of passenger vehicles in public road transport

Occupancy rates of passenger vehicles in public road transport are on the same level during the whole monitoring period showing a minimum of year-to year fluctuations. Occupancy rate of trolleybuses in public transport recorded an increase in 2004 only (up to 39 582 seats), after that year it has been continuously decreasing again and in 2008 the occupancy rate came to the level of 28 362 seats. Occupancy rate of trams in public transport gradually decreased and it was keeping the level of 42 500 seats since 2004. Occupancy rate of bus public transport recorded an increase of 6% in comparison with 2004.
(*Indicator Occupancy rates of passenger vehicles in the public road transport).*

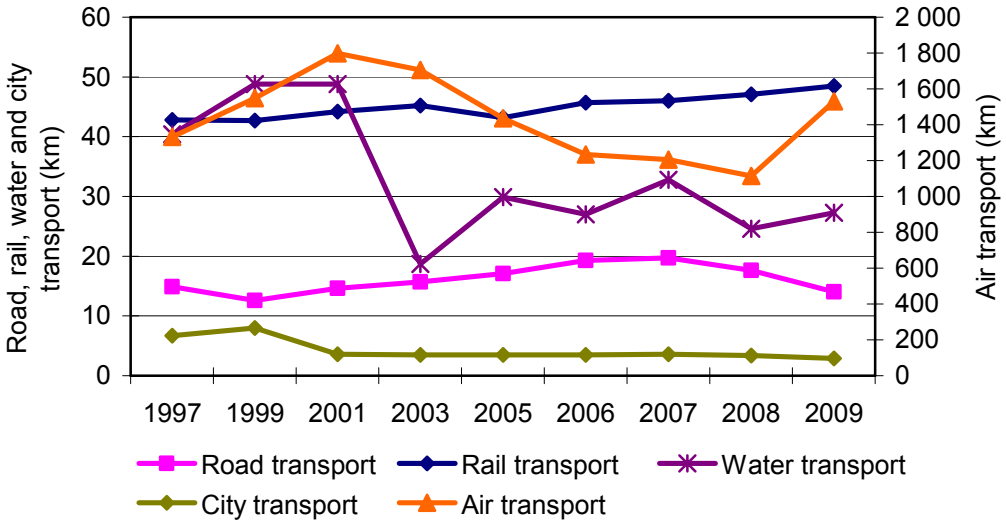
4.1.14. Vehicle payload capacity in the road freight transport

Unfavourable development of vehicle payload capacity decrease in the road freight transport was recorded over the period of 1999 – 2003. In 2003, vehicles of the weight rate from 1 500 to 2 999 kg (22,8%) represented the greatest percentage of number of the freight vehicles, on the contrary vehicles of weight rate over 15 000 kg and more (0.4%) represented the lowest one. More up-to-date data are not available.
(*Indicator Vehicle payload capacity in the road freight transport).*

4.1.15. Average transport distance

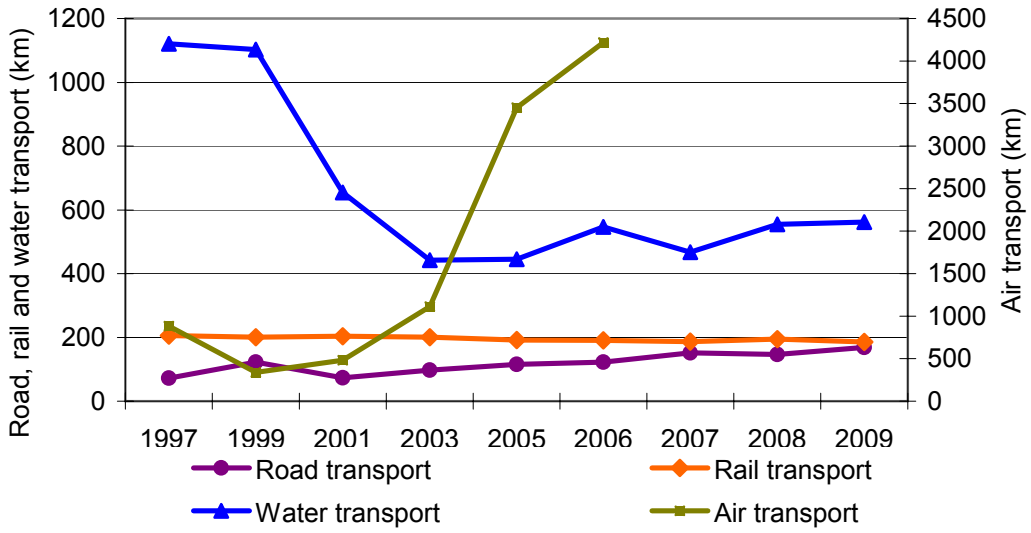
In 2009, an average transport distance of the public road transport was 14.55 km representing a year-to-year decrease of 6.5% being on the level of 1997. In 2009, the average transport distance of the public road transport (by 20.3%) and the city public transport (by 14.8%) decreased in comparison with 2008. In comparison with 1997 the greatest decrease continued in the city public transport representing 56.8%. A decrease in the water transport was recorded till 2003 and after that the average transport distance was noted by year-to-year descrease-increse. The railway freight transport remained on the same level having a minimum year-to-year fluctuations during the whole monitoring period. The greatest decrease was recorded in the water freight transport till 2003, after that time the average transport distance fluctuated.

Average transport distance of the passenger transport (km)



Source: SO SR; Processed by: SEA

Average transport distance of the freight transport (km)

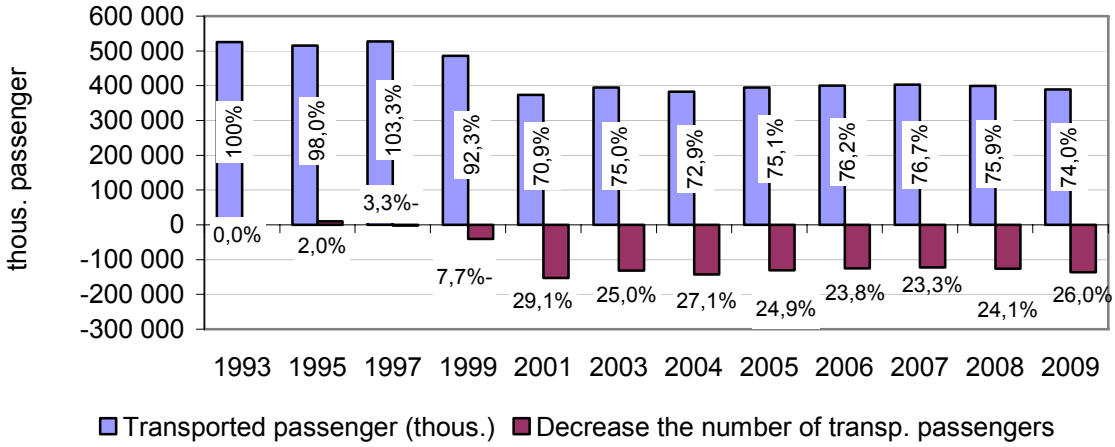


Source: SO SR; Processed by: SEA
Indicator. *Average transport distance*

4.1.16. Public passenger transport

A passenger number decrease in the public passenger transport has been continuing over the 12 year period (1997 – 2009) and in 2009 it arrived to 26%. A slight increase occurred in comparison with 1993, except a decrease of 3.3% in 1996 and a decrease of 0.3% in 1997. During the monitoring period the bus transport remained on the top position in the passenger transport followed by the tram and trolleybus transport.

Development of transported passengers in the city public transport in the SR over the period of 1993 – 2009 and comparison of this transport volume with the volume reached in 1993

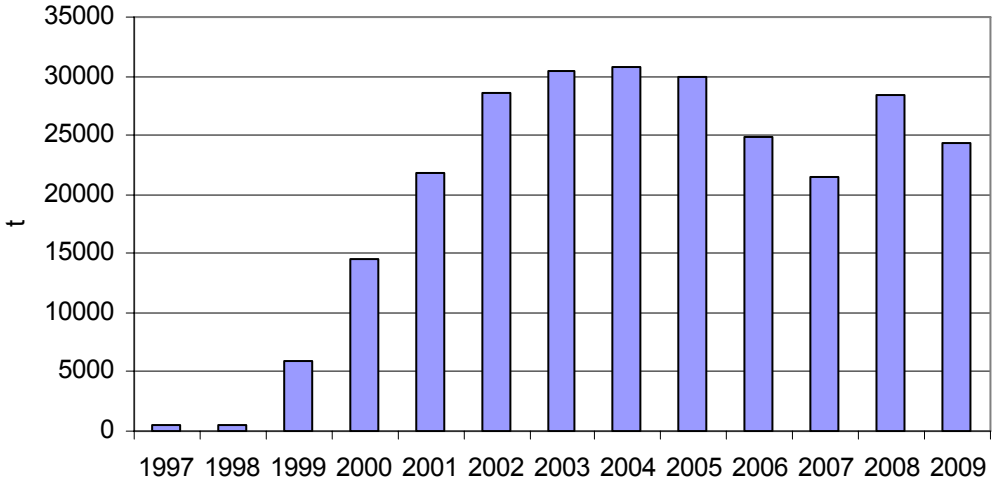


Source: SO SR; Processed by: SEA
Indicator *Public passenger transport*

4.1.17. Use of ecological fuels in transport

Consumption increase of alternative LPG fuel multiplied in the SR during the monitoring of 12 year period. While in 1997, the LPG consumption in Slovakia represented yearly only 510 t, in 2009 it was 24 348 t per year. After 2004, the development of the LPG consumption recorded a fluctuating trend. Compressed natural gas – CNG is another alternative fuel recording a year-to-year increase. In 2009 its consumption represented 9 871 414 m^3.

Development of the total LPG consumption in transport (t)



Source: TRI; Processed by SEA
Indicator *Use of ecological fuels in transport*

5. What are the environmental impacts of transport in the SR?

In terms of environment, transport is a source of pollution (whether the basic polluting substances or greenhouse gases), noise and vibrations, it creates pressure on the soil and impacts its spacial distribution and brings health and safety risks. Next chapter is dealing with environmental impacts of transport, specifically its air element, environmental impacts of the transport waste and also assesses health and safety risks of transport.

5.1. Air

Transport is one of the economic sectors negatively affecting all the elements of the environment (air, water, soil, fauna and flora). However the most affected is the air due to combustion of hydrocarbon fuels burning in engines of modes of transport producing toxic and carcinogenic chemicals (VOC, CO, NO_x, SO_2, TZL, heavy metals) and substances contributing to global warming in the Earth atmosphere (CO_2, N_2O, CH_4).

Set of individual transport and environmental sectors indicators relevant to characterize the air quality and climate changes impacts of the transport

D-P-S-I-R position in the structure	Individual indicators
Driving force	Final energy and fuel consumption in the transport sector
	Number of transported passengers in the passenger transport
	Passenger transport performance
	Freight goods volume
	Freight transport performance
	Transport accessibility of territory
	Fuel prices and fuel taxes
	Size and average age of the fleet by transport types
	Percentage of passenger engine vehicles fitted with a catalyst within the fleet
	Occupancy rates of passenger vehicles in the public road transport
	Vehicle payload capacity in the road freight transport
	Average transport distance
	Public passenger transport
	Use of ecological fuels in transport
Pressure	Emission of the basic polluting substances by transport
	Greenhouse gas emissions by transport
	Waste generated by transport
	Population exposed to the transport noise
State/Impact	Accidental water and air quality deterioration
Response	State subvention for the public transport sector
	Transport expenditures in the household budgets
	Internalization of externalities in transport

5.1.1. Driving forces in transport

The volume of polluting substances emitted from transport is directly related to fuels consumption while executing driving performance and to operating vehicle fleet (its site, structure, age, technical condition), but also to the transport infrastructure condition reflecting driving properties and speed. In order to reduce negative environmental impacts of the transport it is necessary to mainly aim the key solutions to accelerate fleet renewal and to support the public road and rail passenger transport, which for the time being is not able to compete with the private car transport.

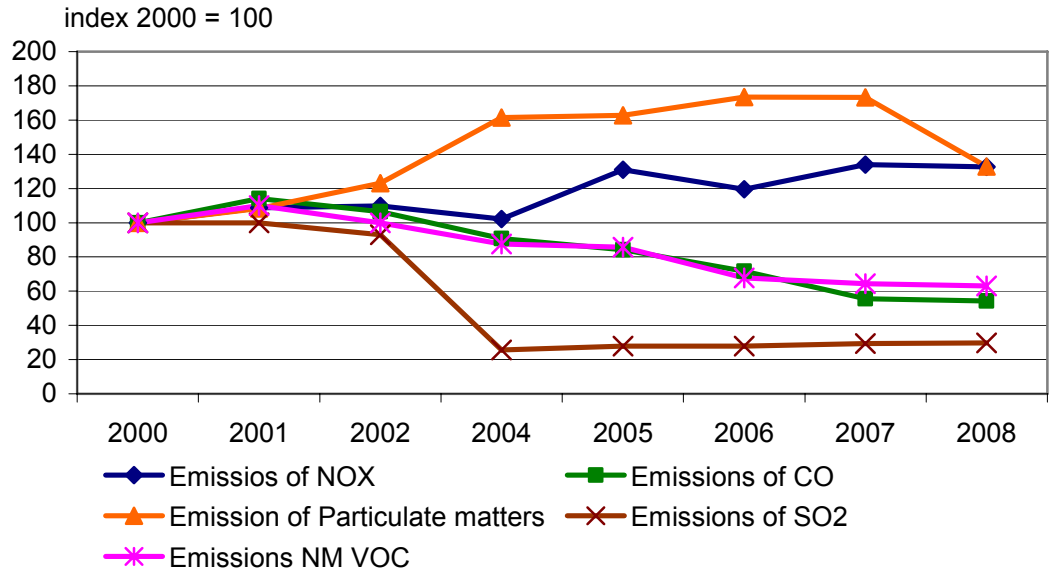
5.1.2. Pressure of transport on the air quality and climate changes

Transport takes part in production of emission of the basic polluting substances (determining substances of emissions balance sheet CO, NO_x and VOC) and production of greenhouse gasses CO_2, CH_4, N_2O. The CORINAIR methodology applied in the EU countries is used to assess the production volume of individual monitored toxic substances having its special programme product COPERT intended for annual stock-taking of emissions production by the road transport operation. In 2008, the COPERT IV began to be used for processing of emissions by the road transport operation and all the emission figures since 2000 were calculated according to this software. In 2008, the values of emissions decreased, which can be attributed to a transition into a new version of the COPERT IV software. Emission of the basic polluting substances coming from transport in 2008 recorded a minimum decrease in comparison with 2007.

5.1.2.1. Emission of the basic polluting substances by transport

Development of emission of the basic polluting substances produced by transport distinctively imitates development of diesel oil and petrol consumption however none of the polluting substances reached the level of pollution by the transport sector in 1990. CO proportion of 26%, NO_x proportion of 51% and NM VOC proportion of 14% are significant ones on the total emission balance sheet of polluting substance from transport for 2008. Proportion of 13% of solid polluting substances and 0.35% of SO_2 emissions took part on total emissions in 2008.

Development of emission of the basic polluting substances by transport (Index 2000=100)



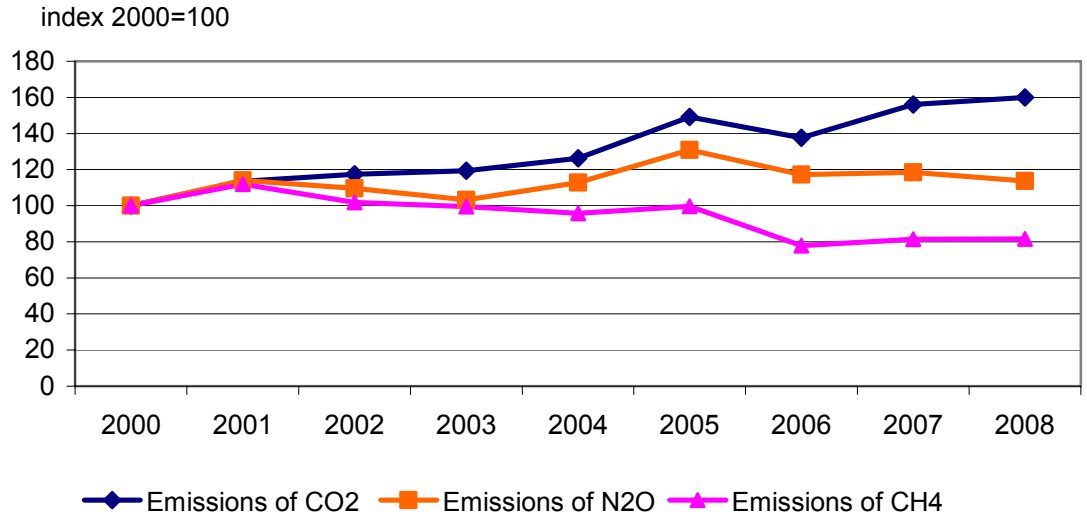
Source: SHMI; Processed by: SEA
Indicator Emission of the basic polluting substances by transport

5.1.2.2. Emission of greenhouse gases by transport

Development of greenhouse gas emissions produced by transport was influenced by ecologically unfriendly road transport (mainly private automobile transport), especially by

transport performance and fuel consumption increase. In 2008, emissions of greenhouse gases were also calculated by the COPERT IV methodology and emission values of CH_4 a N_2O recorded a significant decrease. Over the period of 2007 – 2008 emissions of CH_4 decreased by 0.55% and emissions N_2O by 4.5%. Volume of CO_2 emissions by the road transport had an increasing trend and reached the level of 6 617.21 thous. tons, representing only a minimal increase of 2.46% in comparison with 2007.

Development of emissions of greenhouse gases by transport (Index 2000=100)



Source: SHMI; Processed by: SEA
Indicator Greenhouse gas emissions by transport

5.1.3. Air quality condition / consequences

The road transport is an economic sector growing globally in majority of indicators, such as fuel consumption i.e. energy, number of vehicles and transport performance, considerably faster than GDP (that incurs and increases related damages on environment and population health). Negative changes coming from transport situation appear mainly in cities and residential areas i.e. territories situated nearby exposed transport routes thus increasing environmental pressure and impacting population health conditions. Health effects of air pollution coming from automobile emissions expanded respiratory and cardio vascular diseases, asthma and lungs functional decline.

5.1.3.1. Population exposed to transport noise

Directive No 2002/49/EC of the European Parliament and of the Council on the assessment and management of environmental noise adjures the noise mapping and subsequently the Act No 2/2005 Coll. on Assessment and Control of Environmental Noise was approved. In the SR only Bratislava agglomeration declared to be a Higher Territorial Unit with 546 300 inhabitants and total area of nearly 853 km^2 including 3289 km of roads and motorways, 311 km of railways and 73 km of tram tracks met the criteria of the first stage of the directive.
For the rest of the SR territory, strategic noise maps were elaborated for vicinity of motorways and 1st class roads operated by Slovenská správa ciest, a.s. /*Slovak Road Administration*/, and Národná diaľničná spoločnosť, a.s. /*National Motorway Company*/. There are approximately 480 600 inhabitants altogether living nearby the mentioned roads and motorways being attacked by traffic noise.
(Indicator Population exposed to the transport noise)

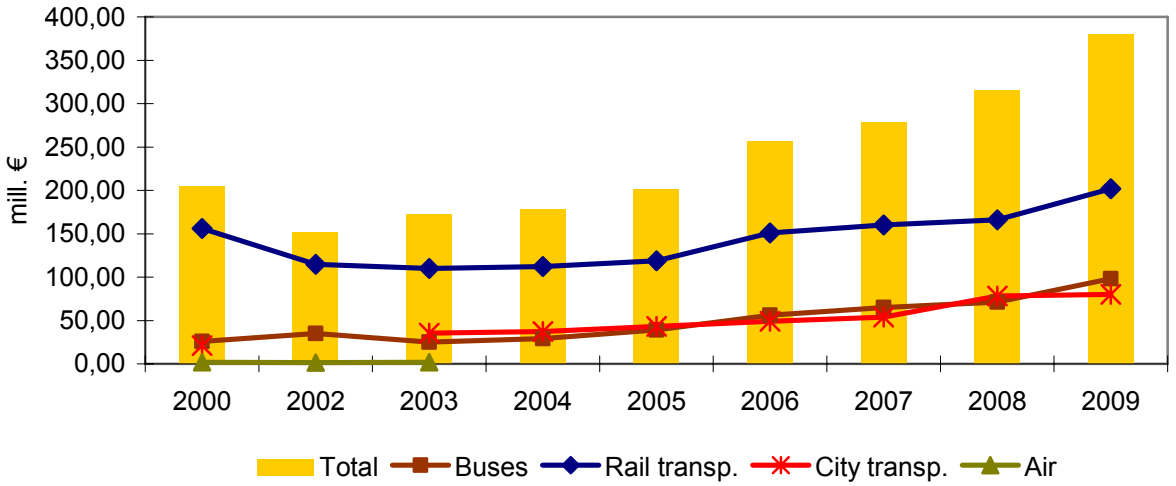
5.1.4. Response

Legislative and other measures are being approved on national and international level as a response to the current air quality condition and climate changes. At the same time to reduce negative environmental impacts by transport it is necessary to ensure optimal balance of individual modes of transport potential use that is via transition of transport performance to environmentally friendly types of transport (rail, water, intermodal, public passenger transport and so on).

5.1.4.1. State subvention for public transport resort

In 2009, the state budget subvention double increased in comparison with 2000. The greatest increase i.e. the most financial sources from state budget headed towards the public rail transport and towards the bus transport. In 2009 the least financial resources were intended for the city public transport.

Development of the state budget subvention for the public passenger transport (mill. EUR)



Source: Statistical Office of the SR, Ministry of Transport, Posts and telecommunication of the SR, state budget, closing accounts of VUC /Higher Territorial Units/, closing accounts of Transport offices of public passenger transports from cities; Processed by: SEA
Indicator State subvention for the public transport sector

5.1.4.2. Transport expenditures in the household budgets

Transport expenditures in households were permanently increasing during the whole monitoring period. From 1999 till 2008, the transport expenditures in households increased by 92%. The greatest percentage of finances used for transport out of the total households expenditures were recorded in 2007 (8.7%)
(Indicator Transport expenditures in the household budgets)

5.1.4.3. Internalization of external costs in transport

In terms of prices in transport, the private car transport is still being preferred to the public transport. Total costs of the car transport including acquisition and operational costs remained more or less stabile while costs of other modes of transport increased. This implies

that mobility of persons without any access to automobile decreased. The proportion of external costs to GDP in the SR is estimated from 3% to 5.5%. It is assumed that this proportion will be growing in future due to increasing economic power.
(*Indicator Internalization of externalities in transport)*

5.2. Waste

The transport sector belongs amongst significant (however in comparison with other economic sectors minor) sources of waste production, while many of them possessing dangerous properties. Due to economic development, rising new technologies, services and products, the OKEČ classification of economic activities was revised and the SK NACE Rev.2 statistical classification of economic activities was published, coming into force on the 1st of January 2008. For that reason it is not possible to compare data of waste produced by transport for 2005 – 2007 with data for 2008 – 2009.

Set of individual transport and environmental sectors indicators relevant to characterize the air quality and climate changes impacts of transport

D-P-S-I-R* position in the structure	Individual indicators
Driving force	Final energy and fuel consumption in the transport sector
	Employment rate in the transport sector
	Number of transported passengers in the passenger transport
	Passenger transport performance
	Freight goods volume
	Freight transport performance
	Length of the transport infrastructure
	Investment in the transport infrastructure construction
	Transport accessibility of territory
	Fuel prices and fuel taxes
	Size and average age of the fleet by transport types
	Percentage of passenger engine vehicles fitted with a catalyst within the fleet
	Use of ecological fuels in transport
Pressure	Waste generated by transport
State/Impact	State of the components of environment
Response	Internalization of externalities in transport

5.2.1. Driving forces in transport

Indicators of driving force related to waste production are: final energy and fuel consumption in the transport sector, employment rate in the transport sector.

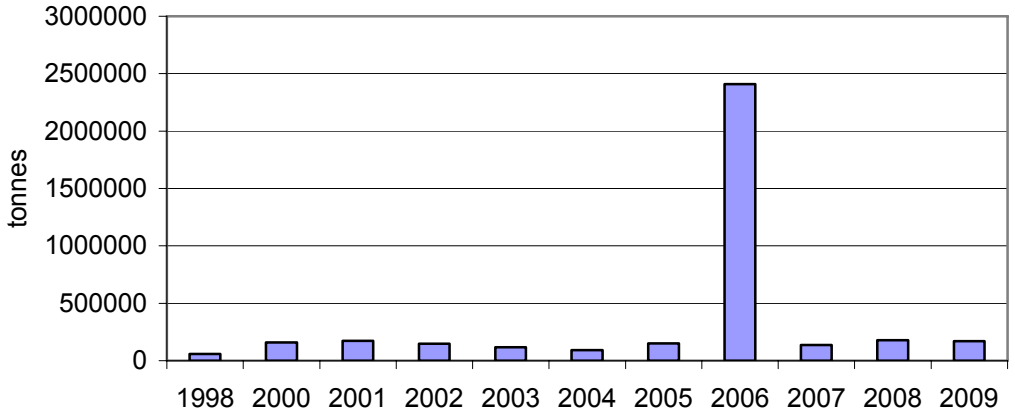
5.2.2. Transport pressure on waste production

Waste from crude oil products (lubricants, fuels) unfavourably effecting soil and surface water pollution belong amongst the waste produced by transport with negative environmental impact. Scrapped road engine vehicles and caravans represent the major part of waste coming from scrapped modes of transport.
Production within a subgroup of Batteries and accumulator represented 450.11 t being an increase of 14 % in comparison with 2008. Annual waste production by types represented 3 054.29 t within a group of Waste oil and liquid waste fuel being a decrease by 15.2%. The waste subgroup Waste oil water separation (2 167.71 t) represented the greatest proportion, followed by a subgroup Waste of engine oils, clutch oils and lubricating oils (676.84 t).

5.2.2.1. Waste generated by transport

In 2009, 165 151 t of waste was produced within the transport and communications sector comprising 86 702 t of dangerous waste and 82 499 t other waste. The waste production character, was balanced during the monitoring period, except an increase in 2006 caused by approx. 2 273 000 tons of excavated soil recorded at earthworks on Sitina tunnel construction in Bratislava. Proportion of transport on the total volume of the waste produced is small in comparison with other economic sectors. In 2008, in terms of scrapping old vehicles, 67 795 vehicles were scrapped representing an increase of 70 % in comparison with 2008. This increase was caused by introducing so called „scrappage scheme“ on older model vehicles.
Waste composition analyses demonstrate that waste of scrapped road vehicle comprise mostly ferrous metals (65-80%), non-ferrous metals (6-6.5%), tyres (4.5%), ferrous metals predominate in waste from scrapped railways vehicles (88-90%), non-ferrous metals (5.6-8.2%), accumulators (1.5-4%).

Development of waste produced within the transport and communications sector (t)



*note: since 2002 the emission balance sheet has been executed according to the new Act on waste
Source: SEA
Indicator *Waste generated by transport*

5.2.3. State of waste production / consequences

An issue of drawing resources is related to an issue of service life of modes of transport and equipment, where service life prolongation while maintaining required technical parameters is being a positive trend. The transport sector belongs amongst significant sources of the waste production from which many of them possess dangerous properties. Negative impacts of transport significantly influenced **condition of living environment (its elements)** and effecting health conditions of the population.

5.2.4. Response

In terms of going eco-friendly it is necessary to introduce and encourage using alternative, renewable energy sources for transport, focus on support and development of non-motorized and more environmentally friendly modes of transport. In past a programme of rapeseed oil use was introduced on order to produce biodiesel oil. Waste-free manufacturing and nearly complete biodegradation in short period of time belong amongst its major positive features. First legislative modifications occurred in this respect to decrease or temporary exempt their taxes.

5.3. Traffic accident rate

Traffic accident rate belongs amongst impacts directly affecting human population and all the environmental elements. In 2004, The Council of the Government of the SR for Road Traffic Safety (BECEP) was formed to be a permanent advisory, coordinative and initiative body of the government in order to ensure complex care about increasing the traffic safety in the SR. **„The national plan on road traffic safety improvement for II. half year towards 2010“** is a strategic document for the Council of the government of the SR for BECEP activities. The national plan focuses its activities and measures to minimize human lives losses and to reduce material damages; its objective is to decrease fatalities of the traffic accidents by 50% until 2010 in comparison with 2002.

Set of individual transport and environmental sectors indicators relevant to characterize traffic accident rate

D-P-S-I-R position in the structure	Individual indicators
Driving force	Final energy and fuel consumption in the transport sector
	Employment rate in the transport sector
	Number of transported passengers in the passenger transport
	Passenger transport performance
	Freight goods volume
	Freight transport performance
	Length of the transport infrastructure
	Investment in the transport infrastructure construction
	Transport accessibility of territory
	Fuel prices and fuel taxes
	Size and average age of the fleet by transport types
	Occupancy rates of passenger vehicles in the public road transport
Pressure	Waste generated by transport
State/Impact	State of the components of environment
Response	Internalization of externalities in transport

5.3.1. Driving forces in transport

Indicators of driving force related to waste production are: final energy and fuel consumption in the transport sector, employment rate in the transport sector, number of transported passengers in the passenger transport, passenger transport performance, freight goods volume, freight transport performance, the length of the transport infrastructure, investment in the transport infrastructure construction, transport accessibility of the territory, fuel prices and fuel taxes, size and average age of the fleet by modes of transport, occupancy rates of passenger vehicles in the public road transport are mentioned in the Chapter No 4.

5.3.2. Transport pressure on traffic accident rate

Quality of the transport infrastructure significantly influences traffic accidents rate and occurrence. Traffic accident rate is related mainly to vehicle transport on rural areas; however the pedestrian transport makes significant proportion on urban areas too. When increased traffic accident rate not only direct costs related to damages removal grow, but medical care ones too.

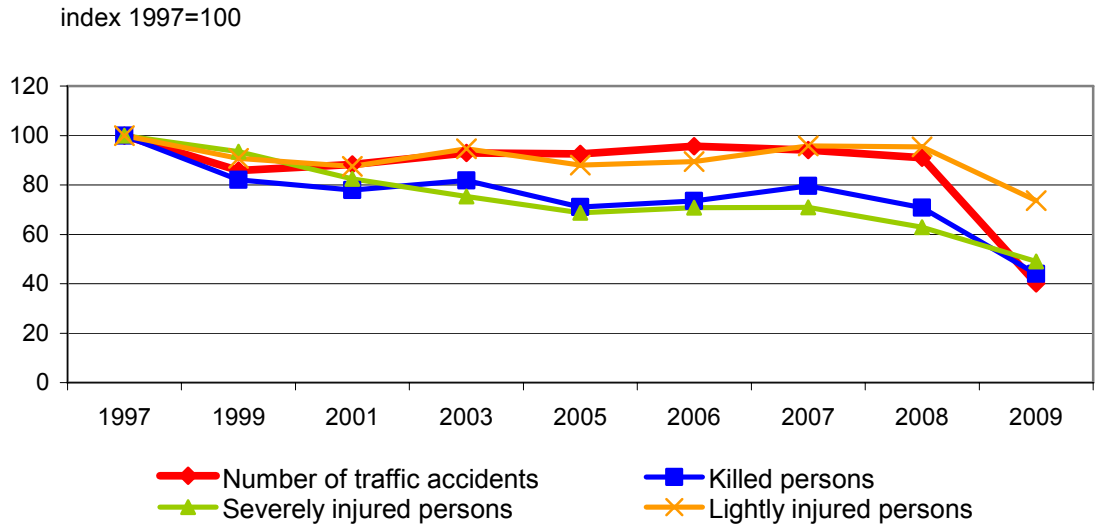
5.3.3. State of traffic accident rates / consequences

Traffic accident rate belongs amongst direct effects that immediately impact human population and all environmental elements. Its direct effects on people are consequence of immediate damage of their health and direct ones are by means of material damages.

5.3.3.1. Traffic accident rate and fatality and injury rates in consequence of the road traffic

In 2009, a significant decrease of number of traffic accidents was recorded in comparison with the previous year. The decrease was caused by the change of methodology at the SO SR */The Statistical office of the Slovak Republic/* and legislative modifications had a significant influence too as the participants of the traffic accidents are not obliged to call the police, if the damage amount does not exceed a sum set by the law. In terms of traffic accidents consequences analysis a significant decrease of fatalities, serious and minor injuries occurred as in comparison with 2009, which was also caused by the road law modification to a certain extend as well as by tougher sanctions for drivers.

Traffic accident rate and fatality and injury rates in consequence of the road traffic operation (index 1997=100)



Source: SO SR; Processed by: SEA
Indicator A number of traffic accidents and a number of fatalities, serious and minor injuries as a result of traffic

5.3.4. Response

In 2009, a significant decrease in development of traffic accidents occurred in comparison with 2008. Several legislative modifications, driving rules modification and tougher sanctions for their infringement as well as legislation on vehicle safety regulation positively contributed to the accident rate decrease.

6. Has been environmental eco-efficiency of transport in the SR improving?

In terms of ensuring quality and fast transport of passengers as well as freight and goods, great requirements are imposed on the transport. Despite of information and communication technologies development, increase of population mobility as well as the freight increase are still evident subjected to the increase of economic activities and the increase of population living standard.

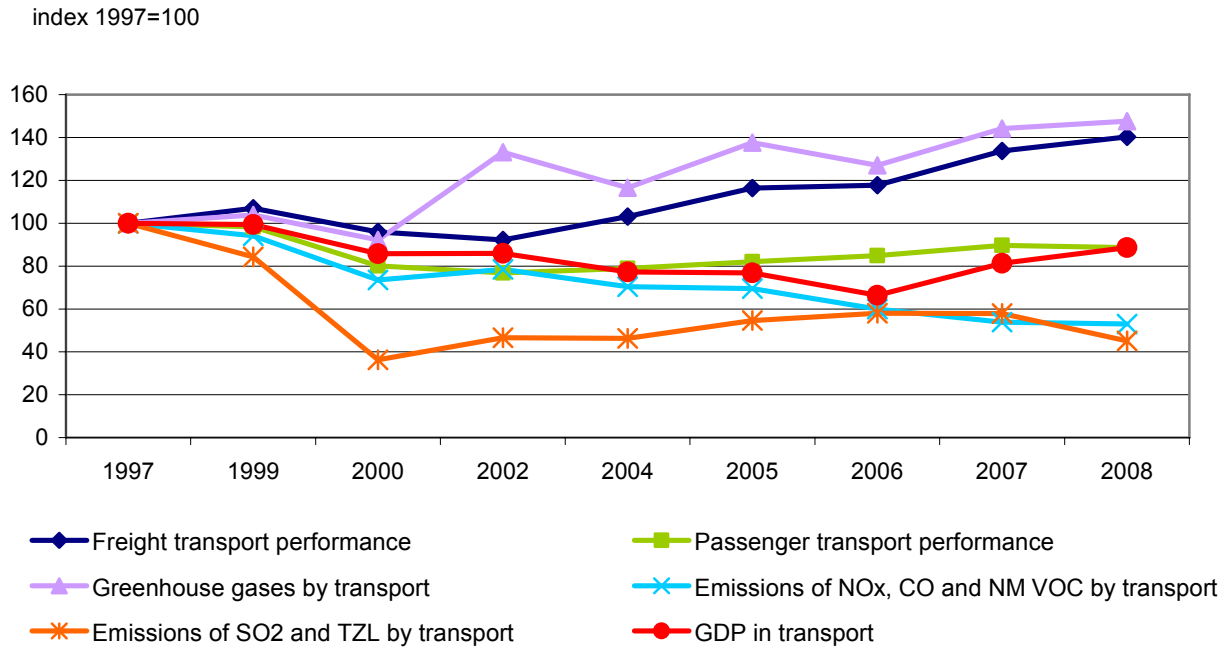
6.1. Environmental eco-efficiency of transport in the SR

The transport sector becomes environmentally efficient, if its economic growth while minimizing pressure as well as negative environmental impacts on living environment is managed to be ensure. This status is graphically illustrated like „a pair of opening scissors“, i.e. a trend of an economic indicator increase that is being copied by a trend of an environmental indicator decrease.
Indicators showing correlation dependency between the economic indicators of transport, expressed for example by proportion of transport-driven gross domestic product (GDP) or gross value added (GVA) and the environmental indicators such as fuel and energy consumption in the transport sector, emission of polluting substances and greenhouse gas emissions by transport, number of transported passengers and freight good volume i.e. passenger and freight goods transport performance as well as waste generated by transport are used to express environmental efficiency.

6.1.1. Environmental eco-efficiency of transport

Environmental efficiency of transport in the SR with respect to a number of passengers and freight goods volume transported is determined by correlation dependency between economic indicator of transport driven GVA (gross value added) and the passengers and freight goods transport performance. In such case efficiency of transport does not declare a positive trend. A negative trend of number of transported passengers or passenger transport performance began to show after 2004 (passenger transport performance increased and gross valued added decreased). Environmental efficiency significantly worsened in relation to freight goods transport performance and gross value added in 2002, where the greatest performance increase was recorded in the road and air transport. Gross added values increase was recorded after 2006. The transport takes part approximately 15% concerning greenhouse gas emissions (CO_2, N_2O and CH_4). Worsened environmental efficiency of transport (the GVA decrease and the emissions increase – opening of the pair of scissors) is caused by the CO_2 proportion which has been significantly growing since 2000. This growth could have been caused by the change of the EU methodology that was to be accepted by all the member states and in 2000, polluting substances from the road transport were calculated by the COPERT IV. methodology.
Environmental efficiency of transport related to the basic polluting substances and to gross value added copied transport-driven GVA development till 2006; a positive trend (CO, NO_x and NM VOC emissions) began to show after that year. The SO_2 and PM emissions recorded a decrease till 2000, a constant emission growth, especially PM, has occurred till 2006. After that year, the return of emissions decrease was recorded, but at the same time gross value added began to increase (opening of the pair of scissors).

Environmental eco- efficiency development in the transport sector (Index 1997=100)



Source: SO SR; Processed by: SEA
Indicator *Environmental eco-efficiency of transport*

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Abbreviations

CNG	Compressed Natural Gas
CTE	City Transport Enterprises
DPSIR	D – driving force, P – pressure, S – state, I – impact, R – response
EEA	European Environmental Agency
EC	European Commission / European Community
EUROSTAT	Statistical Office of the European Communities
EU	European Union
GDP	Gross Domestic Product
LPG	Liquid Propane Gas
MTCaRD SR	Ministry of Transport, Construction and Regional Development
MoE SR	Ministry of Environment of the Slovak Republic
NM VOC	Non-Methane Volatile Organic Compoud
PM	Particulate Matter
SEA	Slovak Environmental Agency
SHMI	Slovak Hydrometeorological Institute
SR	Slovak Republic
SRA	Slovak Road Administration
SO SR	Statistical Office of the Slovak Republic
TRI	Transport Research Institute