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SAFETY OF THE ROAD SYSTEM

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ABSTRACT

In spite of economic difficulties due to the global economic crisis the road transport continues to grow and causes congestion in both cities and the country. One of main causes of this congestion is the excessive mobility that is caused by easier accessibility of destinations with different means of transport, as well as by the increasing dispersion of human activities within the territory. Impacts of growing demands on the mobility of persons and goods also have negative environmental effects and force the responsible authority to search for their possible solutions. One of serious negative impacts of road traffic is road accidents that cause a high death rate and significant damages to health and property of affected persons. A natural requirement of each road user is the safe transport during the whole period of transfer. However this requirement requires a system approach to the enforcement of efficient measures aimed to ensure the safety of transport for all participants of the transport process in a safe environment of quality transport infrastructure. Consequently, the safety of transport, in particular the road safety, becomes one of basic conditions for the operability of the road network in Slovakia as well. This condition results not only from the internal requirements for a high level of safety of the transport system of own country, but in view of the fact that the Slovak Republic is a part of a wider European transport system, also from the requirements for provision of the same level of safety for each citizen of the European Union.

The report provides information on potential causes of excessive mobility that is the main factor of growing congestion of the road network and subsequent negative impacts from the view of road accidents. It describes procedures and strategies by means of which a considerable decrease of road accidents was achieved in the recent years in Slovakia. It also brings information about international projects aimed at specific issues of safety management in the cross-border region of East Austria and West Slovakia, referring to potential transnational extension of acquired knowledge. Finally it specifies conceptions and strategic aims that the Slovak Republic wishes to achieve by the implementation of the prepared National Road Safety Plan for the following period.

1. INTRODUCTION

The Slovak Republic, like many other Central and East European countries, had to cope with fundamental social changes that had been implemented after the year 1989 (at that time a part of Czecho-Slovakia). The period of transformation of the country also showed up in the transport sector. One of the most radical changes was the development in the road transport, where a huge increase in the number of motor vehicles was observed. Road infrastructure was not prepared to manage the increased traffic volumes, which led to an increase of congestion and a higher number of road accidents. The need to develop superior road infrastructure had become one of strategic political aims and these efforts are still pursued. However, at that period, issues related to the transport safety were politically and socially marginalised. Social changes also affected the change of attitudes of road users. It resulted in the increase of the number of road accidents and of killed and injured persons.

2. LAND USE, ROAD TRANSPORT AND ROAD ACCIDENTS

In the last decades, Slovakia went through extensive transformation – from a strong dependence on superior countries to the full state sovereignty and regular membership in the European Union. The central position of the country in the European area, crossed by

main development corridors, is one of important acceleration factors of the previous positive development and creates very good conditions for further economic development and mutual cooperation.

The settlement structure of Slovakia consists of smaller settlements, of which more than 95% are communities with less than 5 thousand inhabitants. From the total population of 5.4 million more than 56% of inhabitants live in larger cities. In comparison with the neighbouring countries, the settlement structure of Slovakia is finer and dynamically developing.

Traffic surveys show that the equipment of the population by passenger and motor vehicles grows very fast, which is manifested by the increase of road transport within the territory of Slovakia, in particular in larger cities. At the same time, individual motor transport grows faster than freight transport (figure 1).

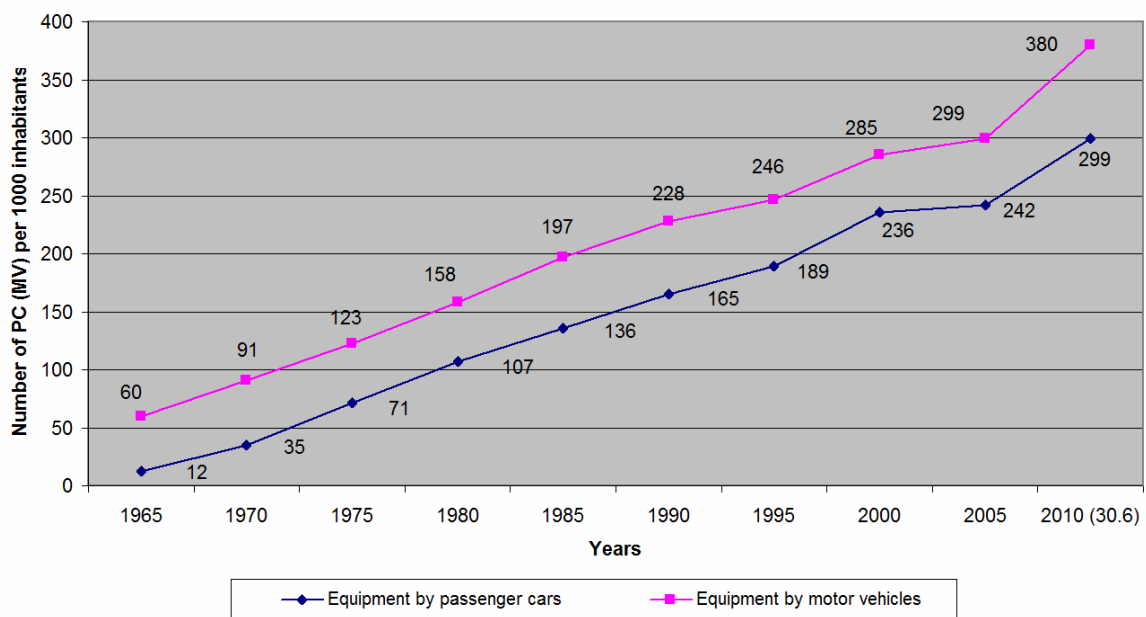


Figure 1 - Development of equipment by passenger and motor vehicles in Slovakia ([5] www.ssc.sk)

The impacts of growing mobility are manifested in the creation of congestions, especially on radial roads to metropolitan areas, not only in the morning peak hours and in the afternoon peaks, but during the whole day, when neighbouring local roads are also overloaded by the throughroad traffic. This pressure from load by the road transport increases in the narrow road network of cities that was constructed in the previous period according to the requirements of a compact urban mass transport. It is the "narrow" street area that presently multiplies the difficulties with permeability of the road network that is congested by the individual motor transport, absorbing all free areas in the city. The individual motor transport gained the upper hand in the division of transport work, not only in the cities, but also in the external transport. The real development of the current modal split is in contradiction with the planned conceptions of sustainability of the transport system in a long-term perspective that prefers environmental transport modes. One of causes of this unfavourable situation is the decrease of the population in urban settlements (Příhodová, 2008, figure 2) and their dispersion in the form of individual

housing development in their catchment area and in smaller rural settlements. For example, for Bratislava, the capital city of Slovakia, the prognoses envisaged that its population would increase up to 750 thousand inhabitants, in a long perspective. In spite of these optimistic assumptions and the positive economic development, the growth of population gradually slowed down and in the year 1996 stagnated at the level of 453 thousand, with subsequent gradual decrease of inhabitants of the administrative boundaries of the city until the present period to approximately 420 thousand inhabitants.

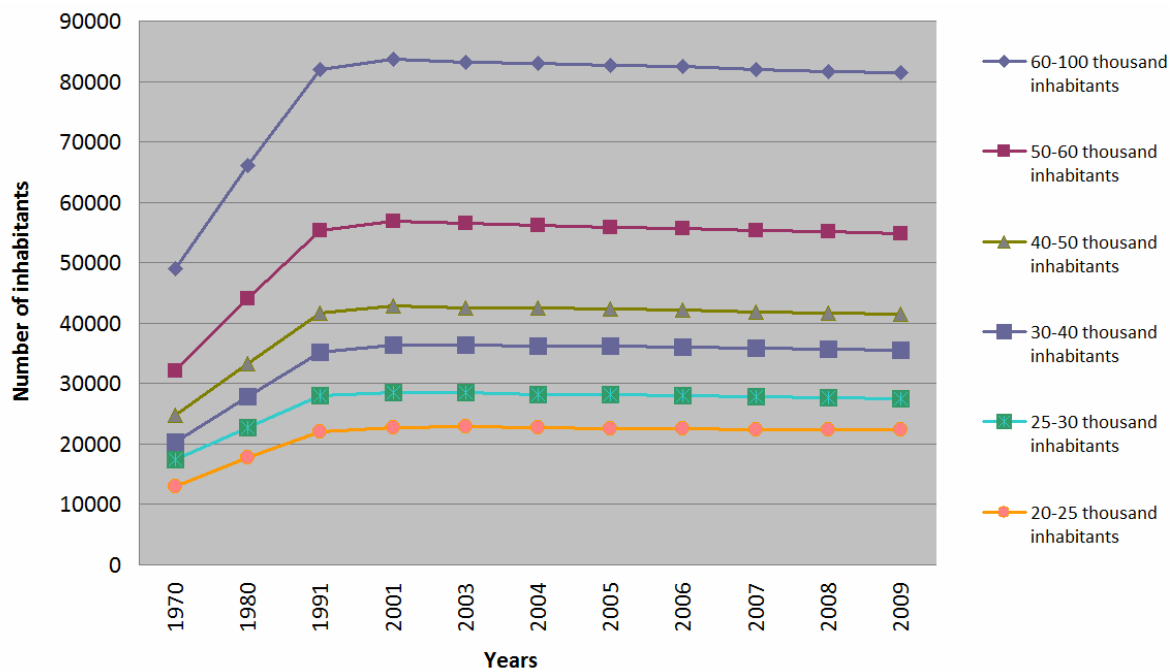


Figure 2 - Development of the number of inhabitants by age categories in selected cities of Slovakia (Přihodová, 2008)

This process of population decrease that can also be observed in other cities of Slovakia and in other Central European countries is affected particularly by the following factors:

- Dislocation of new emerging city functions (trade, services, production, recreation) to the periphery or behind the administrative boundaries of the cities;
- Implementation of extensive individual housing development and home building projects in the catchment area of larger cities with a low density, and
- Decrease in population due to the decreasing natality rate that exceeded the mortality rate in the year 2001. The impact of immigration from other countries is very weak so far and cannot substitute for a natural decrease in urban population.

The dispersion of the housing function to the external positions and the dislocation of new emerging functions (trade, services, production, etc.) to cheaper agricultural parcels outside the territory of the settlements have a negative impact on the modal split of the external transport. The low densities of population in the rural areas do not create a sufficient transport potential for the external mass (bus and railway) transport, but on the contrary encourage the use of comfortable, fast and flexible individual motor passenger

transport. It causes an enormous increase in the volume of road transport, the most sensible impact of which is road accidents.

3. DEVELOPMENT AND ACTUAL ACCIDENT RATE

The development of the number of road accidents and their consequences in the Slovak Republic for a longer period (1993 – 2009) shows an uneven development (figure 3).

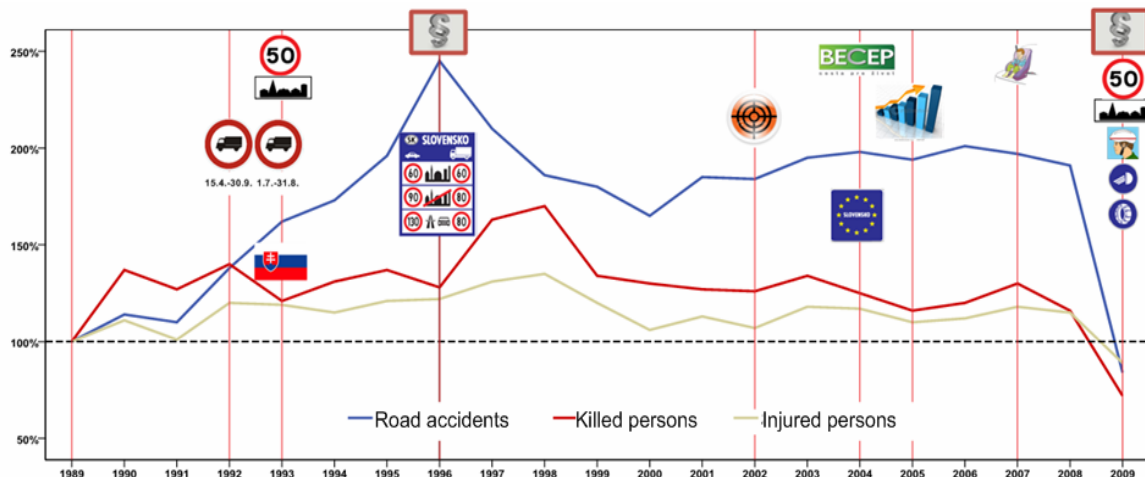


Figure 3 - Consequences of road accidents 1989 – 2009 (Machcink, 2010)

In the years 1993 – 2004 the coordination among the central bodies of state administration in the implementation of measures to decrease the accident rate did not exist. The events shown in table 1 can be regarded as the most important factors that directly or indirectly affected the road traffic situation in Slovakia and hence the road safety.

The improvement in the development of the accident rate has become evident to a fuller extent only by adoption of the National Road Safety Plan for the 2nd Half-Year 2005 with Outlook until the Year 2010. This plan defines the basic strategy for the achievement of the common objective to halve the number of persons killed in road accidents against the year 2002. The Road Safety Council of the Government of SR (RV BECEP) was established, which as permanent advisory, coordinating and initiative body through its working groups creates a framework for adoption of legislative changes and innovative technical solutions increasing the level of safety on Slovak roads. The intensification of the domestic political support (affected particularly by the joint action of EU), the earmarking of financial resources and the establishment of the Road Safety Council of the Government are the most important system tools for the problem solution of road accidents in the era of independent Slovakia.

The percentage decrease in the average number of road accidents and their consequences calculated per 100 km of given road for the year 2009 against the year 2002 is shown in figure 4.

The National Plan defined the basic area of competences and specific measures to increase the level of road safety and determined the responsibilities of the individual departments and institutions. Expert groups composed of specialists in the individual areas had been set up that worked together on the tasks in a coordinated manner. The division

Table 1 - Events affecting changes in the area of road safety (Machciník, 2010)

Year	Change	Year	Change
1992	Driving ban for trucks during holidays (15 April - 30 September)	2004	Establishment of the Road Safety Council of Government
1993	Formation of the Slovak Republic	2005	National Road Safety Plan until 2010
1993	Driving ban for trucks on a motorway	2007	Mandatory use of child restraint systems
1993	Driving ban for trucks on a motorway: amendment (1 July – 31 August)	2009	Act 8/2009 on road traffic
1993	Maximum speed limit in urban areas decreased to 50 km/h	2009	Maximum speed limit in urban areas decreased to 50 km/h
1993	At 351/1996 on road traffic*	2009	Mandatory use of cycling helmets and reflective elements
1996	Speed limit in urban areas increased to 60km/h and on a motorway to 130km/h	2009	Mandatory use of daytime running lights throughout the year
2002	Reference year for reduction of the number of killed	2009	Mandatory winter tires for trucks and buses
2004	Accession of the Slovak Republic to the European Union		* Valid from 1 April 1997

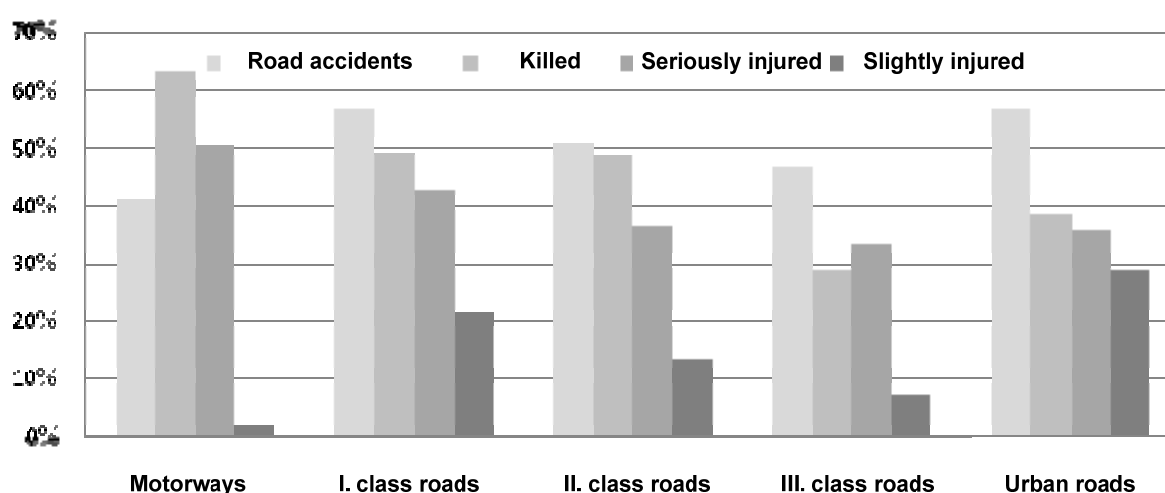


Figure 4 - Percentage decrease of average number of road accidents and their consequences (Machciník, 2010)

of tasks in the individual thematic areas corresponded to a large extent to the structure of focus of the expert groups of the Road Safety Council of the Government. These thematic areas included:

- Vehicle safety
- Safety of road infrastructure
- Traffic education and awareness
- Health education and transport psychology
- Road-safety legislation
- Police enforcement
- Promotion in media

In addition, tasks related to coordination and cooperation at national and international level were defined. Specific tasks and measures resulted from an analysis of statistical data on road accidents, strengths and weaknesses in given conditions, and from international commitments by which the Slovak Republic is bound.

One of priority areas of the National Plan was the increase of the level of safety of road infrastructure, where attention was paid to the following activities:

- Traffic calming
- Improvement of visibility and readability of traffic signs
- Increase of safety of railway crossings
- Accurate localization of road accidents and removal of blackspots
- Creation of conditions for a progressive traffic management

One of basic areas of preventive character of the road safety is traffic education and awareness that positively influences the missing of awareness and the change of attitudes of the general public. Specific tasks resulting from the National Plan were aimed at the following thematic areas:

- Traffic education of children
- Improvement of training of applicants for driver licence
- Campaigns and educational measures for the general public

In view of its scope, media pay more attention to road safety, which resulted in an increased social interest in its solution. Many campaigns aimed at the most serious problems such as speeding, safety belts, alcohol or visibility of pedestrians and bicyclists were implemented. The creation of a volunteers' network VAMOS ([4] www.becep.sk) organising campaigns for the population aimed to above mentioned problems throughout Slovakia is worth attention.

By combination of the preventive and repressive actions the decrease of road accidents and their consequences was achieved in the period of years 2002 to 2009. Thanks to this development, the chances for the achievement of the set strategic aim specified in the National Plan for the year 2010, which is in accordance with the EU objective to have the number of road accident victims (table 2, figure 5), significantly increased.

The most important factors that contributed to the increase of road safety (Kapusta, 2010):

- Setting of maximum speed in urban areas at 50 km/h,
- Obligation of use of daytime running lights throughout the year,

- Prohibition of the use of a telephone by a driver
- Obligation to use tires with a winter tread pattern when the road is covered by a continuous snow layer or ice
- Obligation for the bicyclists to protect their head when driving outside urban areas (children under 15 years of age also in urban areas)
- Increased fines and more stringent sanctions, especially in case of the detection of alcohol in the driver's breath.

Table 2 - Development of persons killed in Slovakia from 2002 onwards

Year	Number of killed persons		
	Actual	Target	Difference
2002	610	610	± 0
2003	645	572	+ 73
2004	603	534	+ 69
2005	560	496	+ 64
2006	579	458	+ 121
2007	627	420	+ 207
2008	558	382	+ 176
2009	347	344	+ 3
2010	141*	305**	

Note: *for the 1st half-year 2010; ** target value in the end of the plan period

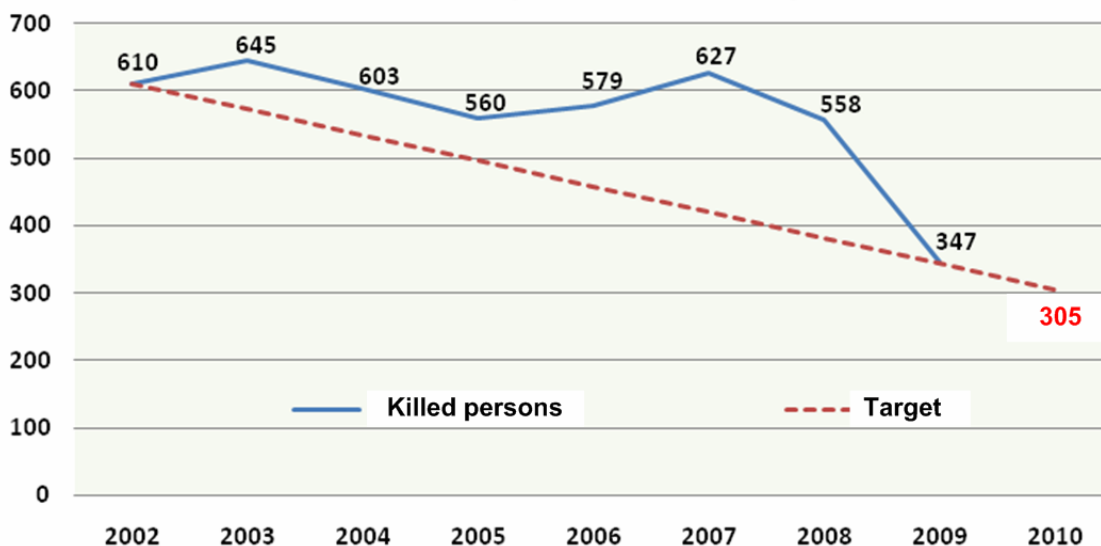


Figure 5 - Number of killed persons

The achieved results confirm the requirement for the increase of road safety by comprehensive measures and planned process, which should receive a strong political and public support.

4. CROSS-BORDER ASPECTS OF ROAD ACCIDENTS

Due to the continuing European integration the issue of road accidents crosses the borders of the individual countries. From this perspective, the issues of dealing with road accidents, especially in border regions whose natural relations were disrupted in the previous century due to political changes caused by military events, come into consideration. The gradual opening of economic cooperation within the European integration process establishes requirements for the elimination of bottlenecks in the cross-border connection of the passenger and freight transport systems, also from the view of road safety. International projects aimed at the compatibility of interconnection of border areas serve to it. These include projects of the Operational Programme Cross-Border Cooperation Slovak Republic – Austria 2007 - 2013 that is cofinanced by the European Regional Development Fund (ERDF) under the motto "Creating the future".

These projects comprise:

- "Cross Border **RO**ad **Saf**Ety **MAN**agement" project known under the acronym ROSEMAN, developed in the years 2009 - 2011 in cooperation of the Austrian Safety Board, Vienna, and the Slovak University of Technology in Bratislava, Slovakia ([1]), and
- "Traffic Model AT-SK" project ([2]), aimed at setting up of the database of input data for the model of transport connection of the territories of East Austria and West Slovakia, developed in the years 2009 - 2012 in cooperation of the Vienna University of Technology, Austria, and the Slovak University of Technology in Bratislava, Slovakia.

The primary objective of the ROSEMAN project is to create conditions for road safety management in the road network within the cross-border territory of Austria and Slovakia (figure 6), that will allow to propose a compatible methodology applicable to the selected road network in both countries.

Specific aims of the ROSEMAN project are:

- To establish a platform for information exchange among Slovak and Austrian experts in the road transport sector;
- To analyse the existing situation of road safety in both countries;
- To conduct road safety surveys on the selected road network in Slovakia and Austria;
- To implement road safety measures in selected model communities;
- To implement measures to enhance the awareness on road safety;
- To draw up specific supporting materials for modern legislation, and
- To involve the inhabitants and students from both countries in the project.

The prepared Methodology ROSEMAN for roads safety inspection (RSI) is based on the verified Austrian methodology worked out by the Austrian Safety Board in Vienna. It will serve for the detection of road safety defects of the existing selected road network within a model territory (figure 6), according to which the mixed group of experts of the ROSEMAN project from Austria and Slovakia will:

- identify road safety defects of selected sections of the road network;
- propose specific recommendations for the elimination of identified defects with estimated expectations;
- establish model measures, including the estimate of costs for given road sections.



Figure 6 - Model territory of cross-border projects

The knowledge derived from the road safety inspection conducted within the model territory will also be used for suggestion of measures to prevent accidents, based on the reports on potential road safety defects.

The second project implemented in the framework of the Operational Programme Cross-Border Cooperation Slovak Republic – Austria 2007 - 2013 is the "Traffic Model AT-SK" project aimed to set up a database of input data for modelling of traffic load of the transport network in the border area of East Austria and West Slovakia for both the present and the future periods. As this project covers the model territory of the ROSEMAN project, results of this cross-border project will be applicable to traffic load modelling, also for the purposes of modelling and evaluation of road accidents within the affected model territory.

Both bilateral projects have been well received during their implementation in the neighbouring countries and at the present period conditions are created for the extension of the VKM Transport Model project to neighbouring Hungary and prospectively to the southern part of the Czech Republic, with an ambition of creation of a transnational project for dissemination and utilisation of results of both projects in a wider European environment.

5. SAFETY CONCEPTIONS FOR THE FUTURE

The systematic increase of the safety level is seen as a way of the permanent decrease of road accidents that remains a serious social problem. Annual costs caused by road accidents represent more than EUR 700 millions (2007), which gives the safety an economic dimension. In spite of the achieved progress it is therefore vital to continue with

the activities that brought expected results and to introduce new procedures that proved to be effective in other countries. For this reason, the draft National Road Safety Plan 2011 - 2020 was based on the Swedish philosophy Vision Zero. Before, a major part of responsibility was placed on road users, and only then the task was shared by several entities interested in the issue. Now politicians and road infrastructure managers have the same responsibility for road safety as a road user has the responsibility for observance of traffic rules.

The aim to decrease the number of road accidents at national level should be determined in accordance with the common approach of EU. The positive experience from the common objective of the European Union in the years 2002 – 2010 led to the conclusion to determine the strategic aim to halve the number of persons killed in road accidents (those killed in 30 days from occurrence of accident) until the year 2020 against the reference year 2010. Experiences from the previous programme period show that such formulated objective is connected in the awareness of the general public with an increase of the road safety level, which is the basic condition of the acceptance of the proposed measures.

System measures for road safety improvement are based on the identification of the most frequent causes of road accidents and are aimed to the creation of a safe transport area for all road users. On this basis the measures are embedded into the structure to fully cover all components of the transport system affecting the overall level of road safety: human factor, road infrastructure and vehicle.

One of system measures is the implementation of speed management that represents a system approach for the definition of credible speed limits on the road network and the use of modern technologies for supervision of their observance (ITS applications, automated law enforcement). In the area of alcohol and drugs the implementation of preventive activities (involvement of the volunteers' network in awareness enhancing activities) and efficient repressive measures (equipment of the police by drug detection devices) will continue. In the area of traffic education the effort to set up a framework for continuous traffic and health education of the public (continuous acquisition of adequate knowledge for different age categories of population) exists. In view of the relatively high share of accidents caused by novice drivers it is important to revise the quality of training of applicants for driver licence at driving schools that will lead to the introduction of better prepared novice drivers into the road traffic.

A well designed road should prevent the occurrence of road accidents by its characteristics and, where impossible, to reduce the severity of consequences. These two basic principles should be applied to the design, maintenance and reconstruction of the road network. For strategic reasons it is important to finish the superior road infrastructure in order to partially transfer the traffic load to higher quality and safer motorways and expressways. The road managers should implement maintenance of existing infrastructure to allow unrestricted vehicle traffic. The introduction of the safety audit system in Slovakia is a legitimate necessity resulting from the adoption of the EP Directive on road infrastructure safety management. Although the Directive only stipulates the obligation of audit for TEN-T projects, these activities must also be supported on roads of lower category where, as mentioned above, most of road accidents and injuries occur. It will also be necessary to introduce, in accordance with this Directive, a framework for performance of road inspection that will be based on credible data on the road accident locations and on the implementation of measures in road sections with their frequent occurrence. The draft plan defines tasks that should contribute to safe movement of vulnerable road users

(safe pedestrian crossings and construction of cycle paths) and increase the safety of railway crossings and tunnels.

The more intensive introduction of ITS applications and the creation of the National Traffic Information Centre that will inform the drivers about actual operating conditions on the road network, should bring innovations into vehicle safety. In addition, it is necessary to successfully accomplish the task of introduction of the eCall system in Slovakia that will speed up the provision of help to victims of road accidents.

6. PRIORITIES OF THE NATIONAL ROAD SAFETY PLAN

The draft Slovak National Road Safety Plan 2011-2020 is based on the following international documents [3]:

- a. Moscow Declaration adopted on the First Global Ministerial Conference on Road Safety on 20 November 2009;
- b. Resolution 64/255 of the General Assembly of the United Nations of 2 March 2010 on improving global road safety – proclaimed the period 2011–2020 as the "Decade of Action for Road Safety",
- c. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions No COM (2010) 389 of 20 July 2010 "Towards a European road safety area: strategic guidelines for road safety 2011–2020" – In this document the Commission determines the basic EU strategy in the area of road safety for the following decade.

System measures enhancing the road safety are based on the identification of the most frequent causes of road accidents and aim the creation of a safe transport area for all road users. On this basis the measures are embedded into the structure to fully cover all components of the transport system affecting the overall level of safety on Slovak roads: human factor, road infrastructure and vehicle.

The priorities of the Slovak Republic in the National Road Safety Plan 2011-2020 pursue the following key measures:

a. In the area of human factor:

- Speed management
- Reduction of road accidents caused by the use of alcohol and drugs
- Effective and continuous life-long traffic education
- Improvement of training of applicants for driver licence
- Preventive road safety campaigns and dissemination of information

b. In the area of road infrastructure:

- Application of road safety audit and safety inspection in the conditions of SR
- Creation of conditions for safe movement of vulnerable road users
- Improving the safety of railway crossings

c. In the area of vehicle safety:

- Effective performance of technical checks of vehicles, state supervision of vehicle testing stations and statistical surveys

- National Traffic Information Centre (informing the drivers on actual operating conditions on the road network)
- Introduction of IDS applications
- Introduction of eCall system in Slovakia

Numeric target: To halve the number of killed road users until the year 2020 against the year 2010.

7. CONCLUSION

In the previous period the development of road accidents in Slovakia followed the trend of growing mobility and increase of road network loading by the road transport. The implementation of measures for reduction of road accidents was not coordinated. But the introduction of comprehensive measures brought positive results in the reduction of road accidents within a short period. These experiences confirm the requirement for the increase of road safety by the implementation of comprehensive measures monitored by a planned process that should receive a strong political and public support.

For the purpose of implementation of these tasks it is necessary in the conditions of the Slovak Republic to establish an effective system of organisation and management of activities of involved institutions in line with the philosophy of shared responsibility for the enhancement of road safety. The area of safety management also includes the issue of financing of these activities that would be independent on resources allocated from the state budget.

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