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THE APPLICATION OF TELEMATIC TECHNOLOGIES IN SLOVAKIA – THE POSSIBILITY OF IMPROVING ROAD SAFETY IN THE SLOVAK REPUBLIC

Summary. Life on the road with all its aftermath and consequences works as a big triangle: driver-road-car. The main cause of road accidents is driver who can't cope with increase of traffic density and with more and more powerful cars. Increasing number of new vehicles on our roads shows certain economic power of Slovakia and improving standard of living. The annual growth of more than seventy thousand new cars has as a result overcrowded Slovakian road network. Because of this, there is a special attention given to road traffic safety and its various factor at the present not only in our country, but also in the European Union. By joining the European Union we are committed to achieve standards in all areas that are comparable with European developed countries. In our paper we would analyze accident rate of traffic in recent years in Slovakia and design telematic measures to reduce it.

Keywords: Traffic safety, intelligent transport systems, development of road transport

ZASTOSOWANIE TECHNOLOGII TELEMATYCZNYCH NA SŁOWACJI – MOŻLIWOŚĆ POPRAWY BEZPIECZEŃSTWA RUCHU DROGOWEGO W REPUBLICIE SŁOWACKIEJ

Streszczenie. Życie na drodze z wszystkimi jego skutkami i konsekwencjami działa jak wielki trójkąt: kierowca-droga-samochód. Główną przyczyną wypadków drogowych jest kierowca, który nie może poradzić sobie ze wzrostem natężenia ruchu i coraz lepszymi samochodami. Zwiększenie liczby nowych pojazdów na naszych drogach pokazuje pewną siłę gospodarczą Słowacji oraz poprawę standardu życia. Roczny wzrost o ponad siedemdziesiąt tysięcy nowych samochodów skutkuje przepelnieniem sieci drogowej Słowacji. Z tego powodu, obecnie nie tylko w naszym kraju, ale również w Unii Europejskiej, szczególną uwagę skupia się na bezpieczeństwo ruchu drogowego i jego różne czynniki. Przystępując do Unii Europejskiej, jesteśmy zobowiązani do osiągnięcia standardów we wszystkich dziedzinach, które są porównywalne z europejskimi krajami rozwiniętymi.

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W artykule będziemy analizować liczby wypadków drogowych w ostatnich latach na Słowacji oraz dedykowane mierniki telematyczne do ich redukcji.

Słowa kluczowe: Bezpieczeństwo ruchu drogowego, inteligentne systemy transportowe, rozwój transportu drogowego

1. INTRODUCTION

The development of the society is connected to the development of transport in all its branches. Especially in road transport there is annual growth of number of vehicles on the roads as well as growth of new drivers that is connected with many negative effects. Due to lack of conditions for implementation of traffic education, low discipline, aggressive driving, breaking the basic duties, and little knowledge of law of driver and other road users, there is growth in number of road accidents and their consequences.

Traffic safety can be defined as protection of life, health and property in the road traffic. So it reflects the ability of the system to operate at an acceptable level of risk to its surrounding as well as to system itself at the acceptable level [1]. Traffic accidents are traditional method of the road safety measurement. In 2001, there were 54 302 people killed in road traffic accidents. In the same year the European Commission in the White Paper, European transport policy for 2010: time to decide, set the target of halving the number of road fatalities between 2000 and 2010 [2], so in 2010 the number of people killed in road traffic accidents shouldn't be higher than 27 000. To achieve the target, each country of the European Union was to take a part in improving road safety and so contributes to decreasing road fatalities by half. Although in 2010 the target wasn't achieved, the number of people killed in road accidents decreased significantly. We can see at the fig. 1 how European

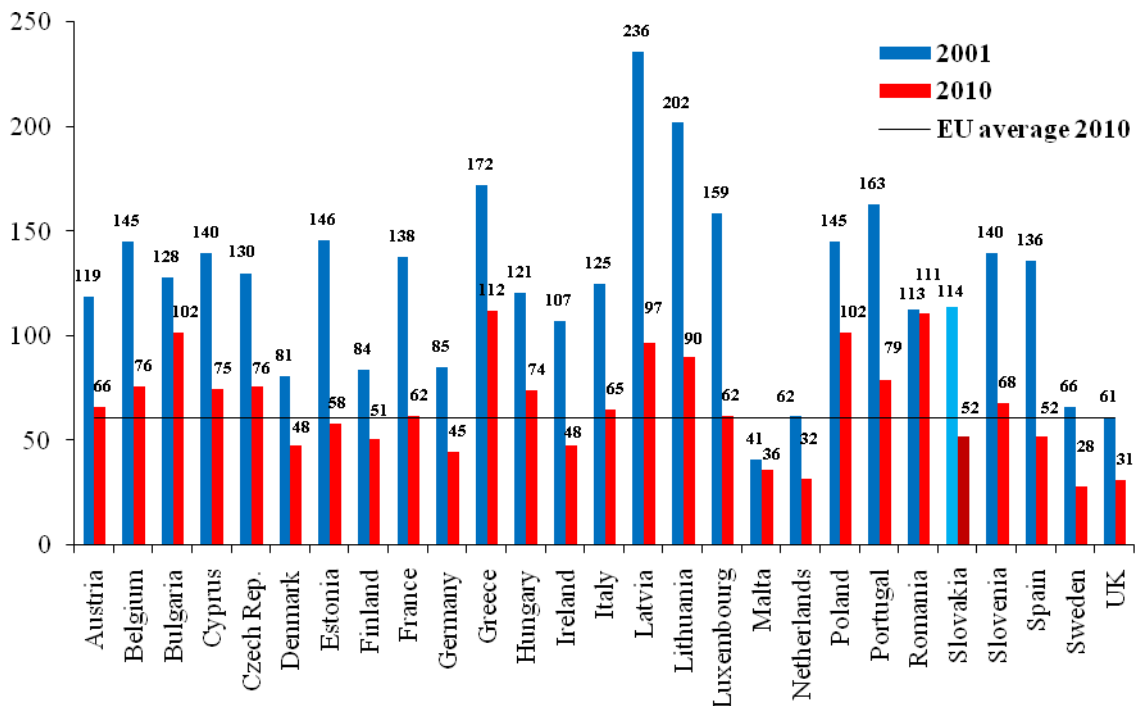


Fig. 1. The number of people killed in road accidents/per million inhabitants

Rys. 1. Liczba zabitych w wypadkach drogowych/na milion mieszkańców

countries managed to increase road safety between 2001 and 2010. The European Union continues its efforts to decrease road accidents and their consequences and in the next White Paper, Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, set a goal: “By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020” [3].

2. TRAFFIC ACCIDENTS IN THE SLOVAK REPUBLIC

In 2010, National plan for increasing road safety in Slovakia for the period 2010-2012 was prepared. The Slovak Republic tried to achieve the objectives by decisive attributes, which mean creation of legislative conditions to eliminate irresponsible behaviour of road users to each other and to enforce the obligations of road users in practice were respected [4]. As you can see at the fig. 1, Slovakia can be count among countries, which managed to achieve significant reduction in road traffic fatalities. But despite enormous effort to prepare legislative and technical conditions for achieving the goal of halving the traffic fatalities, the goal wasn't achieved. This result is caused by several circumstances, but especially because legislative-technical and educational field wasn't sufficiently prepared. Therefore we can objectively say that EU Member States, which adopted the commitment in 2001, were at these 3 areas in 3-year advance. It is clear that Slovakia had time for 7 years to meet the goal, while the “old EU Member States” had time for 10 years to meet the same goal.

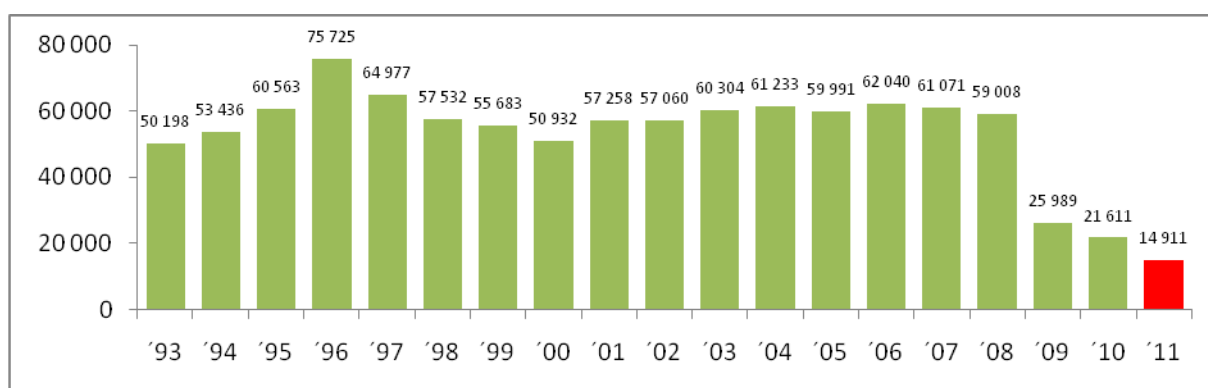


Fig. 2. The number of traffic accidents in the Slovak Republic

Rys. 2. Liczba wypadków w Republice Słowackiej

If we compare years 2001 and 2011, we can see that the number of traffic accidents decreased from 57 258 to 14 911 (fig. 2), that influenced the number of consequences of traffic accidents as well and we can see, that:

- the number of people killed in road accidents decreased from 614 people in 2001 to 324 people in 2010 (decrease of 47%);
- the number of people seriously injured decreased from 2 367 to 1 140 people (decrease of 52%);
- the number of people slightly injured decreased from 8 472 to 5905 people (decrease of 30%).

Because of constant development of motoring, every year new drivers and new vehicles became a road user and it results in increasing road traffic volume. This fact affects and determines to a large degree the overall evolution in road safety situation. The mobility of the population is growing as well. If we take into account the traffic volume, which in 2011 raised by 2.5% while traffic accidents decreased by 31% (see fig. 4), we can say that there is very positive development in the Slovak Republic.

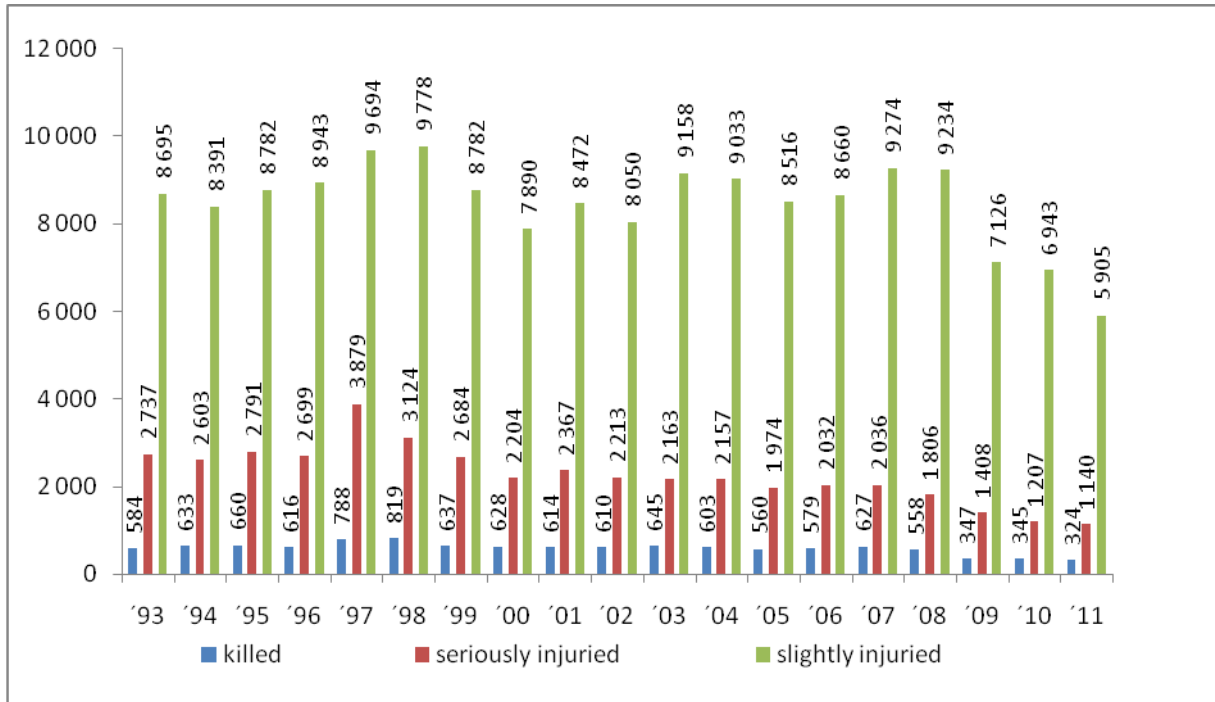


Fig. 3. The consequences of traffic accidents in the Slovak Republic
Rys. 3. Konsekwencje wypadków drogowych w Republice Słowackiej

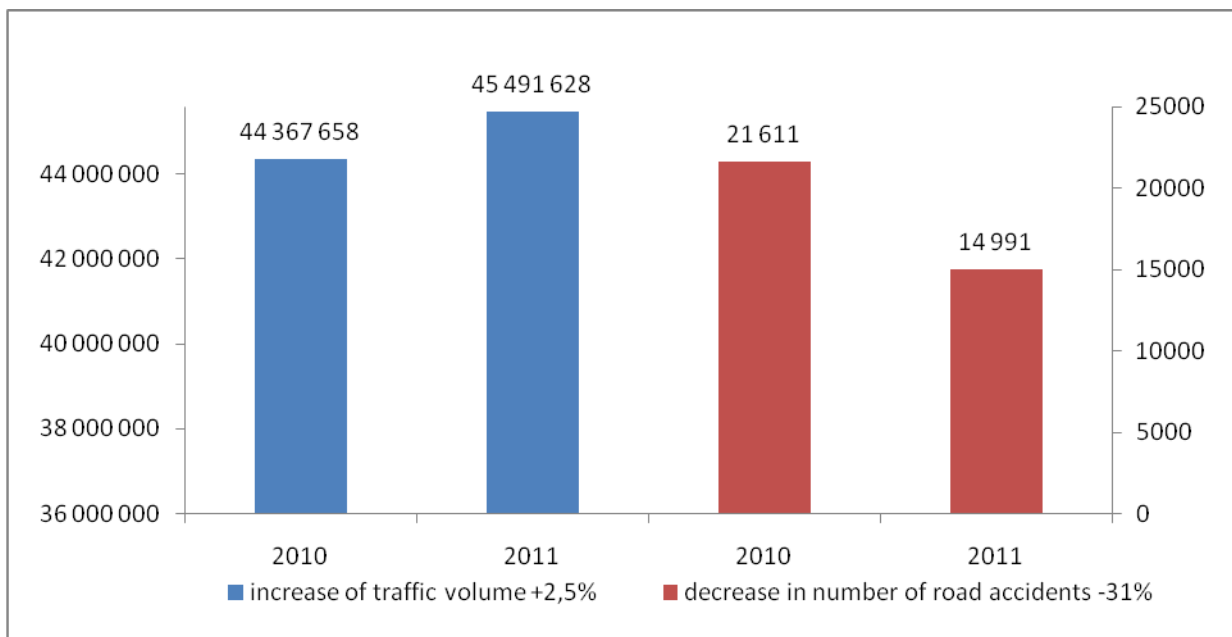


Fig. 4. Traffic volume and traffic accidents
Rys. 4. Natężenie ruchu i wypadki drogowe

In 2011 Slovakia managed to decrease number of road accidents to its historical minimum.

Thanks to this there is in the history of the Slovak Republic the lowest:

- number of people killed in road accidents; 324 (annual decrease of 6%)
- number of people seriously injured in road accidents; 1140 (annual decrease of 6%)
- number of people slightly injured in road accidents; 5905 (annual decrease of 15%)

Although the decrease in numbers of traffic accidents and their consequences was significant, consequences, such as 324 people killed and 1 140 people injured in traffic accident in such small country like Slovakia is, are still alarming.

3. TELEMATIC MEASURES CAN HELP IMPROVE ROAD SAFETY IN SLOVAKIA

The development of transport in all its sectors is linked with the integration to the advanced countries and with developing of the society. Year by year in the road transport the number of vehicles on the roads increases as well as the number of new drivers and with this situation is associated lot of negative effects. The number of road accidents and their consequences increases in the consequence to lack of conditions for the realization of transport education, low discipline, aggressive driving, violation of fundamental duties and low legal awareness of drivers and other participants of road traffic [5].

Traffic accident rate as a serious social problem requires a comprehensive and effective solution that shows features of a coordinated and aimed procedure by all stakeholders and institutions with a broad public support [5].

Implementation of information technologies into transport systems is one of the most important measures in improving of preventive part. Traffic safety solutions based on information systems should increase in the future (with respect to repressive component). Implementation of a good information system results in reducing traffic accidents and also in decreasing number of seriously and slightly injured people

During the last decade of the 20th century, transport policy in relation to the security went through the concept of inherently safe transport system. The priority of this approach is not only minimizing the consequences of accidents, but especially how to avoid them. It is necessary to minimize the level of severity of those accidents which could not be avoided. Mentioned type of transport system is characterized by the integration of infrastructure, vehicles and regulatory measures that are harmonized in user's relation.

On the basis of current trend we can say that without radical measures Slovakia won't be able to meet the commitments to European Union. The only way to meet the commitments is systematic implementation of ITS.

3.1. Intelligent transport systems (ITS)

ITS is generally road based , vehicle based, vehicle to road based , vehicle to vehicle based or vehicle-to-vehicle-to-infrastructure based technologies supporting the driver and/or the management of traffic in transport system. On the vehicle side of ITS often two major subdivisions can be found: in-vehicle information and communication systems (IVIS) and advanced driver assistance systems (ADAS). IVIS and ADAS can be then subdivided into active and passive safety systems [6].

ITS can be categorized in many ways [6].

The first one categorization is on technical aspects:

- vehicle systems without interaction with data sources outside the vehicle;
- roadside systems without interaction with data of individual vehicles;
- systems that allow for interaction between individual vehicles and other data sources, such as between vehicles or between vehicle and roadside.

The second categorization could be on primary purpose:

- management of traffic flows;
- driving comfort;
- safety, subdivided into:
 - systems that prevent unsafe traffic participation;
 - systems that prevent unsafe actions while participating in traffic;
 - systems that reduce injury severity

Assistance systems are the main challenge. They are based on communication (data exchange) not only among vehicles themselves but also vehicles and infrastructure. These so called Intelligent Assistance Systems promise great benefits in the sphere of efficiency of transport systems and road safety. These benefits include mainly increase the capacity of the road network, reduce congestion and pollution, shorter and more predictable time of driving, improving traffic safety for all participants of road traffic, lower operational costs for vehicles, better organization and management of road networks [7].

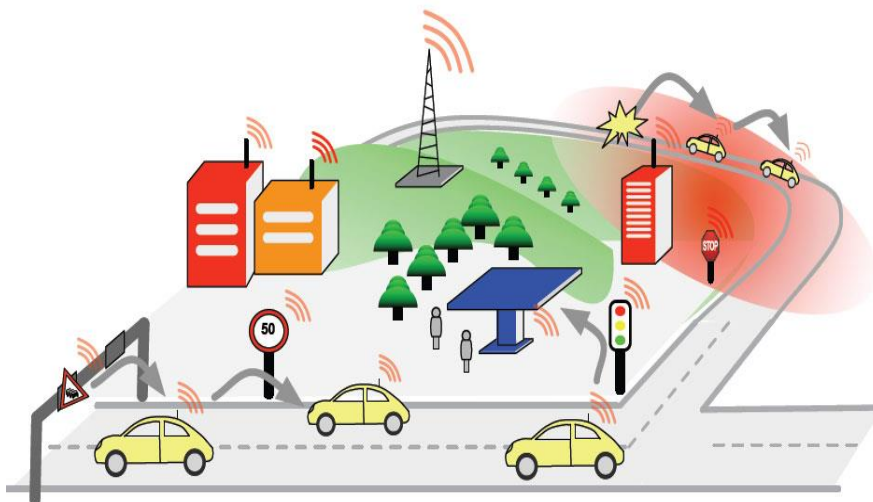


Fig. 5. Scheme of cooperative vehicle - infrastructure systems [8]

Rys. 5. Schemat działania współpracy systemu pojazd - infrastruktura [8]

Examples of such systems are traffic control and management systems; intersection collision warning applications; weather and road condition warning systems; route guidance to avoid traffic congestion and, consequently, wasting fuel; as well as information tools, for example advice on the location of nearby car parks with available parking spaces. Key to the delivery of such applications is communications among vehicles (called vehicle-to-vehicle communications) and also two-way communications between vehicles and Information and Communication Technologies incorporated into the road infrastructure (called vehicle-to-infrastructure communications V2V or, infrastructure-to - vehicle communications V2I).

4. CONCLUSION

The European Union gives a great effort to have safe roads, so that as few as possible people were killed or injured in traffic accidents. The Slovak Republic, as a full EU member, respects European Commission's recommendations on road traffic safety and tries to fulfil them. The traffic accident rate in the Slovak Republic has been decreasing for the last years, but without further measures will be impossible to meet the European Union requirements of decreasing traffic accidents. The possible way of how to continue in decreasing of traffic accident rate is introduction of ITS. The Government of the Slovak Republic in the Government Programme from 2010 declares among other things: "The Government will support the development of quality, accessible and integrated transport infrastructure, competitive transport services, and user-friendly, environmental and energy-efficient safe transport." Implementation of ITS together with better training of road users, higher respecting of traffic rules, safer cars, and good emergency services should contribute to significant safer roads and so save numbers of lives on the Slovak roads.

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Bibliography

1. Kalašová A., M. Hamar. 2011. "Telematické aplikácie – dôležitý nástroj zvyšovania bezpečnosti". In *Nehody s hromadným postihnutím osôb. 4. Medzinárodný kongres spojený s výstavou*: 50-56. [In Slovak: "Telematics applications - an important tool for improving safety". In *Accidents mass of people with disabilities. 4th International Congress and exhibition*]. Hotel HolidayInn, Žilina, Slovakia. Euroedu s.r.o. Košice. 24.-25. November 2011.
2. Kom (2001) 370 *White Paper: European transport policy for 2010: time to decide*.
3. Kom (2011) 144 *White Paper: Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system*.
4. Kupčuljaková J. 2010. "Preference městské hromadné dopravy". In *Mezinárodní Masarykova konference pro doktorandy a mladé vědecké pracovníky*: 1303-1307. [In Slovak: "Preference of public transport". In *International Masaryk Conference for PhD Students and Young Researchers*]. Hradec Králové. 6-10.12.2010.
5. Kalašová A., J. Kupčuljaková. 2011. "Future of telematics applications as support for increased safety". *Archives of transport system telematics* 4(4): 17-21.
6. Kalašová A., Z. Krchová. 2011. "Intelligent transport systems and safety in road traffic". *Archives of transport system telematics* 4(2): 25-28.
7. Kalašová A. 2011. "Decreasing road accident frequency with the help of ITS". In *MOSATT 2011: modern safety technologies in transportation: proceedings of the international scientific conference*: 193-197. Zlata Idka, Slovakia-Košice. 20-22 September 2011.
8. Schreyer Ch., Ch. Schneider. October 2004. *External costs of transport update study*. Paris: International Railway Union.