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The interactive model of traffic accident statistics in the context of the road safety policy

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Abstract

The issue of road accidents on the road network is a serious social problem. Transport is a complicated process in which the ever-increasing demand for transport quality can be identified. For this reason, it is the role of the responsible bodies to find ways and procedures to create a safe transport "ecosystem" for all road users. The basic indicator of road safety is the number of road accidents and their consequences. Road safety in the Slovak Republic is improving, but the number of deaths and injuries is still too high. The EU has adopted a "Zero vision" and a "Safe System Approach" to eliminate deaths and serious injuries on European roads. The Slovak Republic reaches the EU average in terms of the number of deaths per 1 million inhabitants. Also still remains behind the countries where road safety issues are comprehensively and long-term addressed. Collecting traffic accident data is important for developing and setting up meaningful strategies for road safety. Currently, there are problems with traffic accidents localization including their severity and consequences. More detailed processing of these statistical data seems to be beneficial in order to make this information available to a wider range of stakeholders in a user-friendly interface, for example in the form of an interactive accident model.

Keywords: road safety, traffic, collisions, measures, localization

Introduction

Positive economic development of the country and the associated continuous development of road transport is reflected in the greater number of road users and increasing the overall traffic volume and mobility. This fact has a major impact on and determines the general development of the road safety in Slovakia.

Slovak republic recorded 229 road fatalities in 2018, representing a 8.4% decrease when compared to 2017 and 72% decrease when compared to historic maximum in 1998. This is the second lowest figure since systematic record keeping began. The lowest figure is 223 persons, which lost their lives in traffic crashes in Slovakia in 2013. Nowadays, the mortality rate is 46 deaths per 1 million inhabitants.

The long-term trend for road deaths has been downward. The number of road fatalities fell down by 64 % (between 2000 and 2018).
Slovakia recorded in 2018 71 accidents per 1 million registered vehicles – in 2010 it was 147. This represents a decrease of 52%.

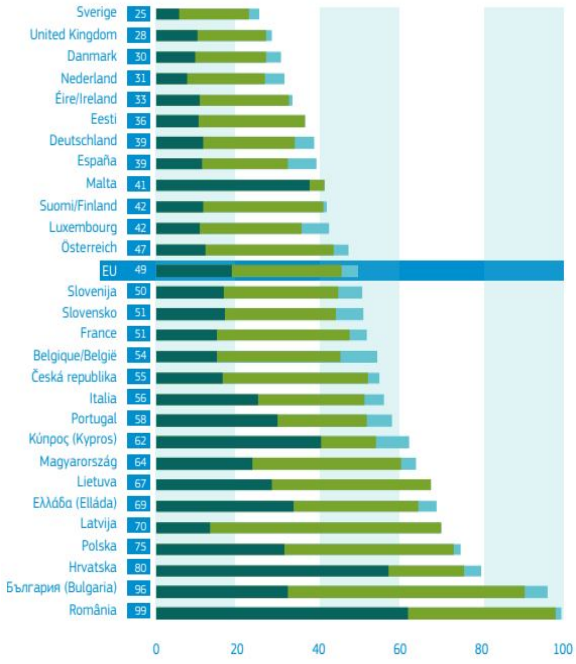

Figure 1 – Fatalities per million inhabitants – EU comparison (2017) [1]

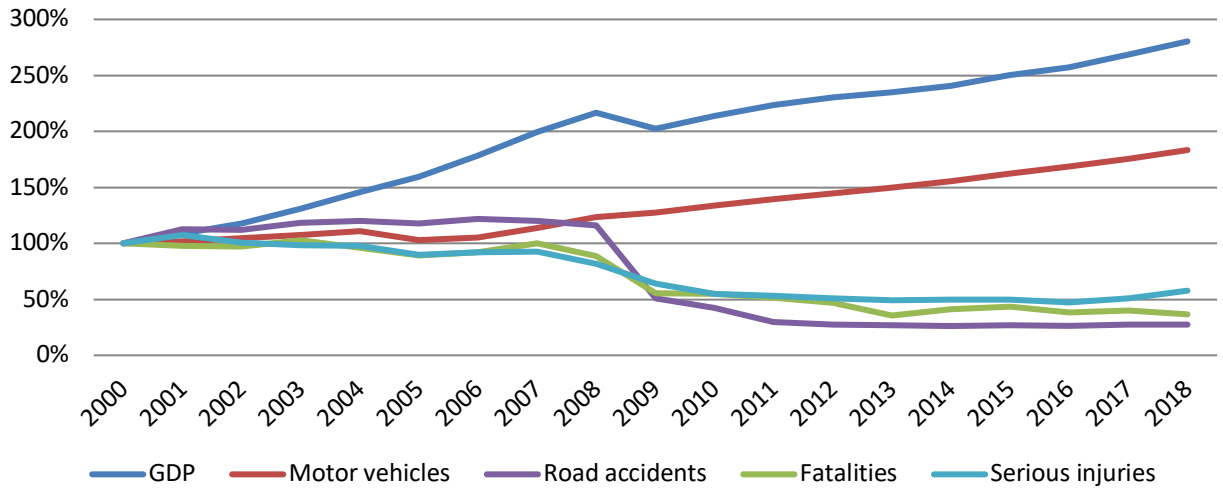

Figure 2 – Rad safety, registered vehicles and GDP trends

Another problem is a number of serious road traffic injuries. For every person killed in traffic crashes, almost six more suffer serious injuries.

Analysis of fatalities by road type shows low number of road deaths on motorways (7% of all fatalities in average). The largest number of serious road accidents in the long term is recorded on I. class roads.

In last decade, the number of traffic accidents in the municipalities (urban areas) is markedly unfavorable. Compared to the 2010, the proportion of road accidents increases from two-thirds to almost three-quarters, which will occur in the municipality. This condition is detrimental to vulnerable road users. In Slovakia it means, that three quarters of vulnerable road users are killed in urban areas (EU – 70%).

Statistical data point to the fact that traffic accidents are the main cause of death and hospitalization of people under 50 years of age in up to 90%. Consequences of traffic crashes (fatalities, serious injuries...) are very costly for society - the socio-economic costs by road accidents are estimated at around 1% of the GDP of the European Union countries - about € 120 billion. [2]

The statistics analysis shows that road safety situation in the Slovak republic became safer for users. However, stagnation has been noticeable in the last five years. Achieving a further decline in road accidents will be a challenge for the next decade 2020 – 2030. Systemic measures are needed to achieve the set objective – make roads safer for all users.

Road safety data collection

Statistical data about road safety are essential for the development of road safety strategies. More and more detailed information about traffic crashes bring us more understanding for setting up the effective measures. Collected data and their reliability depends on the data collection method (the data must be correct and representative).

The crash data in the Slovak republic are collected by the traffic police. This information is subsequently processed in the certain required statistical outputs.

A lot of statistical outputs are beneficial and valuable, but the current police database is not offering enough detailed information about the localization of traffic accidents on road network.

In the traffic accident police database are nowadays reported numbers of roads and kilometer stationing. However, these data are only available in around one third of all records and relate mainly to accidents on motorways, expressways and 1st class roads. The accuracy of these data is also low.

Especially there is a lack of information about the places/road sections of traffic crashes in municipalities and on roads of lower transport importance. The requirement to increase the level of detail is therefore considered justified in this respect.

For a right understanding of road safety features and problems, geo location data are indispensable. This kind of data provide information about dangerous places on road network. Together with another crash information, this information allows for making the right decisions and measures in road safety. For Slovakia, this kind of data collection looks beneficially.

German atlas of traffic crashes

In Germany, an interactive atlas is operated by the Federal Statistical Office. This atlas of road

crashes provides the following information:

- Localization of traffic crashes, number of traffic accidents due to the section of the road.
- Consequences of traffic crashes.
- Traffic accidents according to the accident participant (cars, motorcycles, bicycles, pedestrians...).

"Unfallatlas" contains information from the statistics of road crashes based on police reports. In several federal states, police do not or do not fully record the geo coordinates of accidents during the accident recording (similar to Slovakia) - blank spaces on the map. As soon as the geo coordinates of the accident sites in other federal states are available, the accident atlas is updated. The responsible body for the statistics is the Police. There are information about accident, participants, vehicles, casualties and causes of accidents recorded. The police recorded in the accident recording the geographical coordinates of the accident site. These accident coordinates are processed and then presented in the accident atlas, with all recorded information.

In order to visualize accident focuses in maps, individual accident events are summarized by road sections. For each road segment, it is determined how many accidents have occurred and the section is colored accordingly. By zooming in on a section of road, the individual accident sites at the street level become visible again as dots. The map portal is interactive and allows to work on different map scales.

Vision of Slovak version of traffic crashes atlas

Similar system providing the necessary information about the location and consequences of road accidents would be an effective measure to increase road safety in the Slovak republic.

Based on current legislation, a National Transport and Information Center is currently operating ("NDIC – Národné dopravné a informačné centrum"). Publicly accessible portal "odoprave.info" provides overall information about all traffic related services and the current traffic situation in the Slovak republic. The system performs the following tasks:

- collecting, verifying and processing traffic information,
- providing traffic information,
- archiving traffic information,
- exchange of traffic information within the EU member states.

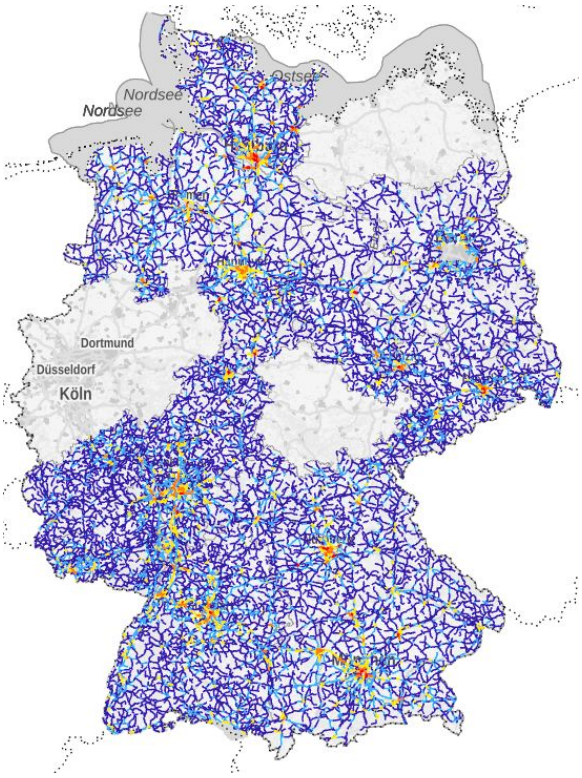

Figure 3 – German atlas of traffic accidents [3]

The operations center acquires traffic data from multiple entities (including police, integrated rescue system, communications managers, etc.) and makes it available to the public in a certain form.

The scope and type of traffic information which are received by system and which are provided, may be modified by the Ministry of Transport and Construction of the Slovak Republic.

This system can also be used to create an interactive map database with traffic accidents scope.

The NDIC system is composed of multiple sub-subsystems and interfaces to accommodate data from various sources, edit, process, and disseminate them.

For the purpose of creating an interactive database of traffic accidents, including its graphical processing on a map basis, it seems to be advantageous to use the current NDIC system.

Certain requirements will have to be met to create a Slovak atlas of traffic accidents. There is a need for legislative implementation of this system. There are also scope of data requirements. Atlas of road crashes should be provides the following minimal information:

- car crashes,
- motorcycle crashes,
- bicycle crashes,

- pedestrians crashes
- fatalities,
- serious injuries

Not least is the requirement to ensure the recording the geographical coordinates of the accident site (by the traffic police). The central data system would collect data at regular time intervals from mainly police sources. In order to assign accident coordinates to the correct road sections, the data must be reliable (police responsibility). Other sources of official records may also be used as a verification.

Possibilities of use

The main benefit of introducing a road accident atlas is to achieve a qualitatively higher level of road safety management for the relevant subjects.

Nowadays is new Strategy for road safety under preparation. National road safety strategy and action plan for road safety for decade 2020-2030 will probably contain similar proposals for measures to increase the collection and analysis of input data to deal with traffic accidents. It is precisely such complex and systematic measures that are necessary to increase the level of road management and correlated of road safety.

Such a traffic accident database can be linked to other existing databases, for example:

- vehicle database,
- driver database (law violators),
- road database (technical condition)…

Also, useful to monitor road user behaviour or characteristics of the road that have been proven to relate to the road safety level. In the context of traffic accident location, such a tool is extremely effective for the traffic police. By knowing the broader context, it is possible to accurately address traffic - safety actions to a specific issue.

Main priority of traffic police is to reduce the number of people being killed and seriously injured on Slovak's roads. Enforcement of traffic law and education will make a significant contribution to reducing the fatalities on the roads. Atlas of road crashes will be a very useful tool for this mission.

On every road network we can find some parts where an unusual high frequency of road crashes is. These dangerous locations are called "black spots" and the identification, analysis and treatment of such places is a well proven method for reducing the number and severity of crashes on the road network. This systematic "Black Spot Management" is an important tool to remove such dangerous locations on road network. The basis for "Black Spot" identification is statistical data analysis of road crash record and mapping of crash locations.

Conclusion

Since 2006, the number of vehicles in the register has increased by 100,000 per year. Traffic volumes and traffic system in general have a growing trend. At this time, the community is aware of the high cost of traffic accidents.

In general, countries of the European Union make impressive progress in road safety. European roads are nowadays the safest in the world. Slovak republic cut the number of fatalities (road crashes) by 60 % between 2008 and 2018. Slovakia also reduced the number of road accidents from 59 000 in 2008 to 13902 in 2018).

There is a progress and Slovakia is trying to makes this situation even better. At this time is under preparation the new safety strategy for 2020-2030. This means new challenge for all stakeholders for creating a safe mobility systems.

Collection of relevant, complete and consistent data is a fundamental input to each planning process.

The aim should be to make this information (about road accidents and their consequences) available in a user-friendly and interactive form to a stakeholders, that can use it to set up their specific tasks.

Interactive map bases will be serving as a work tool for more consistent road safety solutions, not only in transport engineering, road economy and the traffic police, but also in all road safety management levels. Atlas of road accidents will be warning also drivers and other road users to dangerous places and sections of roads.

Acknowledgements

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