

12th International Conference "Organization and Traffic Safety Management in large cities",
SPbOTSIC-2016, 28-30 September 2016, St. Petersburg, Russia

Factor Analysis of Traffic Organization and Safety Systems

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Abstract

The paper describes the analysis of accidents retrospection and motorization of Russia since the beginning of the third millennium in a graphic form of time sequences, according to the Russian Federal State Statistics Service (Rosstat) data, which revealed development trends of the analyzed parameters. The federal target program focuses on target results of its implementation and multi-factorial effect on the accident rate and severity of injuries. This enables to choose the most powerful and effective factors, following the criterion of reduction of mortality and severity of injuries of accidents, out of a multiple set of subjective, objective, basic and associated factors contributing to road accidents and injuries. In our opinion, one of the most important aggregate factors in the whole range of the factor set is the road as an element of the system characterized by different factors of accident risks.

Performed studies of road traffic network (case study of Khabarovsk road traffic network) identified the opportunity to improve traffic safety and reduce injuries through accident risk coefficients obtained by logistic regression with a chi-squared test χ^2 . The method accounted for the level of motorization among the city inhabitants and the structure of the vehicle fleet by the type of vehicles involved into accidents. Some shortcomings of the regulatory and legal framework were revealed; some innovative objective factors and additional activities to increase efficiency of accident combating were proposed.

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Peer-review under responsibility of the organizing committee of the 12th International Conference "Organization and Traffic Safety Management in large cities"

Keywords: accident rate; motorization; injury rate; subjective and objective risks; accident rate coefficient.

Main text

Nowadays road accidents in Russia reached the scale of a national disaster accompanied by a rapid increase in the

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motorization level of the country. The accident risk rate is 3–4 times higher in Russia than in other countries with a high level of motorization. The high level of road traffic accident rate in our country makes the traffic safety problem a top-priority nation-wide problem of social and economic significance. This was confirmed at the meeting of the Presidium of the State Council on the road safety in the Russian Federation under the chairmanship of the Russian Federation President held in Yaroslavl on 03.03.2016. It was announced that 350 thousand people were killed and more than 3 million people were injured in road accidents in Russia over the past 10 years. This circumstance has become a prerequisite and motivation to study the matter of accident rate reduction and improvement of the road safety in the Russian Federation.

Traffic organization and road safety are interconnected by definition in the system “road — driver — vehicle — environment”; operation of this system generates causes and effects leading to road traffic accidents.

Accident rate within the road transport is characterized by a number of road traffic accidents which killed or injured people during the period under review. At that, seriousness of an accident is determined by the number of fatalities per 100 victims. Relative indicators are applied for comparative analysis, i.e. the number of road fatalities per 100 thousand people (social risk) or per 10 thousand of vehicles (transport risk) [Pugachev and Kulikov (2013)].

A clear picture of statistical trends of the studied parameters can be seen at the graphical representation of time periods of basic development levels of corresponding parameters (Fig. 1).

The presented dynamics reflects the results of implementation of the federal target program Increase of Traffic Safety in 2006–2012 and, partly, the first phase (years of 2013–2015) of a new federal target program Increase of Traffic Safety in 2013–2020 years.

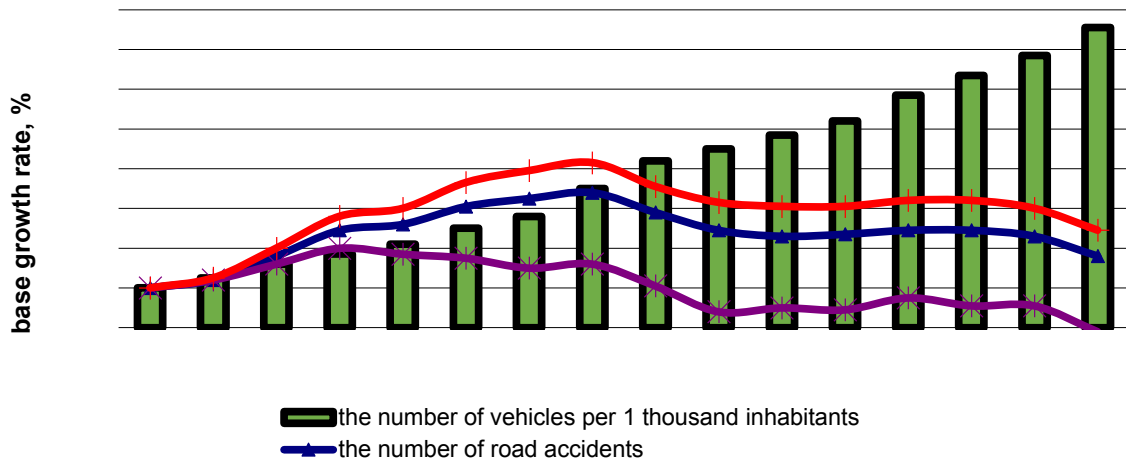


Fig. 1. A period of time accounting basic development levels of the accident rate and the motorization rate in the Russian Federation.

The method of management by objectives for solving problems of road transport accidents in Russia provides for multifactor impact on accident rates. According to experts, the number of causes and factors influencing the accident rate is several thousand, which requires logical selecting of the most powerful and effective factors by the criterion of reduction of road accident deaths out of a multiple set of subjective, objective, basic and associated factors contributing to road traffic accidents and injuries [Kulikov et al. (2013)].

There is a limit of accident requiring urgent actions in case of its exceedance. In such cases, road repair and reconstruction is performed. The recommended level and criteria of road safety assessment were established by Professor V. F. Babkov who developed the Methodology of Accident Rate Coefficients. This method has a major impact on elimination of shortcomings in operation of the existing road network.

The work was carried out in three stages. The first stage of the work included determination of influencing factors specific to the road traffic network which accompany every accident. New factors theoretically affecting injuries were added to those stated in the work of V. F. Babkov [Pugachev and Sheshera (2015), Pugachev and Sheshera (2016)].

The second stage was compilation of statistics and the database with detailed factors and description of each accident.

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