

Traffic accidents in winter conditions for the Republic of Serbia

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Abstract: Traffic safety is influenced by numerous factors that can be grouped into four categories: the human element, the vehicle, the road, and the environment (Pešić, Antić and Lipovac, 2023). In the Republic of Serbia, during the year 2022, there were 33,230 traffic accidents. This paper analyzes the impact of the environment on the occurrence of accidents, with a focus on accidents that occurred during the winter period due to the influence of specific weather conditions and environmental factors.

Keywords: traffic accidents, environment, weather conditions

Introduction

Traffic safety is an interdisciplinary and intermodal science that broadly studies all negative consequences of traffic. In a narrower sense, traffic safety examines traffic accidents as one of the major causes of traffic insecurity. Factors influencing the occurrence of traffic accidents are classified into four categories: human, vehicle, road, and environment. These four factors together constitute an expanded Hedonic Safety Factor Matrix

for traffic safety (Pešić, Antić and Lipovac, 2023). Each of these factors contains a large number of sub-factors that influence safety. The environment includes weather conditions, roadside environment, healthcare, and more.

Although the trend in the Republic of Serbia in recent years has been a decrease in the number of traffic accidents, the goal of traffic safety remains the same as to reduce accidents. *The misconception is that only a mistake or unsafe behavior of drivers causing traffic accidents, in almost all cases. The results of study the causes of road accidents show that in every third of road accident road environment has a significant impact (Trifunović, et al, 2019).*

This research aims to highlight the differences between the number of traffic accidents during winter and other periods, the variations in the severity of traffic accident consequences, and to point out characteristic situations that may lead to accidents during winter periods.

Methods and data

For the purposes of this research, data from the Traffic Safety Agency's database and an interactive map created by the same entity were used. Traffic accidents were categorized according to the months they occurred. The consequences of traffic accidents were categorized as accidents resulting in: material damage, injuries and fatalities. For the purposes of the research, data from the most recent available year, 2022, were used. In 2022, there were 33.230 traffic accidents in the Republic of Serbia (Road traffic safety agency, 2022). Figure 1 provides a graphical representation of the number of traffic accidents categorized by the type of consequences.

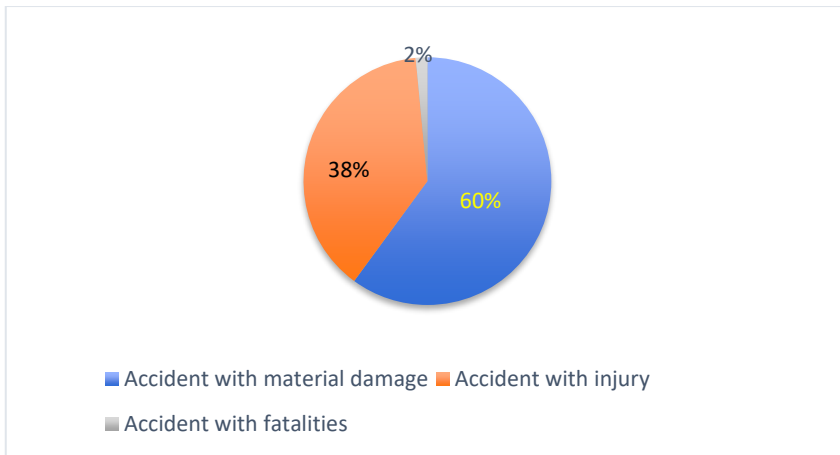


Figure 1. Accidents by the type of consequences

From the previous figure, it can be seen that in 2022, the majority of traffic accidents resulted in material damage (19,961 accidents), while the fewest accidents resulted in fatalities (505 accidents). One of the issues in Serbia is the underreporting of accidents with minor material damage, so this number of accidents should not be considered final. The highest number of fatal accidents occurred in July (59 accidents), as well as a large number of accidents with injuries. The fewest fatal accidents occurred in February (28 accidents). During the winter months, a lower number of fatal accidents (110 accidents) is recorded compared to other seasons of the year, as can be seen in the following table.

Table 1. Accidents by season

	Accident with material damage	Accident with injury	Accident with fatalities
Spring	5.071	3.079	113
Summer	4.693	3.410	150
Fall	5.126	3.444	132
Winter	5.071	2.831	110

When all traffic accidents are summed by season according to Table 1 (Агенција за безбедност саобраћаја, 2022), it results in the lowest number of accidents occurring in winter. In 2022, most accidents occurred during autumn (8,702 accidents), while the number of accidents was approximately the same in spring and summer.

Results and discussion

The data show that the fewest accidents occur during the winter months, which may be expected given that environmental conditions are particularly challenging during this time. Due to these environmental conditions, road users pay more attention to their surroundings to avoid accidents. This is reflected in the reduction of driving speed, which is often a cause of accidents as well as the severity of their consequences.

Some of the causes of accidents that should be addressed include young drivers. During intense snowfall at night, young and inexperienced drivers instinctively turn on their high beams to improve visibility. In such conditions, high beams can have the opposite effect and completely block the driver's field of vision. Additionally, on lower-category roads where snow clearing services do not operate, snow can cover obstacles that may lead to accidents.

In Serbia, many local roads lack designated pedestrian areas, creating a risk that pedestrians may slip on ice during winter periods with low temperatures, potentially leading to accidents with serious consequences (Davidović, Antić, Pešić, 2024). The road maintenance services are responsible for managing vegetation alongside the road to prevent the accumulation of large amounts of snow on trees extending over the roadway. Due to the heavy weight of the snow, it may fall

onto a vehicle passing underneath, surprising the driver. This can lead to sudden maneuvers that may endanger both the driver and other road users.

Conclusions

In Serbia, in 2022, there were 33,230 traffic accidents, of which 8,012 occurred during the winter months (Pešić, Antić and Lipovac, 2023). To reduce the total number of traffic accidents and the severity of their consequences during winter periods, it is essential to train young drivers to handle winter driving conditions. Additionally, improving the work of road maintenance services can contribute to traffic safety. Investing in technologies that better predict weather conditions could help drivers be more informed about upcoming weather, thus enhancing overall road safety.

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