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The effect of the geometric features of the road on traffic accidents

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ABSTRACT

In our developing country, as a result of the disruptions in both urban and intercity road planning and construction, there is a lack of function and irregular roads. The road structure that cannot meet the expected performance according to the service class it belongs to causes an increase in road operating costs and a decrease in traffic safety. In addition to the direct negative reflection of the effect of the defective road structure on the traffic, it also has a secondary negative effect as it causes stress on the drivers. Traffic safety should be the priority goal of decision-makers in the road planning and construction phase. In this study, the negative effects of road defects on traffic safety are mentioned. The data used includes the part of KGM arising from the geometric structure of the road in 2020. These data constitute 0,27% of the accidents.

Introduction

Transportation can be expressed as the displacement of human or human belongings [1]. The parameters that are generally taken into account when choosing the mode of transportation are cheap, safe, comfortable, environmental compatibility, speed, etc. [2]. We can examine the types of transportation used to transport people and goods under 5 headings. Road Transportation, Airline Transportation, Railroad Transportation, Sea Transportation, Boat Line Transportation Road transportation is the most used mode of transportation in our country as well as all over the world [3]. The reason why it is the most preferred mode of transportation is the advanced road network structure, the relatively more economical transportation of passengers and cargo compared to other transportation types, etc. The reasons were effective. While road transportation is preferred, this has led to some disadvantages. For example, the increasing number of vehicles has increased the traffic density. Increasing traffic density necessitated the construction of a continuous road and the maintenance of the existing roads. Human factors (pedestrian, passenger), vehicle and road are important in road transportation. The fact that these factors are in a harmonious relationship both among themselves and with each other has been effective in preventing traffic accidents, which are a result of traffic density. Traffic accidents can occur with the unusual action of one of these three factors.

Material and method

In this study, the effect of road geometric structure on traffic accidents will be examined by using data from the General Directorate of Highways (KGM) and the Turkish Statistical Institute (TUIK).

Road geometric standards

Geometry standards of a road; platform width (lane and shoulder width) horizontal and vertical radii of the curves longitudinal and transverse slopes expropriation width. Factors considered in the selection of geometric standards during the road design phase [4]: Project speed, Geological and Topographical Structure of the Land Road Carrying Capability Types of Vehicles in Motion in Traffic Service Level of the Road Security Traffic Safety

Financial Opportunities Local Factors (weather, transit route, etc.) The purpose of the geometric design of the road; should be to increase safety and efficiency while minimizing cost and environmental damage. The geometric design of the road built with this goal can be examined under three headings: alignment, profile, and cross-section. Combined, they provide a three-dimensional layout for a path. In alignment; horizontal tangents and alignment of curves are involved. The path, including the profile crest and sag curves and the straight grade lines connecting them, is a vertical direction. The cross-section shows the location and number of vehicles and bike lanes and sidewalks along with their transverse slope. Sections also show drainage features, pavement structure, and other elements outside the geometric design category, Unfortunately, mistakes made in the calculation of these elements during the road design and construction phase of the application of the project cause traffic accidents.

When the traffic data of TUIK and KGM for the year 2020 are examined, the causes of the accidents are shown in the graphic below.

As can be seen from Figure 1 the main cause of accidents is driver errors, followed by pedestrian errors, vehicle errors, passenger errors, and road design errors. Although errors due to road design appear as 0,27% in accidents, when it comes to human life, the values should be taken into account regardless [5].

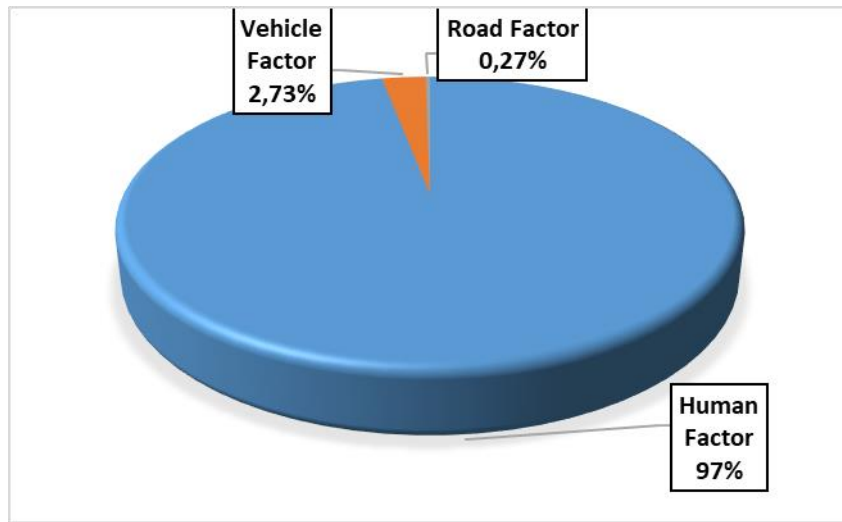


Figure 1. Faults Causing Road Traffic Accident Involving Death or Injury 2020

When the accidents with the effect of the geometric design of the road were examined, the following results were obtained.

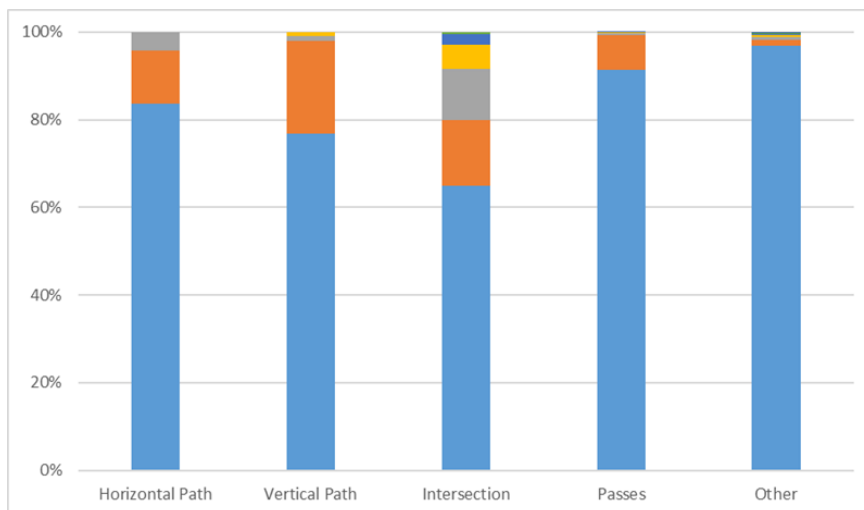


Figure 2. The Rate of The Geometric Feature of The Road in Traffic Accidents

When the horizontal route in the road structure is examined, it is seen that the straight road structure is the main reason for the accident rates with a rate of 83.7%. The straight road increases the accident rate by causing the focus of the drivers to shift from the road.

When the vertical route in the road structure is examined, it is seen that the non-sloping road structure is the main reason with a rate of 77.18%. The transverse slope given for the self-evacuation of rain water falling on the road platform allows vehicles to move safely.

The main purpose of the intersections in the road structure is to regulate the vehicle and pedestrian traffic on the main and secondary roads. Intersections are built in order to ensure a continuous traffic flow and traffic safety at the intersections of two, three or more roads, to eliminate negative situations such as reduced speed at intersections, increased waiting queues and an increase in extra operating costs. From this point of view, the absence of the required intersection puts traffic safety at risk.

Crossings made to avoid interrupting the traffic flow always create a safe traffic flow for pedestrians and vehicles on the road.

Conclusion

When the data obtained are examined, a total of 150,275 accidents were caused by human, vehicle, and road factors. Of this number, 38,358 were caused by the road component, resulting in 2530 deaths and 73139 casualties. When the road geometry is examined, the factors that cause the most accidents are; It has been observed that it occurs on straight, no slopes, no intersections, no passages.

References

- [1] Kurt, Cihan (2010). The Place and Importance of Logistics in the Transportation Sector in Turkey. Unpublished Master Thesis, Istanbul University Institute of Social Sciences, Istanbul.
- [2] Doğan, Zeki. Beller D., Beyhan (2018). Comparison Of Transportation Sector and Types of Transportation In Turkey. International Journal of Social Studies / The Journal of International Social Research 2018 Volume: 11 Issue: 56 April 2018
- [3] Yumak, Ahmet (2019). Investigation of Highways Geometric Standards and Road Safety: The Case of Şırnak City Cente. Master Thesis, Şırnak University, Institute of Science and Technology, Şırnak.
- [4] Yayla, Nadir (2015). Highway Engineering Book.
- [5] General Directorate of Highways Traffic Information in 2020