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IMPORTANT INFORMATION-ANALYTICAL METHODS FOR ASSESSING THE RISK OF ACCIDENTS IN TRAFFIC

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Abstract:
This article publishes the results of a study on the information and analytical assessment of the risk of accidents in road traffic in the Republic of Uzbekistan. As part of the study, an integrated approach was implemented to consider the problem of road accidents from various points of view and take into account the views of all interested parties. The research methodology included both qualitative and quantitative analyses. Particular attention is paid to the development of recommendations aimed at minimizing the risks associated with the human factor, the technical condition of cars, the characteristics of the road infrastructure and the influence of the environment. The use of the Smeed method made it possible to determine the relationship between the level of social and transport risks, which helped to identify the real situation in traffic that required increased attention. Using the Q-Cochran method, the opinions of drivers were systematized, which helped highlight the subjective aspects of risk factor perception, including dangerous manoeuvres, speeding and lack of visibility on the roads. The analytical hierarchy method, based on expert assessment, made it possible to identify priority areas for improving road safety. As a result of the analysis, key factors were highlighted, such as the quality of the road surface, the presence of clear markings and road signs, as well as the level of lighting in areas with high traffic intensity. The use of the iRAP method revealed the most

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dangerous sections of roads, which made it possible to propose targeted measures for their modernization. Among such measures are the installation of additional elements of passive safety, the arrangement of pedestrian crossings with alarms, as well as the introduction of intelligent traffic control systems. Thus, the results of the study provide an extensive basis for the formation of an effective strategy to reduce accidents. The proposed recommendations include measures to improve driver training, modernize road infrastructure, introduce innovative technologies in the field of road traffic and strengthen control over compliance with traffic rules.

Keywords: Traffic, Road accidents, Road injuries, Smeed's method, Q-test Cochran's, Manchester Driver Questionnaire, Analytical hierarchy method, Expert panel, Road safety audit.

INTRODUCTION

In the Republic of Uzbekistan, the economy and production, including the demand for road transport, are developing at a high rate, primarily the demand for road transport, which connects all sectors of a single economic mechanism. The interests of the development of society and production processes in the country require further improvement in the efficiency of vehicles, which in turn is directly related to improving road safety.

In the world, traffic accidents are the second leading cause of serious injury after criminal injuries. During the year, up to 1.3 million people become victims of road accidents, and up to 50 million received injuries of varying degrees [1]. Low- and middle-income countries account for approximately 60% of global road transport and 93% of all fatal road accidents. Road traffic injuries are the leading cause of death for children and young people aged 5 to 29. In many countries, road traffic damage accounts for 3% of their gross domestic product [2].

The issue of improving road safety is considered relevant worldwide not only because of the importance of the health and life of each person in the country, but also because it incurs financial losses in the economy due to long-term social losses. Therefore, in order to implement more effective measures to improve road safety, it is important to promptly assess the risk of road accidents and reduce it,

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taking into account the characteristics of the factors causing road accidents, the behavior of road users, and the interaction of factors.

The results of a detailed study of the set of measures implemented in the field of road safety in our republic indicate the presence of a number of problems, in particular, the lack of effective models for assessing the risk of road accidents for optimal regulation of individual requirements for roads, vehicles, road users, as well as other infrastructure elements. According to the Road Safety Service of the Department of Public Safety under the Ministry of Internal Affairs of the Republic of Uzbekistan, an average of 9-10 thousand accidents occurs annually, including more than 2 thousand of them with human casualties, including in 2021 compared to 2020, the number of road accidents increased by 43.24%, and the number of deaths in car accidents increased by 23.65%. In 2021, the number of victims of road accidents amounted to 2426 people (of which 263 children), and the number of victims - 9230 people (Figure 1). Identifying and analyzing factors that significantly affect the likelihood of road accidents and the severity of their consequences, as well as the impact on them by identifying general patterns and causes of road accidents, predicting the likelihood of their occurrence and assessing the severity of them, significantly increase road safety [3].

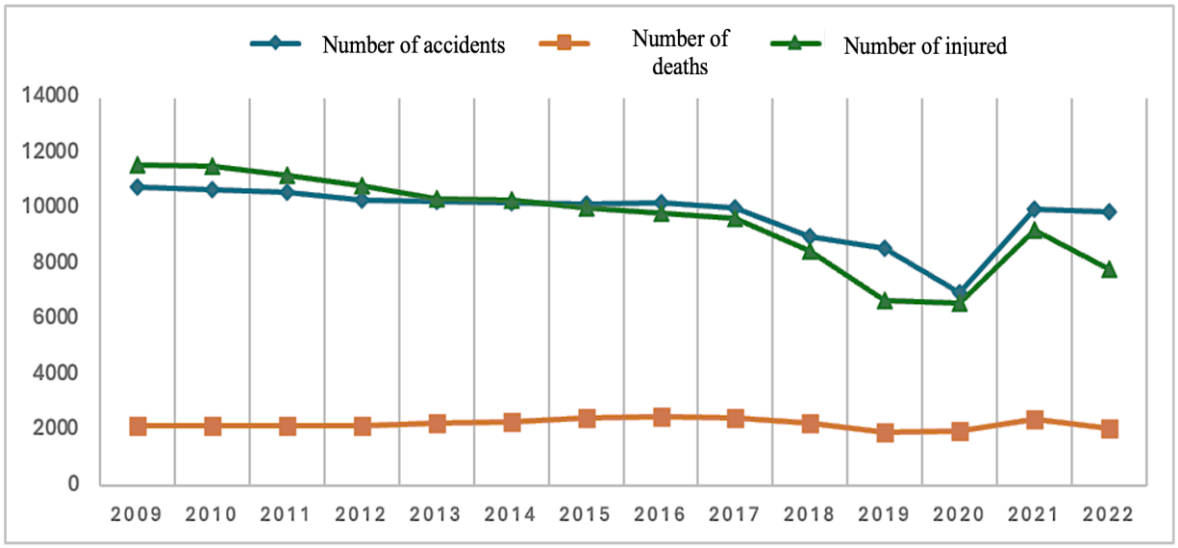

Figure 1: Information on road accidents in the Republic of Uzbekistan for 2009-2022.

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On average, about 2,000 people die on the roads of the Republic of Uzbekistan every year [4]. This indicator does not decrease over the years. According to the traffic safety service of the Department of Public Safety under the Ministry of Internal Affairs of the Republic of Uzbekistan, the death toll from accidents in 2021 increased by 23.65% compared to 2020 (Figure 1).

As can be seen from the above indicators, the issue of the risk of death of people in road traffic is relevant, since it is necessary to take into account the basic safety requirements associated with the following risks on roads: the transport and operational condition of the road, roadside and dividing strips, traffic management equipment, road fences, road facilities, artificial lighting devices, etc.

Since, today, road traffic injuries and mortality from a traffic accident are recognized as one of the most important problems of modern society. It is known that many factors affect the occurrence of road accidents. According to the Haddon matrix [5], the significance of risk factors in accidents is divided into three stages: before the accident, during and after the accident, and into three groups of factors: person, vehicle and environment (Table 1).

Table 1. Haddon matrix.

Phase		**Factors dependent on:**		
		Human	**Vehicle and road**	**Environment**
Before the accident	Accident prevention	Knowledge Behavioral attitudes Health problems Police control	Roadworthiness Road lighting Brake system condition Compliance with the speed limit	Road section and condition Speed limits Pedestrian structures and devices
At the time of the accident	Injury prevention during an accident	Use of seat belts Health problems	Availability and use of seat belts by passengers Other safety devices Emergency vehicle design	Road objects preventing accidents
After the accident	Maintaining life	First aid skills Availability of health care	Easy access to the scene Fire risk	Availability of rescue services Traffic congestion

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It was revealed that the lack of modern information and analytical methods makes it difficult to correctly assess the current state of road safety in the Republic of Uzbekistan. This study addresses this issue.

MATERIALS AND METHODS

In this studio we have selected the most innovative methods of information and analytical assessment of the risk of road accidents.

When comparing the death toll from accidents with the public, the risk of death is relatively low. Not all segments of the population may be road users, but drivers are directly the main road users. This comparison shows us the dependence of the mortality rate as a result of road accidents in the Republic of Uzbekistan on the number of direct road users (Figure 2).

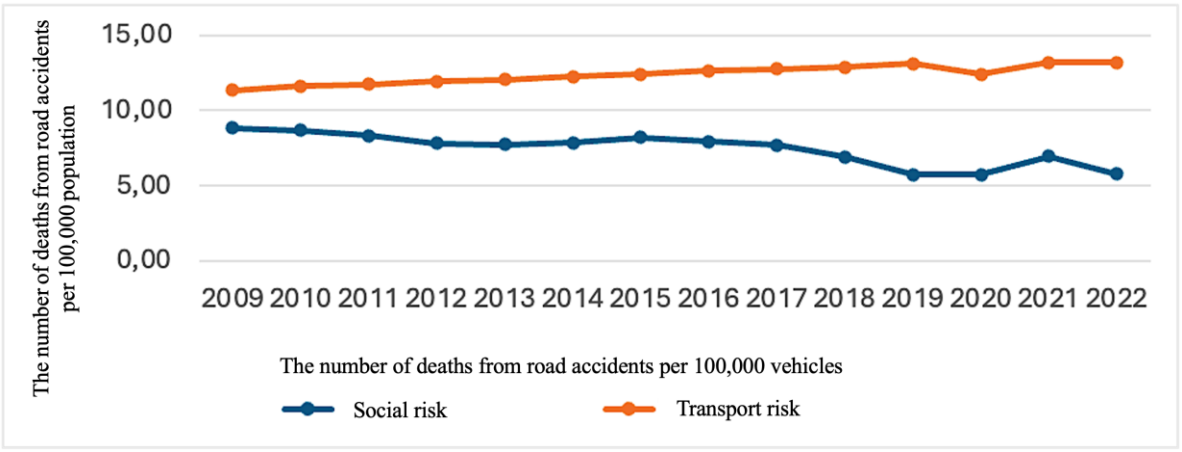

Figure 2: Relationship of social and transport risk.

Most accidents are directly related to the human factor. Driving skills and driving style, that is, driver behavior, can be considered as the main factor in driving a car.

Analyzing foreign research, it was found that the Manchester Driver Questionnaire method [6,7] helps to identify and assess important factors on the road through driver behavior. With this method, it is possible to assess the factors influencing road deaths from the point of view of drivers as direct participants and major road users.

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Therefore, one of the main directions of this study is the method of information and analytical assessment of the risk of road accidents by conducting a survey among drivers. This approach involved collecting data directly from drivers through surveys and analyzing them to identify risk factors and improve road safety. Below are some of the main aspects and methods I have used in this direction [8,9,10]:

1. Survey Design. Effective survey design is critical to obtaining accurate and meaningful data. A questionnaire was developed containing a series of questions related to driver behaviour, attitudes, driving experience, risk perception and road traffic accidents. The survey was designed to collect both quantitative (e.g. multiple choice questions, Likert scale) and qualitative (e.g. open-ended questions) data.

2. Sampling methods. Appropriate sampling methods are important to ensure that survey results are representative of the target population. Different sampling methods such as random, stratified, and quota were used to select different groups of drivers to participate.

3. Data collection. Surveys are conducted through a variety of means, including online platforms, telephone interviews, and face-to-face interviews. Each method has its advantages and limitations, and the choice depends on factors such as population size, available resources, and research objectives. I used online surveys and face-to-face interviews to collect data from different drivers.

4. Data analysis. Once the survey data is collected, it must be analyzed to obtain meaningful information. I used the method of descriptive statistical analysis to identify aspects, relationships and significant factors associated with the risk of accidents. Advanced statistical tools such as factor analysis or modeling by structural equations can also be used to study complex relationships between variables.

5. Risk assessment: Based on the results of the survey and data analysiss, we developed risk assessment models that take into account various factors associated with accidents. By quantifying the level of risk, the relevant road organization specialists can prioritize and plan measures for the effective use of resources.

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6. Recommendations and measures: The results of the survey and risk assessment serve as the basis for the development of targeted measures to reduce the risk of accidents. These recommendations may include educational programs, improvements to road safety infrastructure, or policy changes to address risk factors identified by survey data.

Improving the information and analytical assessment of accidents is an important area of research aimed at improving measures to ensure road safety. Accurate accident risk assessments allow government, transport authorities and researchers to identify key factors influencing the number of road fatalities and develop effective prevention strategies. The Analytic Hierarchy Process (AHP) [11,12] is a widely used research method and tool to help systematically assess and prioritize different risk factors.

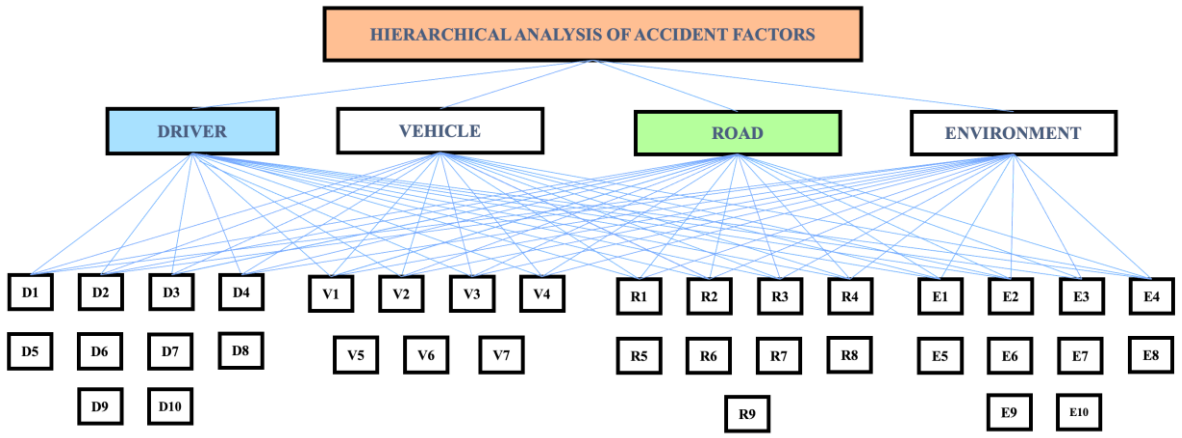

Figure 3: Flow chart of matrix assessment of accident risk factors.

Advantages of the AHP in assessing the risk of death on the road:

1. Structured decision-making: AHP provides a systematic approach to decision-making, comprehensively analyzes risk factors and their relative significance.
2. Subjective and objective factors: AHP allows you to combine both subjective judgments and objective data, providing a balanced assessment of risk factors.

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3. Flexibility: AHP can solve complex problems on the road according to several criteria. It is flexible and can adapt to hierarchical or weighted results as new data becomes available.

4. Transparency and communication: AHP provides a transparent decision-making framework that allows stakeholders to understand the rationale for prioritizing risks. This facilitates communication and consensus building between experts and decision makers.

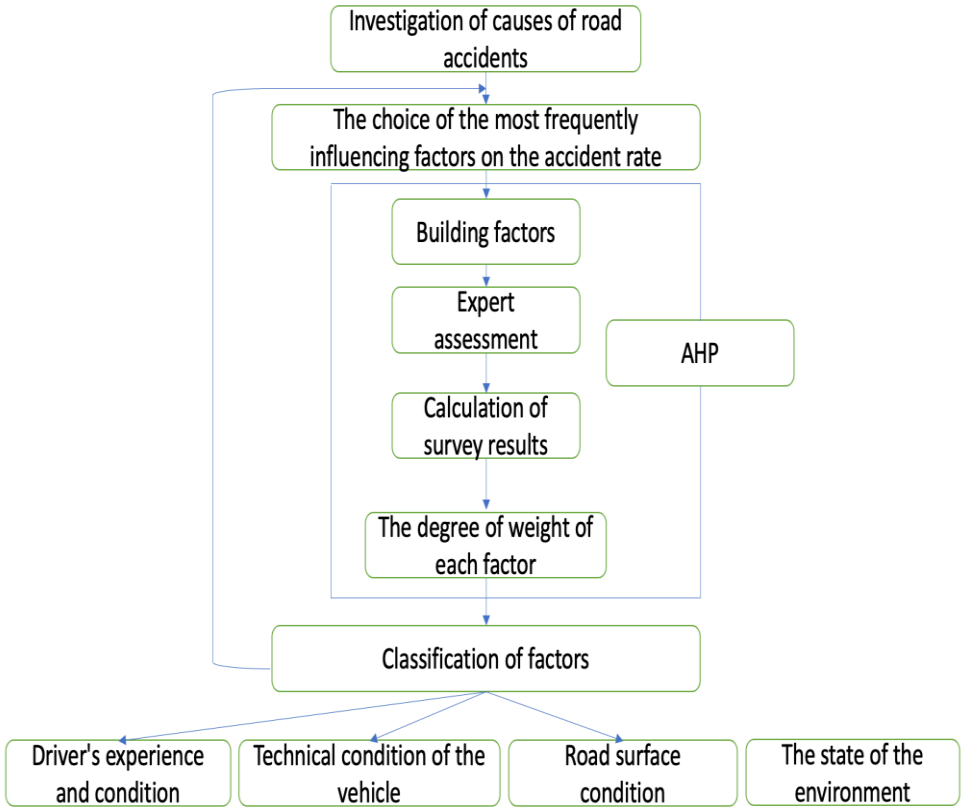

Figure 4: Flowchart for organizing an expert group survey.

Benefits of a road safety audit (RSA) [13,14]:

1. Systematic approach: The RSA follows a systematic and standardized approach to identifying safety concerns and proposing appropriate measures. This ensures that safety assessments are comprehensive and consistent and lead to targeted interventions.

2. Data-driven decision making: RSA relies on data collection and analysis to identify risk factors and prioritize safety improvements. This data-driven

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approach helps allocate resources efficiently and supports evidence-based decision-making.

3. Improving safety: RSA can identify potential safety hazards before accidents occur. By actively solving these problems, the RSA algorithm prevents accidents and reduces the severity of injuries (Figure 5).

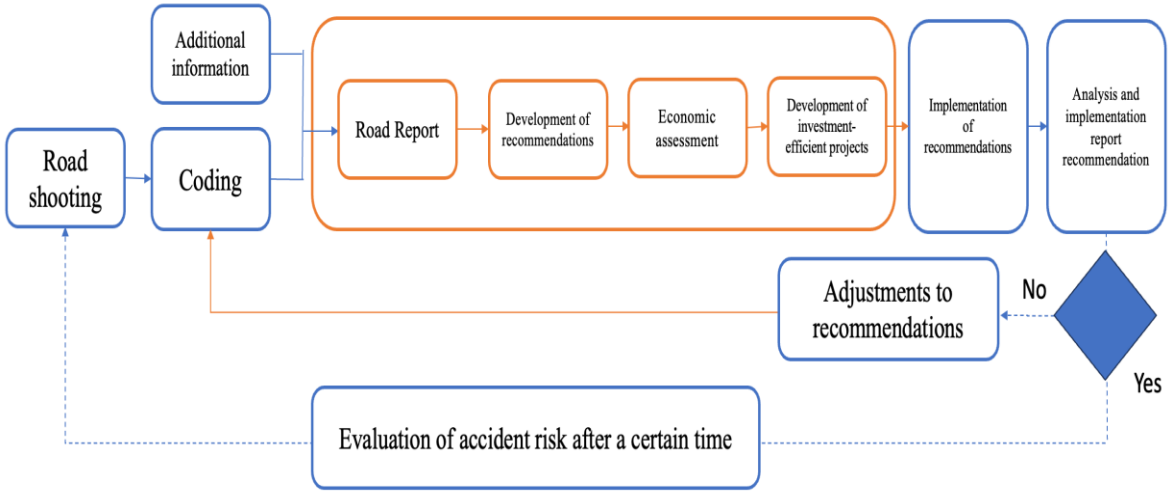

Figure 5: Recommended block-scheme on conducting road safety audit process.

RESULTS

An online survey was conducted among 384 drivers in Tashkent using Google Forms. According to statistics from the Republic of Uzbekistan, as of January 1, 2022, 3051.7 thousand vehicles were registered for individuals. A random sampling method was used to select the required number of participants, and it was determined that 384 participants were needed to conduct the survey. When developing the content of the questionnaire questions, the results of foreign studies were studied and 26 questions were initially created. An additional 18 questions were formed taking into account the conditions of the Republic of Uzbekistan and a total of 41 questions were drawn up.

When polled by participant gender: male-89.5%, female-10.5%; By age: 18-22 years old-3.3%, 23-38 years old-43.1%, 39-54 years old-39.2%, 55-70 years old-14.1% and over 70 years old-0.3%; By profession: employees of state bodies - 17.6%, law enforcement officers - 1.3%, employees of defense structures - 1.6%; employees of educational institutions - 10.8%, employees of public organizations

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- 13.4%, passengers and cargo carriers - 6.5%, entrepreneurs - 32.4%, students - 4.2% and official unemployed - 12.1%; By education: secondary-5.6%, secondary specialized-23.9%, higher-68.3% and doctors of science (PhD) -2.3%. The 37 factors used are structured as questions, and the driver assesses the importance of the factors by answering "yes" or "no" to indirect questions. The Cochran's Q-test was used to test for a statistically significant effect of the results because this test is appropriate for the corresponding binary data samples.

This study used 37 factors (41 in total) related to road traffic accident, which took into account many aspects, such as driver experience, reaction, confidence, alcohol consumption, etc., developed with the help of the Cochran's Q-test, the following important factors were identified that affect the occurrence of accidents from the point of view of drivers: non-compliance with driving distance or traffic lights, fatigue behind the wheel, family conflicts and problems at work, use of a mobile device while driving, nervousness from external influences while driving, weather conditions, sudden switching of cars from one lane to another, standing in traffic jams were assessed as important factors affecting the risk of accidents on road traffic (Table 2).

Table 2. Level of most important factors by Q-criterion.

Factors	Q-criterion
Not keeping the distance while driving or when settling in front of a traffic light	80.5
Intersection passage with flashing yellow traffic light	80.1
Adverse weather conditions (fog, rain, snow, dust storm)	76.2
Continuous lane change	71.2
Traffic congestion	68.6
Stressful state from family quarrels or from problems at work	61.4

The causes of accidents are different, but the main reason is that there is an imbalance in the system consisting of people (drivers), vehicles, roads and environmental factors. The following "D-V-R-E" (Driver – Vehicle – Road – Environment) system factors were selected (Table 3) [16]:

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1. "Driver" factors.

Drivers are the most active factor in ensuring road safety. According to statistics, in 2022, 26 accidents occurred on the Tashkent Bypass Road 4R21, including 16 collisions with other vehicles, 6 collisions with barriers, 3 collisions with pedestrians and 1 collision with a cyclist. As a result, more than 10 people died. In most cases, the accident was caused by the driver's behavior.

2. "Vehicle" factors.

The car is the main means of modern transport. The quality of vehicle performance plays an important role in road safety. The immediate cause of road accidents can be problems such as brake failure and other mechanical failures due to late technical inspection.

3. "Road" factors.

As the main elements of the road, the technical and operational condition of the road, the level of equipment and traffic conditions should not be neglected. Road conditions are a combination of important factors affecting the comfort and safety of road users.

4. "Environment" factors.

Weather conditions such as fog, heavy rain, snow, icy roads, dust storms and darkness are important factors affecting road safety. Adverse weather is often the cause of accidents and its importance cannot be denied.

Table 3. Classification of selected factors by "D-V-R-E" system.

Category	Factors	
Driver	Floor Age Driving experience Seat belt non-use Driving at high speed Improper overtaking Driving under the influence of alcohol or drugs	Failure to maintain a safe distance between vehicles Driving through a red light Non-compliance with pedestrian priority Non-compliance with road signs Tiredness or falling asleep at the wheel
Vehicle	Vehicle type	Vehicle headlight defects

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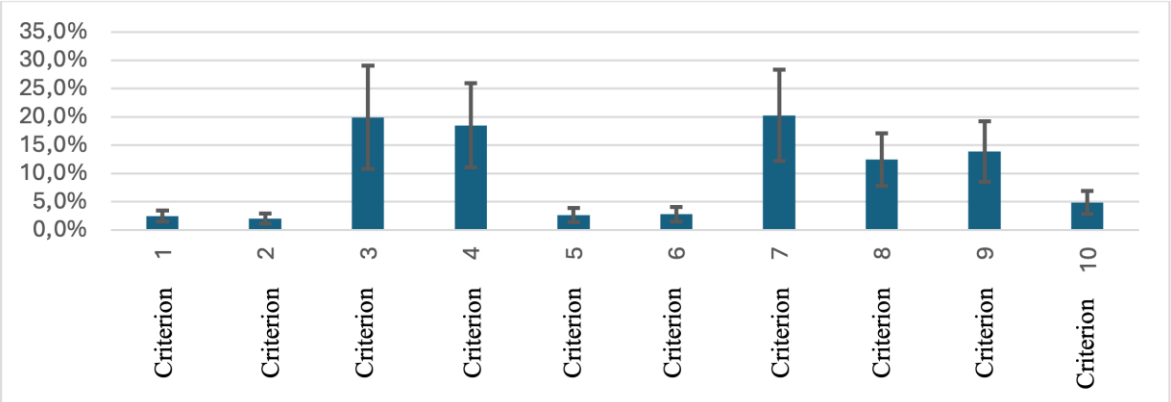
	Vehicle model and make Vehicle size and weight Car body color Late maintenance	Side and rear mirrors malfunction Presence of tyre defects Faults in brake system Fault in control system
Road	Road category Road section where there is an intersection, intersections, junction Low road capacity Missing or insufficient shoulder width Lack of road lighting	Condition of road surface Condition of road signs Insufficient protection of the road section being repaired Low visibility on the road Other objects or animals on the road
Environment	Season Day of the week Time of day Fog Dust storm	Snowfall Heavy rain Strong wind Scorching heat

Table 4. Comparison matrix.

	Criterion 1	**Criterion 2**	**Criterion 3**
Criterion 1	*A11=1*	*A12*	*A13*
Criterion 2	*A21*	*A22=1*	*A23*
Criterion 3	*A31*	*A32*	*A33=1*

Using hierarchical analysis, the level of importance of factors within the "D-V-R-E" criteria was assessed (Fig. 6). As a result, the experts determined the weight level of each factor and the compatibility limit of mutual assessments (Tables 5,6,7,8).



"Driver" criterion

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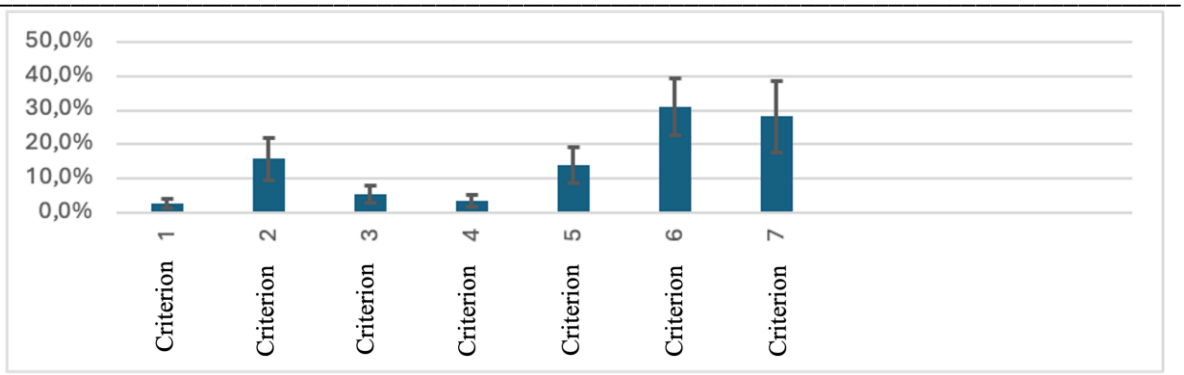
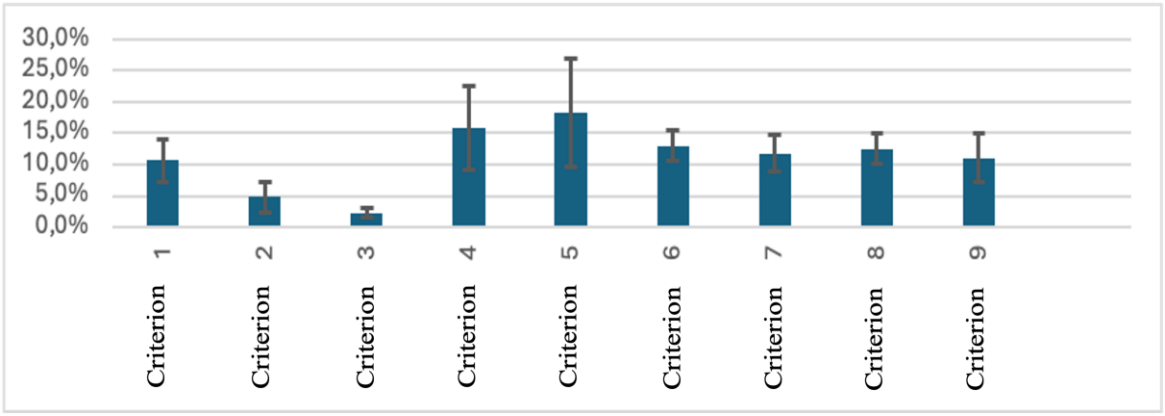
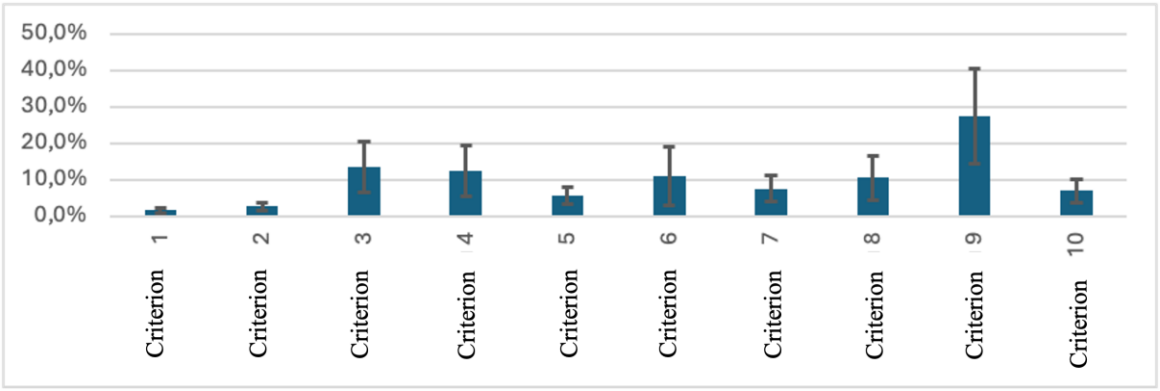


"Vehicle" criterion



"Road" criterion



"Environment" criterion

Figure 6: Graph of factors assessed by the expert group.

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Table 5. "Driver" criterion.

Criterion	Title	Weight Index	+/-
Criterion 1	Age	2.5%	1.0%
Criterion 2	Driving experience	2.0%	0.9%
Criterion 3	Riding at high speed	19.9%	9.1%
Criterion 4	Driving under alcohol/drug intoxication	18.5%	7.4%
Criterion 5	Insufficient distance between the vehicle	2.7%	1.2%
Criterion 6	Wrong overtaking	2.8%	1.3%
Criterion 7	Running a red light	20.3%	8.1%
Criterion 8	Do not give priority to pedestrians	12.5%	4.6%
Criterion 9	Non-compliance with other road signs	13.9%	5.3%
Criterion 10	The state of fatigue and sleepiness during movement	4.9%	2.1%

Table 6. "Vehicle" criterion.

Criterion	Title	Weight Index	+/-
Criterion 1	Type of vehicle	2.6%	1.3%
Criterion 2	Delayed transport service	15.7%	6.1%
Criterion 3	Malfunction of the headlamp	5.2%	2.5%
Criterion 4	Malfunction of the side mirrors and rear view	3.5%	1.9%
Criterion 5	Tyre wear	14.1%	5.2%
Criterion 6	Malfunction of the brake system	30.8%	8.4%
Criterion 7	Malfunction of the steering system	28.1%	10.5%
Criterion 8	Type of vehicle	2.6%	1.3%
Criterion 9	Delayed transport service	15.7%	6.1%
Criterion 10	Malfunction of the headlamp	5.2%	2.5%

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Table 7. "Road" criterion.

Criterion	Title	Weight Index	+/-
Criterion 1	The intersection and the intersection	10.6%	3.4%
Criterion 2	Insufficient road capacity	4.8%	2.4%
Criterion 3	Insufficient shoulder width	2.3%	0.8%
Criterion 4	The weak illumination of the road	15.8%	6.7%
Criterion 5	Bumpy road	18.2%	8.6%
Criterion 6	Malfunction of the road signs	13.0%	2.5%
Criterion 7	Repair sections of the road	11.7%	2.9%
Criterion 8	The lack of road markings	12.5%	2.4%
Criterion 9	The presence of animals on the road or other objects	11.0%	3.9%
Criterion 10	The intersection and the intersection	10.6%	3.4%

Table 8. "Environment" criterion.

Criterion	Title	Weight Index	+/-
Criterion 1	Day of the week	1.7%	0.8%
Criterion 2	Time of day	2.7%	1.2%
Criterion 3	Fog	13.5%	6.9%
Criterion 4	Snowfall	12.6%	6.9%
Criterion 5	Rain	5.7%	2.4%
Criterion 6	Shower	11.1%	8.0%
Criterion 7	Strong wind	7.6%	3.6%
Criterion 8	Dust storm	10.7%	6.1%
Criterion 9	Ice-covered ground	27.4%	13.0%
Criterion 10	Heat	7.0%	3.1%

An increase in the average speed of movement directly affects the risk of accidents and the severity of their consequences. For example, a 1% increase in average speed leads to a 4% increase in the risk of a fatal accident and a 3% increase in the risk of serious accidents. When increasing the speed of the car

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from 50 km/h to 65 km/h, the risk of pedestrian death increases 4.5 times. In a collision at a speed of 65 km/h, the risk of death of drivers and passengers of vehicles is 85%.

Road Safety Audit (RSA) studies include safety checks of road sections, pedestrian crossings, shoulders, and guardrails using accident records, as well as an assessment of safety measures on a selected road section.

Figure 7: Pictures of the highway 4P21 section – "Tashkent bypass road" obtained with the help of a mobile road laboratory.

On the 4p21 – "Tashkent bypass road", analytical photo and video images were obtained using a mobile road laboratory, data on the features of each section of the road were collected (Fig. 7). The data collected were used to assess the safety performance of various road users (drivers, pedestrians, cyclists and motorcyclists) using the iRAP method [18].

In addition to data on road sections and intersections, the iRAP model makes it possible to assess the safety of vulnerable road users, such as pedestrians, cyclists and motorcyclists, taking into account road conditions. As shown in Figure 8, based on the overall results for the 4R21-"Tashkent bypass road", the accident risk level for road users such as vehicles (driver), motorcyclists, pedestrians and cyclists was estimated within 5 stars.

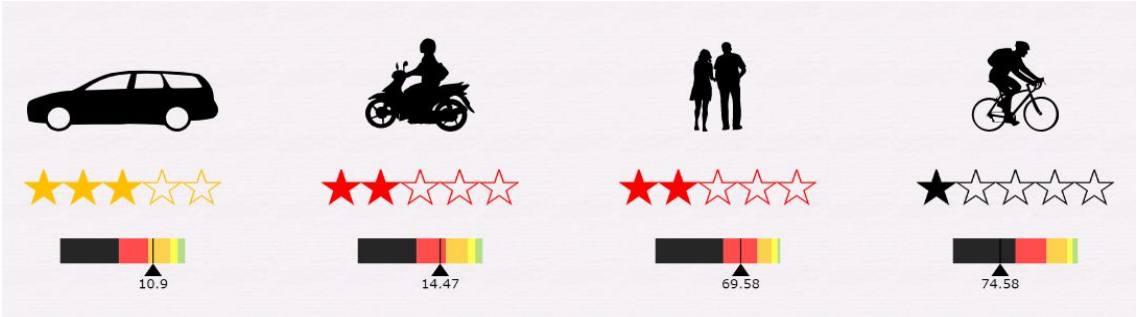

Figure 8: The results of the 5-star rating of road users by the level of accident risk on the road under study 4R21 – "Tashkent bypass road".

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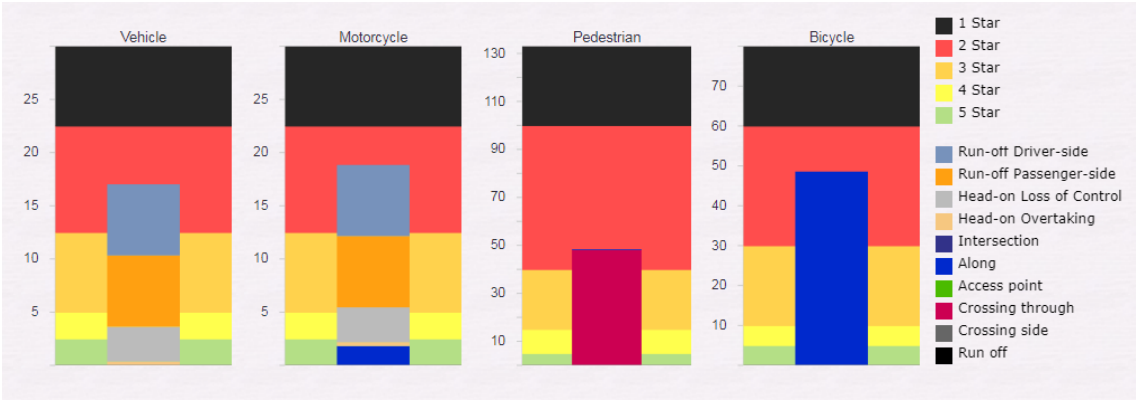

Figure 9. Hazard risk indicators according to the safety index for various road users on the 4R21 highway – "Tashkent bypass road".

From Figure 9, it can be concluded that the higher the risk index, the lower the star rating. In addition, it can be determined that intersections are dangerous for motorists and motorcyclists, and crossing the road in certain sections of the road is dangerous for pedestrians and cyclists.

CONCLUSIONS

Based on the obtained patterns and analysis results, it is possible to develop effective tools for influencing the transport system. This is possible both at the operational level of management - through the introduction of corrective measures and operational measures, and in the long term - through the improvement of development strategies and traffic management.

Based on the results of the study, a block diagram of the information and analytical assessment of the risk of accidents in road traffic is proposed, taking into account an integrated approach (Figure 10).

In this study, the development of conceptually new approaches to assessing accident risks is of particular importance. This contributes to improving the efficiency of public administration, allows optimizing traffic management processes and strengthens the basis for the introduction of modern management solutions in the field of road safety. One of the most important approaches to assessing the risk of accidents on various sections of roads is the road safety audit,

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as it is considered a systematic process of assessing the road infrastructure in order to identify potential risks that can lead to accidents and develop recommendations for their elimination. This tool is actively used to improve road safety at all stages of the design, construction and operation of roads in developed countries of the world.

In addition to these fundamental principles to reduce road mortality and injuries, effective bills are needed, the correct organization of road traffic, as well as more extensive social education of the population on traffic rules (propaganda of traffic rules in the media, social networks, advertising banners, regular publications, etc.) [19, 20].

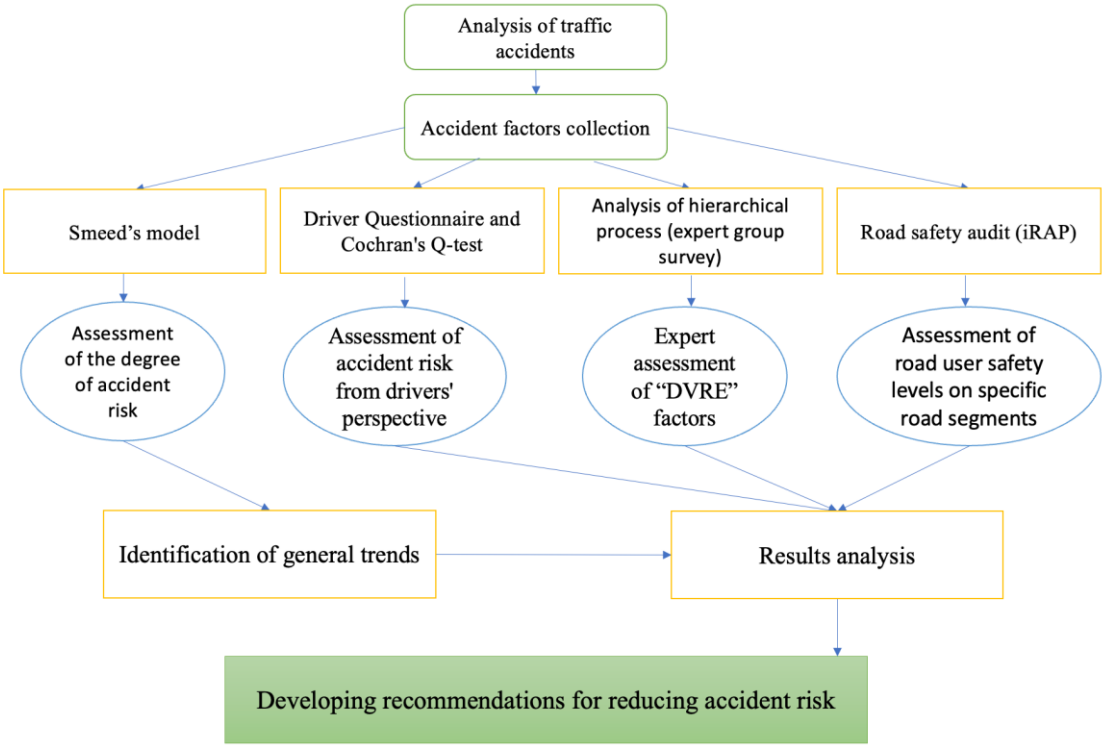

Figure 10: Flow chart of information and analytical assessment of road accident risk in road traffic.

The presented results in the four main areas of road safety measures illustrate the following facts:

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• Speed violation is a key risk factor for road injuries; due to violation of the speed limit, both the likelihood of an accident and the risk of severe consequences increase. Effective speed control measures, such as establishing and enforcing speed limits, calming traffic through special road design and other methods, and improving vehicle safety technologies, must be implemented everywhere. All four countries have speed limit rules, but speed limits are different, and in some countries it is desirable to further reduce the set speed.

• A significant reduction in could be facilitated by the widespread introduction of more modern vehicle safety technologies, including both passive and active safety systems, based on the implementation of a set of measures, such as unification.

According to the results of the study, it was concluded that without an integrated approach, reducing accidents in road traffic will not give an effective result. Therefore, it is necessary to create a state integrated system that can plan, manage, monitor and improve the field of road safety, taking into account all "D-V-R-E" systems. Such a system should ensure the integration of all elements of road infrastructure, transport, regulations and technologies.

This system will require the introduction of modern data monitoring and analysis technologies, the use of information platforms for the exchange of data between various public and private structures, as well as the development of a system of training and advanced training of drivers. Particular attention should be paid to the prevention of road accidents, improving the state of the road network, as well as introducing innovative solutions to improve vehicle safety.

In addition, it is necessary to take into account the influence of the human factor, which requires the development and implementation of programs for psychological training of drivers and pedestrians, the introduction of automation technologies and assistance to drivers, such as collision prevention systems, adaptive cruise control, as well as constant monitoring and analysis of accident data in order to identify causes and develop effective measures to prevent them (Figure 11).

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Figure 11: Integrated road safety management system.

Thus, an integrated road safety system should ensure effective interaction of all components aimed at reducing accidents and increasing the level of safety for all road users.

REFERENCES

1. Global status report on road safety 2018. - Geneva: World Health Organization, 2018. - ISBN 978-92-4-156568-4. 5 p. http://who.int/publications/i/item/9789241565684.
2. Imamaliev D.M., Urakov A.H., Darabov M., Sayfutdinova R.A. (2021) “Important risk factors for road accidents” // E3S Web of Conferences 264, E3S Web Conf. Volume 264, 2021 International Scientific Conference “Construction Mechanics, Hydraulics and Water Resources Engineering” (CONMECHYDRO - 2021). - 02 June. – 02025 p. http://doi.org/10.1051/e3sconf/202126402025.

Modern American Journal of Engineering, Technology, and Innovation
ISSN(E): 3067-7939
Volume 01, Issue 03, June, 2025
Website: usajournals.org

3. Jamshid Sodikov, Quvonchbek Musulmonov, Dilshod Imamaliev. Developing Novel Registration of Road Traffic Accidents. Communications - Scientific Letters of the University of Zilina 2022, 24(4):F62-F71. https://doi.org/10.26552/com.C.2022.4.F62-F71
4. Darabov M., Akhrarov A. Study of the influence of road surface evenness on traffic safety and speed //AIP Conference Proceedings. – AIP Publishing, 2024. – Т. 3244. – №. 1. https://doi.org/10.1063/5.0242135
5. Haddon J. W. The changing approach to the epidemiology, prevention and amelioration of trauma: the transition to approaches etiologically rather than descriptively // America J. of Public Health. — 1968, vol. 58. — P. 1431-1438.
6. Sucha, M., Sramkova, L., & Risser, R. (2014). The Manchester driver behaviour questionnaire: self-reports of aberrant behaviour among Czech drivers. European Transport Research Review, 6(4), 493–502. https://doi.org/10.1007/s12544-014-0147-z.
7. af-Wåhlberg, A., Dorn, L., & Kline, T. (2011). The Manchester Driver Behaviour Questionnaire as a predictor of road traffic accidents. Theoretical Issues in Ergonomics Science, 12(1), 66–86. https://doi.org/10.1080/14639220903023376
8. Wang, Y., Li, L., Feng, L., & Peng, H. (2014). Professional drivers' views on risky driving behaviors and accident liability: A questionnaire survey in Xining. Transportation Letters, 6(3), 126–135. https://doi.org/10.1179/1942787514Y.0000000019
9. Ozkan T, Lajunen T, Summala H. Driver Behaviour Questionnaire: a follow-up study. Accid Anal Prev. 2006 Mar;38(2):386-95. http://doi.org/10.1016/j.aap.2005.10.012. Epub 2005 Nov 28. PMID: 16310749.
10. Nordfjærn, T., Jørgensen, S., & Rundmo, T. (2011). A cross-cultural comparison of road traffic risk perceptions, attitudes towards traffic safety and driver behaviour. Journal of Risk Research, 14(6), 657–684. https://doi.org/10.1080/13669877.2010.547259
11. Saaty, T. L. (2002). Decision making with the Analytic Hierarchy Process. Scientia Iranica, 9(3), 215–229. https://doi.org/10.1504/IJSSCI.2008.017590

Modern American Journal of Engineering, Technology, and Innovation
ISSN(E): 3067-7939
Volume 01, Issue 03, June, 2025
Website: usajournals.org

12. Saaty, T. L. (2004). Fundamentals of the analytic network process — Dependence and feedback in decision-making with a single network. Journal of Systems Science and Systems Engineering, 13(2), 129–157. https://doi.org/10.1007/S11518-006-0158-Y
13. UN.G.A. (74th sess.) (2020). Improving global road safety: resolution/: adopted by the General Assembly. UN. https://digitallibrary.un.org/record/3879711
14. Devang G Patel, FS Umrigar, CB Mishra, and Amit A Vankar (2013). Road Safety Audit of Selected Stretch from Umreth Junction to Vasad Junction International Journal of Science and Modern Engineering (IJISME) 2319–6386.
15. IRC SP 88 Manual on Road safety Audit Indian Roads Congress New Delhi.
16. Имамалиев, Д. М., Сайфутдинова, Р. А., Терпак, А. А. (2023). Применение иерархического анализа для определения значимости факторов, влияющих на безопасность дорожного движения. WORLD OF SCIENCE, 38-42.
17. Имамалиев Д.М., А. И. у. Холиков, А. А. Терпак, А. М. Ахраров. Оценка риска аварийности в дорожном движении методом аналитической иерархии // НАУКА, ОБЩЕСТВО, ИННОВАЦИИ: АКТУАЛЬНЫЕ ВОПРОСЫ СОВРЕМЕННЫХ исследований: сборник статей Международной научно-практической конференции, Пенза, 25 мая 2023 года. – Пенза: Наука и Просвещение (ИП Гуляев Г.Ю.), 2023. – С. 40-44. – EDN ORYHEF.
18. Nabarjun Vashisth (2016). Road safety assessment and test application of iRAP along National Highway 3 in Haiti PhD thesis Clemson University.
19. K. Azizov and A. Kholikov, “The impact of basic traffic indicators on traffic noise,” in AIP Conference Proceedings, 2023. doi: 10.1063/5.0145449.
20. S. Sadikov; Z. S. Pulatova; S. S. Salikhanov; R. A. Sayfutdinova; I. B. Khoshimov. Development of the street and road network in Tashkent. AIP Conf. Proc. 3045, 050026 (2024). https://doi.org/10.1063/5.0197553.