IMPACT OF TRAFFIC FLOW AND COMPOSITION ON ROAD SAFETY AT THE INTERSECTION OF CHINGIZ AITMATOV STREET AND THE SMALL RING ROAD IN TASHKENT

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Abstract: *This article examines the intersection of Chingiz Aytmatov Street and the Small Ring Road in Tashkent as the object of study. It analyzes the intensity of traffic flow in this area as well as the impact of the existing road infrastructure on traffic safety. Additionally, practical recommendations and proposals have been developed to address the identified problems.*

Keywords: *traffic volume, road traffic safety, traffic flow, road infrastructure, pedestrian crossings, road traffic accidents.*

Currently, the rapid increase in the number of vehicles in large cities is making the problem of ensuring road safety an urgent socio-economic issue. In particular, as a result of the intersection of traffic flows of vehicles and pedestrians at intersections, conflict points arise, which significantly increases the likelihood of various hazardous situations.

In our republic, an increase in the number of accidents, especially an increase in the severity of accidents, is being observed as a result of an increase in traffic volume and changes in the composition of highways, city roads, and streets. In this regard, special attention is paid to the implementation of solutions that determine traffic safety standards, taking into account the functionality of city streets.

In the course of this research, the intersection of Chingiz Aitmatov Street and the Small Ring Road in Tashkent was selected as the object of study. This intersection is a vital element of the city's transport infrastructure, characterized by high levels of traffic congestion and intensive traffic flows. As a result, the interaction between the movement of vehicles and pedestrians in this area has increased, and the issues of ensuring traffic safety are of particular importance.

The purpose of the study at the intersection of Chingiz Aitmatov Street and the Small Ring Road in Tashkent is to determine the intensity of traffic flow at the intersection, assess traffic density, and analyze the impact of road infrastructure on traffic safety.

A number of scientific and practical methods were used during the research process. In particular, monitoring of traffic flows was carried out based on visual observation (visual method), the intensity of traffic flow was determined in one hour, and the dynamics of changes in the composition of vehicles were analyzed. Additionally, the cyclical operating modes of the traffic light facility at the intersection were studied, and their impact on traffic flow was assessed.

According to official statistics provided by the Traffic Safety Department of the Tashkent City Internal Affairs Department, the dynamics of road traffic accidents by district have shown an upward trend in recent years. Specifically, in 2025, a total of 6,535 road traffic accidents were registered in the city of Tashkent, indicating a 30.4% increase compared to 2024. For comparison, it should be noted that in 2023, this figure was 4,733.

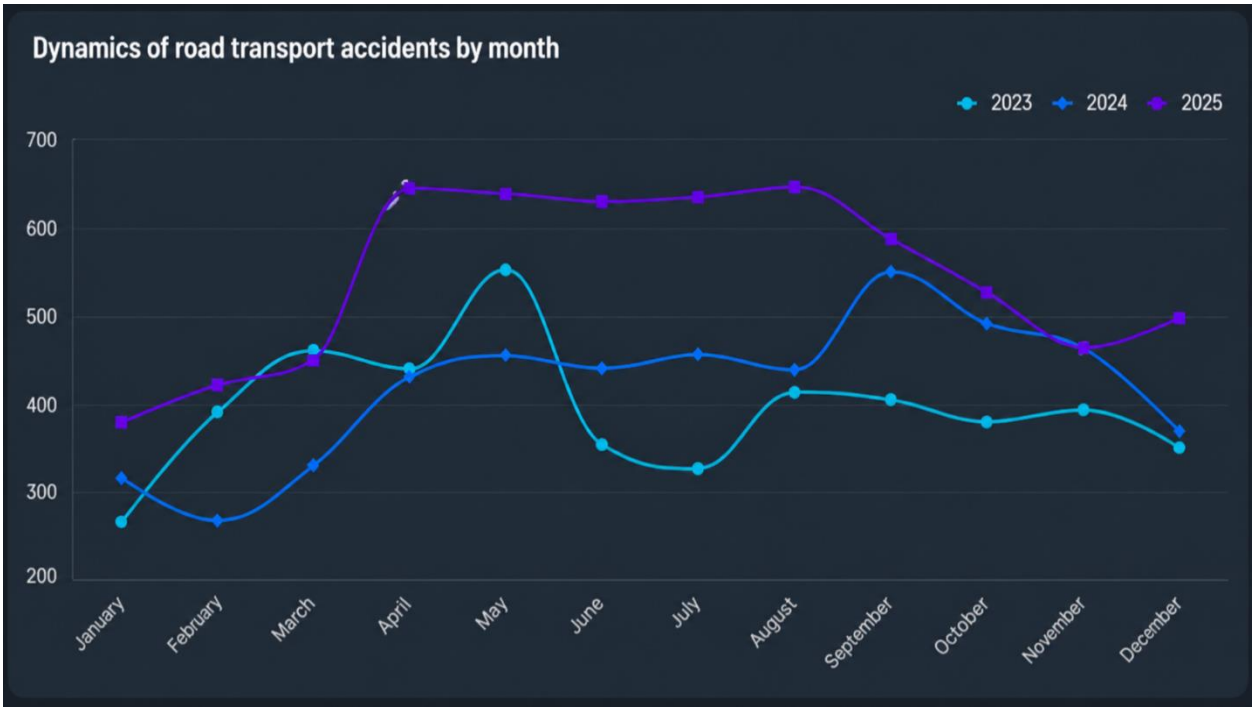

Figure 1. Graph of the change in the number of traffic accidents that occurred in the city of Tashkent over the last 3 years.

Analysis of these figures shows that the increase in the number of road traffic accidents is inextricably linked to a number of factors, a clear example of which is a significant increase in the number of vehicles, insufficient adaptation of the road infrastructure to the existing traffic flow, and an insufficient level of traffic organization at some intersections and road sections. Furthermore, the increase in conflict points resulting from traffic congestion and increased traffic intensity is explained by the increased complexity of the measures.

At conflict points, there is not only a risk of collisions between vehicles in the same direction or with pedestrians, but also the possibility of their delay. The hazardous situation at the intersection is complicated by the increase in traffic volume and the number of lanes, which further increases the risk of traffic accidents.

In 2025, road traffic accidents (RTAs) in Tashkent were distributed differently across districts. The highest figures were recorded in the Yunusabad district, with 830 accidents. High results were also observed in the Yashnabad and Chilanzar districts, where 815 accidents occurred in each. In the Mirzo-Ulugbek district, 687 incidents were registered, in Shaykhantakhur - 559, and in Almazar - 542. The average figures are 461 in Uchtepa, 457 in Sergeli, and 395 in the Mirabad district. Relatively low indicators are shown in the Yakkasaray (331), Yangikhayot (322), and Bektemir (321) districts (Fig. 2).

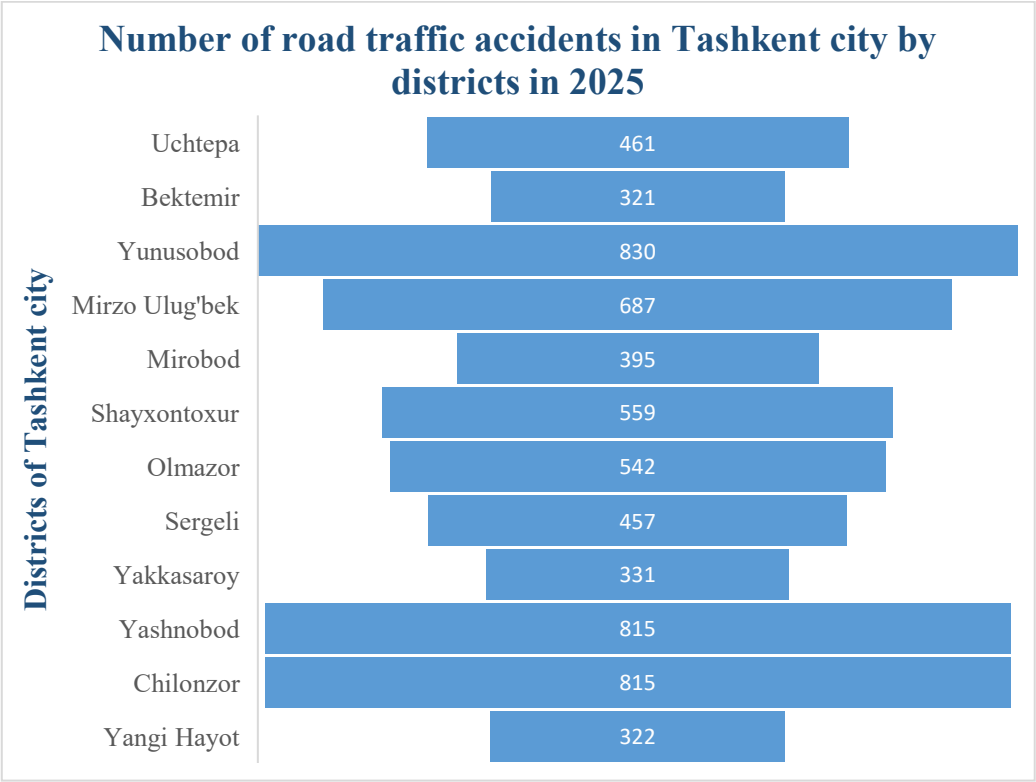

Figure 2. Number of accidents in Tashkent city by districts in 2025

From the figure above, it can be stated that road traffic accidents occur 2-2.5 times more frequently in the Yunusabad, Yashnabat, and Chilanzar districts compared to other districts. This is explained by the high population density and traffic flow in the region. In the process of analyzing road traffic accidents, we conducted observations on Chingiz Aitmatov Street and the small ring road in the Yunusabad district as the object of study.

The intensity and composition of traffic at the intersection of Chingiz Aitmatov Street and the Small Ring Road in the Yunusabad district were determined using a visual inspection method. Traffic intensity: Significant congestion occurs at the intersection between 7:00 and 10:00 a.m. during peak hours. According to the observation results, there are 4 traffic lanes in one direction of movement, with an average of 17–20 vehicles concentrated along each lane. This leads to a queue of up to 68–80 cars at the intersection in a single cycle.

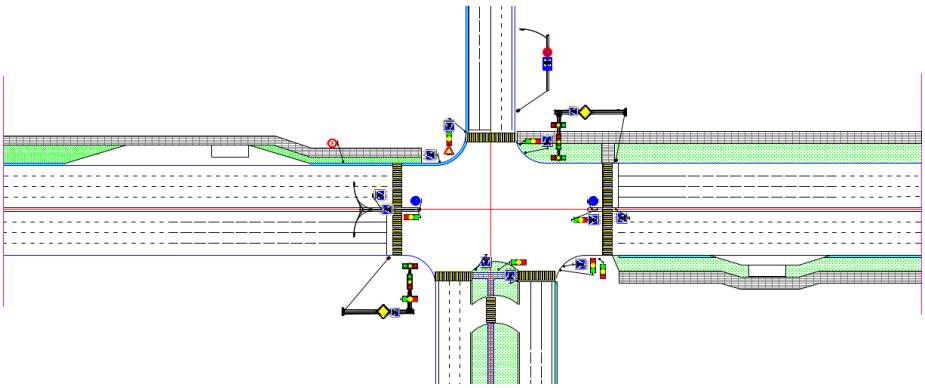

Figure 3. Diagram of the current state of the intersection of Chingiz Aitmatov Street and the Small Ring Road in Tashkent.

As a result, vehicles are forced to wait for 1–2 traffic light cycles to cross the intersection. This leads to an average loss of up to 2-3 minutes.

Figure 4. Traffic jam at the intersection of Chingiz Aitmatov Street and the Small Ring Road (on the left lane).

In the context of current urbanization, the increasing density of traffic flow on central city streets and the increasing frequency of stop-and-go cycles are, in turn, causing serious environmental issues. Specifically, traffic congestion resulting from traffic

congestion is one of the most significant factors indicating the level of atmospheric air pollution.

In this case, the engine idle mode is the most environmentally hazardous stage. From a scientific perspective, the main pollutants emitted by internal combustion engines include carbon monoxide (CO), nitrogen oxides (NO2), hydrocarbons (CH), and particulate matter (PM). During traffic jams, emissions of these substances are observed to increase manifold, as frequent stop-and-go mode reduces engine efficiency and disrupts the combustion process. The indicators of harmful substances are presented in Table 1.

Also, as a result of the density of vehicles in traffic jams, the spread of exhaust gases becomes difficult and they accumulate at the street level. This increases the local concentration of atmospheric air pollution and has a negative impact on human health. The risk of respiratory diseases, allergic reactions, and cardiovascular problems is particularly high.

Table-1

Name of toxic gases	**Amount of waste generated from the combustion of 1 kg of fuel, g**	
	Gasoline	**Diesel fuel**
Carbon dioxide (CO2)	225	20-30
Nitrous oxides	55	20-40
Hydrocarbons	20	4-10
Sulfur oxide	1,5÷2,0	10-30
Aldehydes	0,8÷1,0	0,8-1,0
Saja (soot)	1,0÷1,5	3-5

In conclusion, traffic congestion in city centers not only reduces traffic efficiency but is also one of the important factors that worsen the ecological state of the atmospheric air.

Taking the aforementioned data into account, the volume and composition of traffic on the highway were systematically studied, the results of which are presented in Table 2.

Table-2

№	**Hour**	**Passenger car**	**Truck**			**Bus**	**Mopeds**	**Bicycle**	**Total**
			2-5 t	**5-8 t**	**8 t upper**				
1	8^{00}-8^{05}	214	9	4		9		2	**238**
2	8^{05}-8^{10}	250	9	6		5			**270**

3	8^{10}-8^{15}	218	10	3		3	1		**235**
4	8^{15}-8^{20}	227	6	1		1			**235**
5	8^{20}-8^{25}	236	5	3	1			1	**246**
6	8^{25}-8^{30}	175	5		1	6		1	**188**
7	8^{30}-8^{35}	251	13	2	2		3		**271**
8	8^{35}-8^{40}	144	7	3	1				**155**
9	8^{40}-8^{45}	265	5	1	1				**272**
10	8^{45}-8^{50}	241	15	3			1	1	**261**
11	8^{50}-8^{55}	214	19	1		1		2	**237**
12	8^{55}-9^{00}	183	9	1	1		3		**197**
Total		2618	112	28	7	25	8	7	**2805**

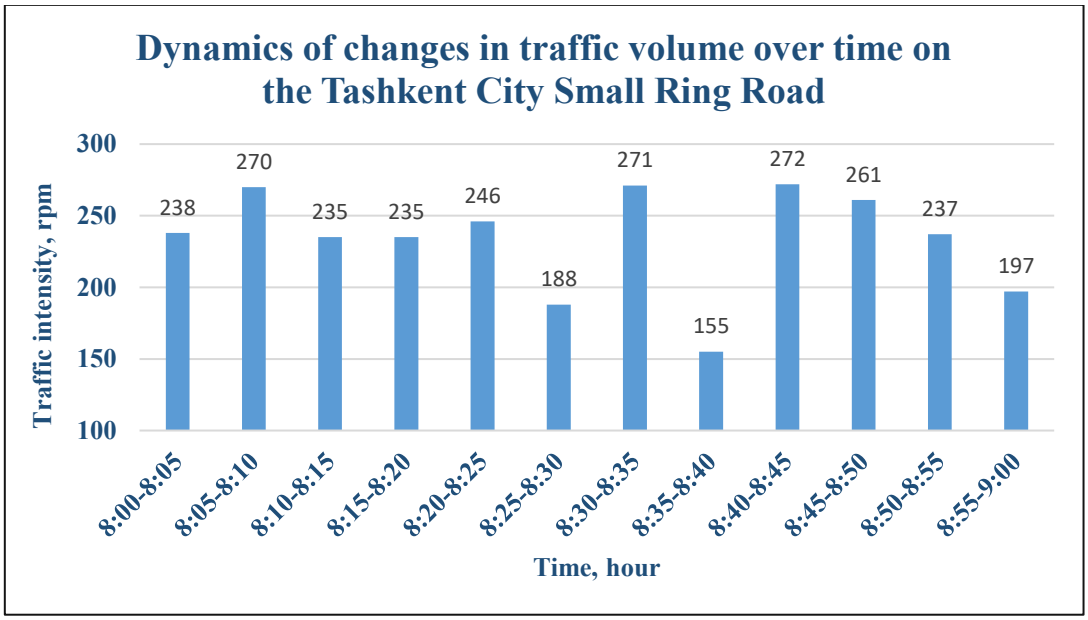

Figure 5. Dynamics of changes in traffic volume over time on the Tashkent City Small Ring
Road

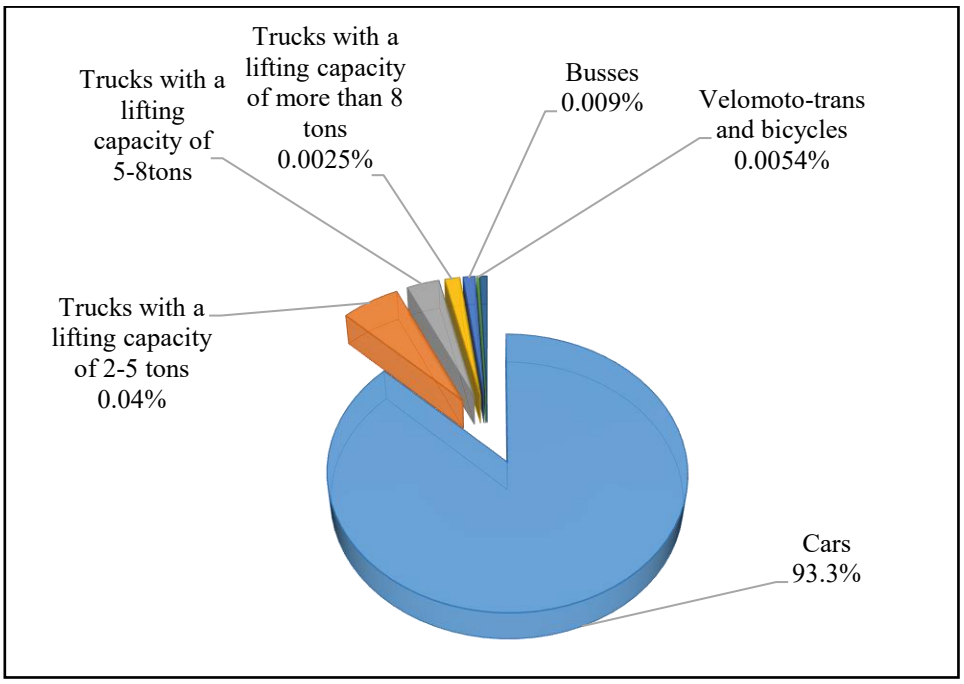

Figure 6. Composition chart of changes in the composition of vehicles on the Tashkent City Small Ring Road.

The composition of traffic on the Tashkent City Small Ring Road is based on measured data. According to the results, passenger cars account for the majority of the traffic flow (93.3%). The share of trucks is very low (2–5 tons – 0.04% and higher categories are even less), which is explained by the limited entry of freight transport into the city territory. The share of public transport is 0.009%, while bikes and bicycles account for 0.0054%. Figure 6.

The positive aspects of this composition are that the restriction of heavy-duty vehicles reduces the rapid wear and tear of the road surface, increases traffic safety, and to a certain extent reduces the amount of noise and harmful emissions in urban areas. Also, the fact that the main part of the road is adapted for passenger transport allows for a relatively stable organization of traffic. However, there are also negative aspects. In particular, a very high share of passenger cars places an excessive load on the road's capacity and causes traffic jams. The extremely low share of public transport increases the population's dependence on individual transport.

Furthermore, the very low share of bicycle transport indicates the insufficient development of an environmentally sustainable transport system. Overall, the current situation indicates the need to balance transport flows, particularly the development of public transport and alternative modes of transport.

Conclusion: Based on the results of this study, the state of traffic flow and road safety at the intersection of Chingiz Aitmatov Street and the Small Ring Road in Tashkent was analyzed. It was found that this intersection has a high traffic load, causing traffic jams and delays, especially in the morning and evening hours. The abundance of

vehicles leads to an increase in harmful atmospheric gases and increased noise, which negatively affects the quality of the environment. At the same time, the lack of dedicated lanes for cyclists reduces traffic safety and increases the risk of traffic accidents.

Based on this, the following recommendations are put forward:

1. Traffic flow management and optimization: It is necessary to revise traffic light cycles at intersections, reduce congestion by reorganizing traffic lanes, and optimize traffic flow.
2. Implementation of intelligent transport systems (ITS): Through smart traffic lights and real-time traffic flow management systems, it is necessary to minimize congestion, automatically adjust traffic light cycles, and ensure the ability to respond quickly to emergencies.
3. Development of cycling infrastructure: It is necessary to create separate lanes for cyclists, thereby increasing their traffic safety and reducing traffic congestion.
4. Development of the public transport system: It is advisable to reduce the population's dependence on individual vehicles by improving the quality and convenience of public transport.
5. Ensuring environmental safety: To reduce the amount of harmful emissions from vehicles, it is necessary to encourage the use of electric vehicles and alternative energy sources.

Implementation of these recommendations will increase the efficiency of traffic flow at the intersection of Chingiz Aitmatov Street and the Small Ring Road, improve road safety, and significantly improve the quality of life for the city's residents.

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