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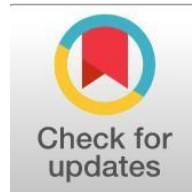
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Negative factors Affecting public transport movement in Urban streets

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Abstract

General Background: Urban public transport systems require reliable traffic operations and safe road infrastructure to maintain mobility efficiency and passenger service quality. **Specific Background:** This study investigates operational constraints affecting bus movement on Alisher Navoi Street in Tashkent, focusing on dedicated bus lanes, geometric lane dimensions, roadside infrastructure, and traffic intensity characteristics. **Knowledge Gap:** Existing urban traffic lanes and supporting infrastructure do not fully correspond to the geometric and operational requirements necessary for safe and continuous bus movement under high traffic density conditions. **Aims:** The study aims to identify negative factors affecting public transport movement and to determine scientifically justified measures for improving bus operating speed and traffic safety on urban streets. **Results:** Traffic observations revealed high vehicle density dominated by passenger cars, with total traffic intensity reaching 4306 vehicles during peak periods. Statistical analysis showed dispersed modal vehicle speeds, with an 85th-percentile speed of 64 km/h and a speed variation range of 55 km/h, indicating inefficient use of street transport capacity. The existing dedicated bus lane width was found to be inadequate for the designated operating speed. After increasing the dedicated bus lane width from 2.2 m to 3.20 m and removing barriers obstructing bus movement, bus operating speed increased from 18 km/h to 22 km/h, while congestion and operational interruptions decreased. **Novelty:** The study provides a scientifically justified assessment of dedicated lane geometry and roadside operational constraints based on field traffic observations and statistical speed analysis. **Implications:** The findings support practical road infrastructure modifications for improving public transport reliability, traffic safety, and urban traffic-flow management.

Highlights:

- Dedicated bus lane expansion increased bus operating speed from 18 km/h to 22 km/h.
- Statistical traffic analysis identified dispersed modal speeds and inefficient street capacity utilization.
- Removal of roadside barriers reduced operational interruptions within priority transit corridors.

Keywords: Dedicated Bus Lane, Public Transport Safety, Traffic Intensity, Urban Traffic Flow, Vehicle Operating Speed

Published date: 2026-05-20

Introduction:

The study considers the geometric condition of lanes allocated for public transport, the speed indicators of buses and cars, the quality of road infrastructure, and the location of barriers. Practical solutions and recommendations are proposed for improving these factors and bringing them to an optimal condition. The proposed recommendations and problem-solving measures were implemented in practice. As a result, congestion on the street and road network decreased, while the intensity, communication speed, and reliability of safe movement of public transport increased. Therefore, this scientific article has practical significance for ensuring the safe operation of the urban transport system.

Methodology :

Buses are an affordable, convenient, and environmentally cleaner mode of mobility for broad segments of the population. Their regularity and reliability in safe movement determine the stability and attractiveness of urban life. For this reason, proper organization of public transport movement, identification of hazardous sections, elimination of existing shortcomings in transport infrastructure, and development of scientifically grounded measures to improve safety are of considerable importance [10,11,12].

Accordingly, research was carried out on Alisher Navoi Street, one of the main arterial streets of Tashkent. Based on a scientific analysis of factors that hinder public transport movement due to deficiencies in road infrastructure, recommendations were developed and introduced into practice.

Research Results:

The research object, Alisher Navoi Street, is one of the central arterial streets of Tashkent and is characterized by a high density of traffic. The length of the street, its geometric parameters, the number of traffic lanes, the number of bus stops, the availability of pedestrian sidewalks [13,14,15], and the location of pedestrian crossings directly influence the formation of the transport flow in the area. In addition, lanes required for bus movement play an important role in ensuring transport - flow efficiency, improving public transport operations, and balancing the load on the road network. The indicators of the road-transport infrastructure of Alisher Navoi Street are presented in Table 1. Road infrastructure indicators of Alisher Navoi Street

1- Table.

Design speed, km/h	Traffic lane width, m	Bus lane width, m	Number of traffic lanes	Dividing strip .		Maximum sidewalk width, m	Green area width, m	Drainage ditch	
				width, m	Height, m			width, m	depth, m
60	2.80	2.85-3.55	5-10	0.80	0.30	4	4	0.70	0.50

The one-hour traffic intensity and traffic composition on Alisher Navoi Street were determined through visual observation. The results for four consecutive observation periods are given in tables 2-5.

2- Table. Traffic intensity on Alisher Navoi Street during 16:00-17:00.

Time interval	Cars	Tracks according to thier load capacity				Buses	Motorcycles t	Total
		2t	2-5t	5-8t	Tracks ≥ 8t			
16 ⁰⁰ -16 ⁰⁵	302	6		1		5	1	315
16 ⁰⁵ -16 ¹⁰	325	4	1			6		336
16 ¹⁰ -16 ¹⁵	340	4	1			5		350

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16 ¹⁵ -16 ²⁰	320	5		2		7		334
16 ²⁰ -16 ²⁵	332	4	2			6		346
16 ²⁵ -16 ³⁰	351	3				4		358
16 ³⁰ -16 ³⁵	360	6				3	1	370
16 ³⁵ -16 ⁴⁰	344	4	1		1	7		357
16 ⁴⁰ -16 ⁴⁵	330	4				5		339
16 ⁴⁵ -16 ⁵⁰	310	5				4		319
16 ⁵⁰ -16 ⁵⁵	319	5	3		1	6		334
16 ⁵⁵ -17 ⁰⁰	324	3				4	2	333
16 ⁰⁰ -17 ⁰⁰ jami	3957	50	8	3	2	62	4	4091

3- Table. Alisher Navoiy ko'chasidan o'tuvchi (1700-1800) davrdagi transport harakat jadalligi

Time interval	Cars	Tracks according to thier load capacity				Buses	Motorcycles - transport	Total
		2t	2-5t	5-8t	Tracks ≥ 8t			
17 ⁰⁰ -17 ⁰⁵	305	5	2			4		316
17 ⁰⁵ -17 ¹⁰	324	4				5		333
17 ¹⁰ -17 ¹⁵	343	6			1	3		353
17 ¹⁵ -17 ²⁰	354	3		3		7	2	369
17 ²⁰ -17 ²⁵	347	7				6		360
17 ²⁵ -17 ³⁰	315	5	3			5		328
17 ³⁰ -17 ³⁵	337	6				4		347
17 ³⁵ -17 ⁴⁰	312	3				5		320
17 ⁴⁰ -17 ⁴⁵	306	5	1	2	2	7		323
17 ⁴⁵ -17 ⁵⁰	359	4				4		367
17 ⁵⁰ -17 ⁵⁵	350	6				5	1	362
17 ⁵⁵ -18 ⁰⁰	367	7	2			6		382
17 ⁰⁰ -18 ⁰⁰ jami	4019	61	8	5	3	51	3	4160

4- Table. Traffic intensity on Alisher Navoi Street during 18:00-19:00

Time interval	Cars	Tracks according to thier load capacity				Buses	Motorcycles - transport	Total
		2t	2-5t	5-8t	Tracks ≥ 8t			
18 ⁰⁰ -18 ⁰⁵	315	4	2			6		327
18 ⁰⁵ -18 ¹⁰	322	3				5		330
18 ¹⁰ -18 ¹⁵	332	5				7		344
18 ¹⁵ -18 ²⁰	340	6	1			4		351
18 ²⁰ -18 ²⁵	347	2				3		352
18 ²⁵ -18 ³⁰	310	5	3			6		324
18 ³⁰ -18 ³⁵	318	4				4		326
18 ³⁵ -18 ⁴⁰	337	3		1		5		346
18 ⁴⁰ -18 ⁴⁵	327	6	2			4		339
18 ⁴⁵ -18 ⁵⁰	338	4			1	6		349

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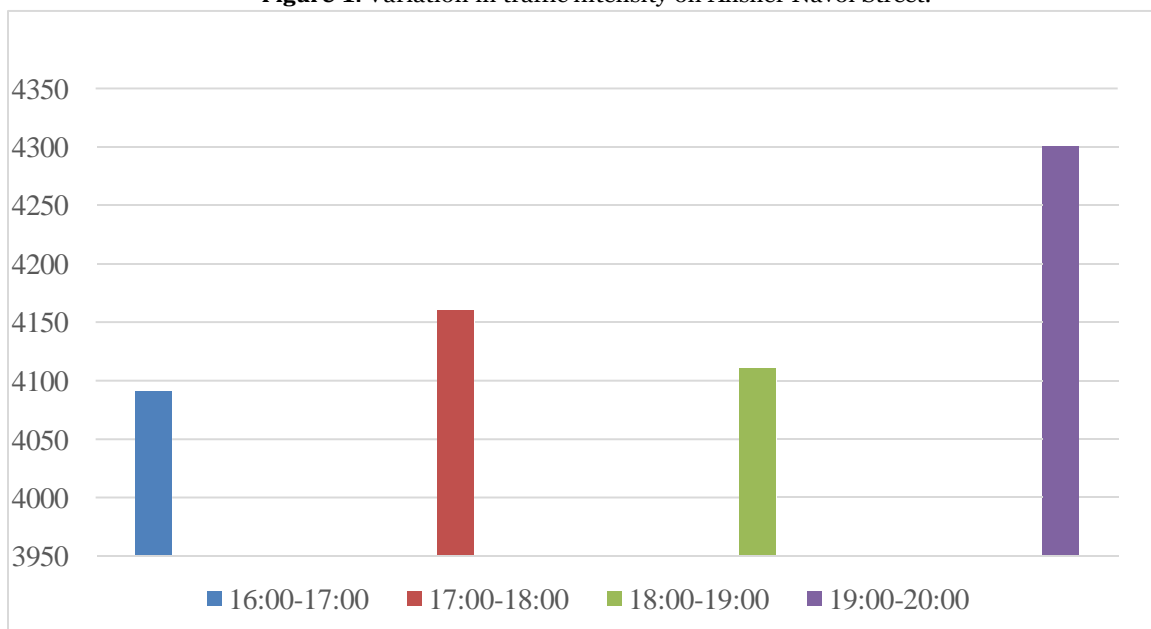
18 ⁵⁰ -18 ⁵⁵	350	3	1	1		3		358
18 ⁵⁵ -19 ⁰⁰	355	2	2		1	4		364
18 ⁰⁰ -19 ⁰⁰ jami	3991	47	11	2	2	57		4110

5- Table. Traffic intensity on Alisher Navoi Street during 18:00-19:00

Time interval	Cars	Tracks according to thier load capacity				Buses	Motorcycles	Total
		2t	2-5t	5-8t	Tracks ≥ 8t			
19 ⁰⁰ -19 ⁰⁵	310	4	3			5		322
19 ⁰⁵ -19 ¹⁰	343	5				4		352
19 ¹⁰ -19 ¹⁵	324	3				6		333
19 ¹⁵ -19 ²⁰	336	6	2	2		3	1	350
19 ²⁰ -19 ²⁵	353	4			1	4		362
19 ²⁵ -19 ³⁰	344	6	1	1		5		357
19 ³⁰ -19 ³⁵	342	3				7	2	354
19 ³⁵ -19 ⁴⁰	327	5	2		1	6		341
19 ⁴⁰ -19 ⁴⁵	339	4				4	2	349
19 ⁴⁵ -19 ⁵⁰	351	6	3	2	2	5		369
19 ⁵⁰ -19 ⁵⁵	345	5				3		353
19 ⁵⁵ -20 ⁰⁰	349	4	4	1	2	5	1	364
19 ⁰⁰ -20 ⁰⁰ jami	4163	55	13	6	6	57	6	4306

Based on the data obtained during the research, diagrams showing the variation in total traffic intensity and the four-hour traffic composition were prepared.

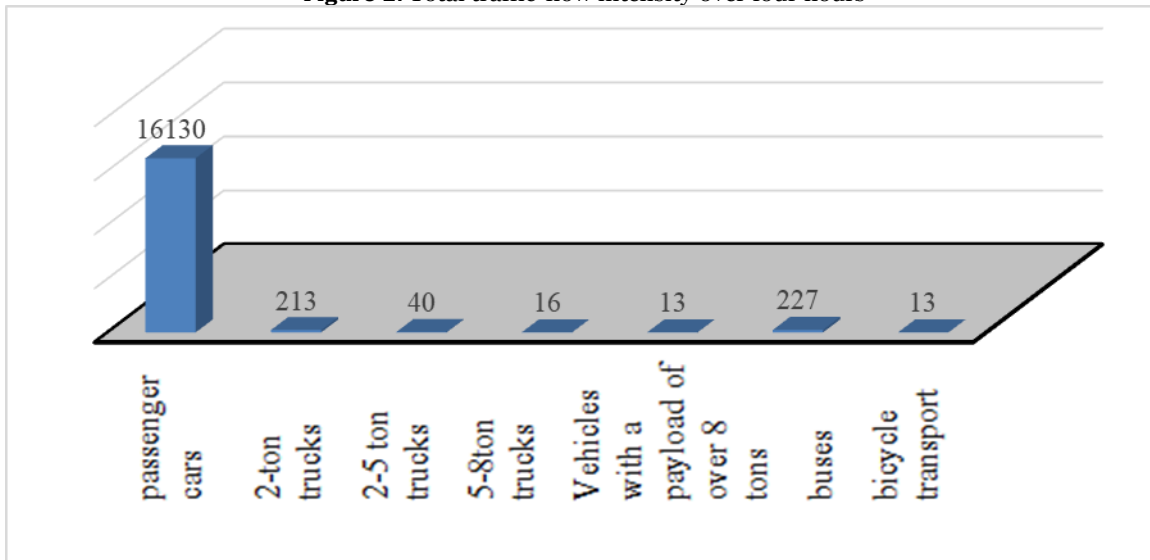
Figure 1. Variation in traffic intensity on Alisher Navoi Street.



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Figure 2. Total traffic-flow intensity over four hours



The negative factors affecting the movement of road vehicles and buses on Alisher Navoi Street include the geometric parameters of the traffic lanes and the branches of trees planted close to the road infrastructure. Since these branches extend into the carriageway, they obstruct the dedicated bus lanes. This condition does not comply with the requirements of normal traffic and is illustrated in Figure 3.

Figure 3. Obstruction of a dedicated bus lane by roadside vegetation and adjacent infrastructure.



In such a situation, the visibility of the road decreases and traffic safety is adversely affected. Consequently, congestion of different levels occurs because buses operating in the dedicated lane are forced to move over the 1.1 road marking line. To construct the speed-variation graph shown in Figure 4, the observed speeds of vehicles were statistically processed, as presented in Table 6.

6- Table. Statistical processing for assessing vehicle speeds.

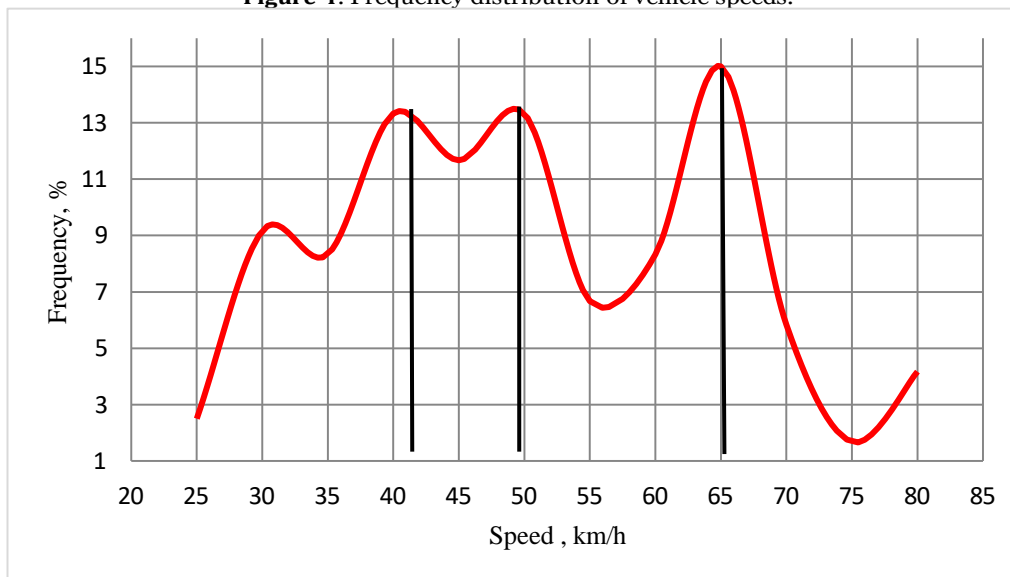
Speed group, km/h	Frequency, units	Frequency, %	Cumulative frequency, %
25-30	3	2.5	2.5
30-35	11	9.17	11.67
35-40	10	8.33	20

40-45	16	13.33	33.33
45-50	14	11.67	45
50-55	16	13.33	58.33
55-60	8	6.67	65
60-65	10	8.33	73.33
65-70	18	15	88.33
70-75	7	5.83	94.16
75-80	2	1.67	95.83
80-85	5	4.17	100
	120	100	

7-

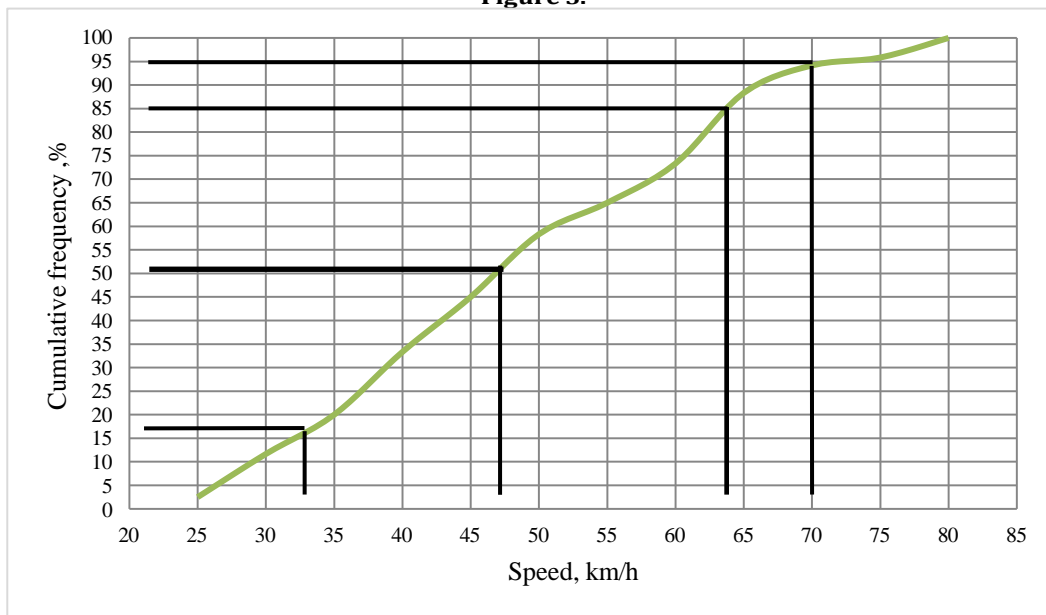
On Alisher Navoi Street, the most frequently repeated speed, or modal speed, was 65 km/h at a density of 15%. In addition, speeds of 40 km/h and 50 km/h were observed at densities of 13.33% and 13.33%, respectively. This indicates that the modal speeds are dispersed and that movement is not uniformly distributed across the traffic lanes in Figure 4.

Figure 4. Frequency distribution of vehicle speeds.



The cumulative distribution curve shows that at a cumulative density of 15%, vehicle speed is approximately 32 km/h; at a cumulative density of 50%, vehicle speed is approximately 46 km/h; and the 85th-percentile speed is 64 km/h. These results indicate that the dispersion of speed indicators has a negative influence on the capacity of Alisher Navoi Street. Figure 5. Cumulative distribution curve of vehicle speeds.

Figure 5.



The effect of vehicle speed on street capacity can also be expressed through the range of variation in vehicle speeds

$$R = V_{max}^i - V_{min}^i$$

$$R = 80 - 25 = 55 \text{ km/hour}$$

A variation range of 55 km/h indicates that the dynamic characteristics of the vehicles forming the traffic flow differ significantly by vehicle type. This, in turn, shows that the available transport capacity of the street is not being used efficiently.

For buses operating in the inner areas of cities in Uzbekistan, the 85th-percentile speed is considered to be 50 km/h in order to ensure safe movement [5,6,7,8,9]. However, in order to maintain this speed safely, a dedicated lane with appropriate geometric dimensions is required. Therefore, the required lane width for safe bus movement must be determined in accordance with the vehicle speed and geometric design requirements. The analysis shows that the existing geometric dimensions of traffic lanes on urban streets do not fully correspond to the required movement speed, which negatively affects both safety and operating speed.

$$H_h = 0,054v + H_a + 0,3$$

Here, H_h -represents the width of the lane required for the vehicle to move.

v- movement speed (m/c).

Therefore, the required lane width for the bus to travel safely is determined as follows.

$$H_h = 0,054v + H_a + 0,3 = 0,054 * 50/3.6 + 2,60 + 0,3 = 3,65 \text{ m}$$

The value $H_h=3,65$ m indicates that the geometric dimensions of traffic lanes on city streets are not suitable for the designated traffic speed.

Conclusion

Based on the experimental results, a statistical analysis was conducted on the level of traffic congestion, traffic intensity, and the composition of vehicles on Alisher Navoi Street. It was found that the street has a high density of traffic during the day, especially at high times of the day. Based on experimental and experimental research observations, it was noted that the share of passenger cars is very high, and the impact on road capacity and traffic conditions was determined. Furthermore, it was established that the geometric dimensions of the vehicle movement belts do not comply with standard requirements. The measured result for the conveyor belt in practice is $H_h=2,2$ m, while the scientifically justified value is $H_h=3,65$ m. As a result, it was found that this affects the safe movement of vehicles and causes a decrease in their speed.

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