

PHYSICAL SEPARATION OF URBAN PUBLIC TRANSPORT FROM OTHER TRAFFIC FLOWS IN THE CITY OF TETOVO AS A MODERN MOBILITY SOLUTION

Resmi EJUPI¹, Dean BRKOVSKI², Adina OSMANI³

¹Faculty of Applied Sciences, Str. Ilinden, 1200 Tetovo State University of Tetovo, Republic of North Macedonia, Republic of North Macedonia

e-mail: resmi.ejupi@unite.edu.mk

²Faculty of Applied Sciences, Str. Ilinden, 1200 Tetovo State University of Tetovo, Republic of North Macedonia

e-mail: dean.brkovski@unite.edu.mk

³Faculty of Applied Sciences, Str. Ilinden, 1200 Tetovo State University of Tetovo, Republic of North Macedonia

e-mail: adina.osmani@unite.edu.mk

Abstract

The increase in private vehicle ownership and insufficient development of road infrastructure have created serious mobility challenges in the city of Tetovo. Traffic congestion, reduced operational efficiency of public transport, environmental pollution, roadside parking, and travel delays have become major urban transport problems. This paper analyzes the possibility of implementing physically separated bus lanes for urban public transport in Tetovo and evaluates their potential impact on improving mobility conditions, reducing travel time, and increasing public transport reliability. The research is based on traffic flow analysis, field observations, comparative analysis of urban bus routes, and evaluation of the current traffic conditions within the city. The results indicate that dedicated bus infrastructure could significantly improve urban mobility, increase average bus speed, reduce congestion, and contribute to sustainable urban development.

Keywords: urban mobility, public transport, Tetovo, dedicated bus lanes, traffic engineering.

Introduction

Urban public transport systems represent one of the most important components of sustainable urban mobility. Efficient public transport directly affects economic development, environmental sustainability, social mobility, and the quality of urban life. In many European cities, dedicated public transport infrastructure has become a strategic tool for reducing congestion and improving transport efficiency.

The city of Tetovo has experienced a continuous increase in private vehicle ownership during the last decades, while road capacities and traffic infrastructure have remained almost unchanged. As a result, heavy congestion, travel delays, increased fuel consumption, and environmental pollution have become serious urban problems. Urban buses currently operate under mixed traffic conditions together with private vehicles. This significantly reduces the reliability and efficiency of public transportation systems, especially during peak traffic periods. The lack of dedicated bus lanes additionally reduces the competitiveness of public transport compared to private vehicles. Therefore, the physical separation of urban public transport from other traffic flows represents a modern and sustainable solution for improving urban mobility conditions in Tetovo.

Research Methodology

The methodology used in this paper is based on literature review, field observation, comparative traffic analysis, and direct evaluation of traffic conditions in Tetovo. The research methods include:

- traffic flow analysis;
- comparative before/after analysis;
- travel time analysis;

- field observation of critical urban corridors;
- environmental impact evaluation.

Special attention was given to urban corridors characterized by high traffic density, roadside parking, and conflicts between different traffic participants. Traffic photographs and route maps were used to document the current traffic situation and identify the most problematic segments of the urban road network.

Current State Of Traffic Conditions in Tetovo

The current traffic conditions in Tetovo are characterized by insufficient road capacity, uncontrolled roadside parking, mixed traffic flows, and inefficient traffic organization. Field observations indicate that the central urban area is heavily affected by traffic congestion, especially during peak hours. In many locations, parked vehicles reduce the effective width of the roadway and create bottlenecks that significantly affect traffic flow efficiency. The following figures illustrate typical traffic conditions observed in several urban corridors in Tetovo.



Figure 1. High vehicle density and roadside parking in central Tetovo.

The observed traffic conditions demonstrate the lack of effective traffic management measures and the negative impact of uncontrolled parking on urban mobility. Similar conditions are present in several urban corridors within Tetovo, creating delays for both private vehicles and public transport operations.



Figure 2. Traffic conflict caused by mixed traffic conditions.

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Figure 3. Reduction of effective roadway width due to roadside parking.

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Figure 4. Urban boulevard suitable for public transport prioritization.

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Analysis Of Existing Urban Bus Routes

The urban public transport network in Tetovo consists of several main bus lines connecting residential zones with universities, commercial centers, and the city center. These routes represent the primary mobility corridors used daily by students, workers, and citizens.

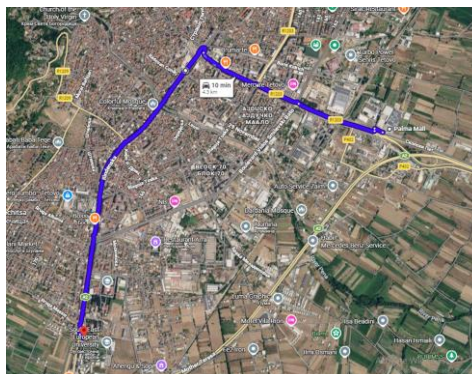


Figure 5. Bus route: Pallma Mall – SEEU

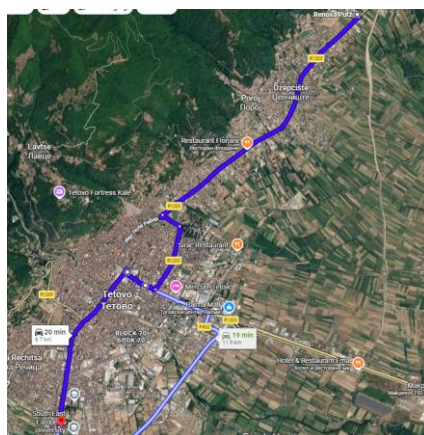


Figure 6. Bus route: Xhepçishtë – SEEU.

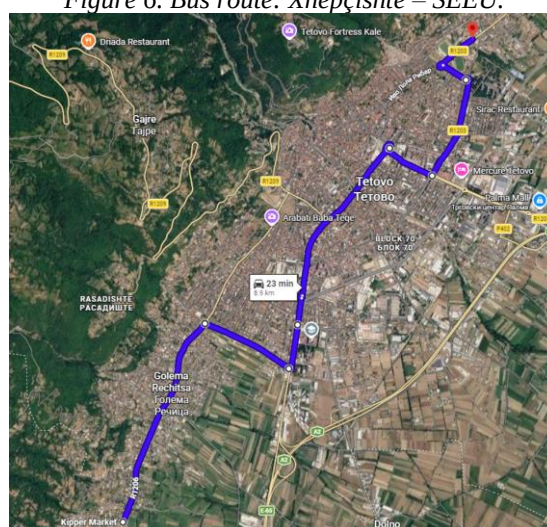


Figure 7. Bus route: Reçicë e Madhe – Pallma Mall.

Analysis of the existing routes indicates that the most problematic segments are located near urban intersections and central corridors with high traffic intensity. During peak hours, travel times increase significantly due to traffic congestion and roadside parking.

Table 1. Existing Urban Bus Lines

Bus Line	Distance	Travel Time	Main Problem	Traffic
Pallma Mall – SEEU	4.3 km	25–45 min	Heavy congestion	
Xhepçishtë – SEEU	8.7 km	30–50 min	Entrance bottlenecks	
Reçicë e Madhe – Pallma Mall	8.9 km	30–45 min	Urban conflicts	

Concept Of Physical Separation Of Public Transport

Physical separation of public transport means reserving specific traffic lanes exclusively for buses and public transportation vehicles. Dedicated bus lanes can be implemented through road markings, physical barriers, traffic islands, and traffic signal priority systems. This concept has been successfully implemented in many European cities and has produced positive results in reducing travel time and improving operational efficiency.

The main advantages of dedicated bus infrastructure include:

- increased average bus speed;
- reduced travel time;
- improved schedule reliability;
- reduced congestion;
- lower environmental pollution;
- increased attractiveness of public transport.

Implementation Possibilities In Tetovo

Based on urban structure analysis, several corridors in Tetovo are suitable for the initial implementation of dedicated bus lanes, including the city center–university corridor and the eastern entrance toward the city center. The implementation process could be realized gradually through pilot projects and continuous traffic performance evaluation.

Expected Effects

The implementation of dedicated public transport infrastructure in Tetovo is expected to significantly improve urban mobility conditions. Increased average bus speed and reduced travel time would improve the competitiveness of public transport and reduce dependence on private vehicles.

Table 2. Comparison Before and After Implementation

Parameter	Before	After
Average Bus Speed	14 km/h	24 km/h
Travel Time	30 min	18 min
Schedule Reliability	Low	High
Passenger Demand	Average	Increasing
CO ₂ Emissions	High	Lower

Conclusion

Tetovo requires a comprehensive transformation of its urban mobility system. Continued dependence on private vehicles will further increase traffic congestion, environmental pollution, and travel inefficiency. Physical separation of urban public transport from other traffic flows represents a realistic and sustainable solution for improving mobility conditions in the city. Dedicated bus lanes would significantly improve public transport efficiency and contribute to sustainable urban development.

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