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Problems and Proposed Solutions to Improve Freight Transportation, Case Study

Nikola Krstanoski [1], Ile Cvetanovski [2], Vaska Atanasova [3], Marija Stojanoska [4*]

[1]*Doctor, Faculty of Technical Sciences, University "St. Kliment Ohridski", Bitola, Macedonia*

[2]*Doctor, Faculty of Technical Sciences, University "St. Kliment Ohridski", Bitola, Macedonia*

[3]*Doctor, Faculty of Technical Sciences, University "St. Kliment Ohridski", Bitola, Macedonia*

[4]*Ph.D candidate, Faculty of Technical Sciences, University "St. Kliment Ohridski", Bitola, Macedonia*

* ***Corresponding Author:*** *marija.stojanoska2@uklo.edu.mk*

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ABSTRACT

Transportation is not just about getting from point A to point B, it's about coordination, accuracy and trust. The transport of goods is an integral part of the city's economy and is a prerequisite for sustainable urban life, but it causes a number of negative effects on the environment followed by air pollution and increased noise. The problems arising from road freight transport are constantly overlooked. The subject of analysis in this paper is the city of Bitola. We are witnessing the daily intertwining of different streams of goods, materials and cargo through the city's street network. To meet the needs of the inhabitants, the following supplies of goods are present: trade goods, finished products, semi-finished products, raw materials, building materials, consignments, secondary raw materials, waste and the like. With the help of a month-long survey of truck drivers in the territory of the city of Bitola, we learned about the problems they face. Based on this as a conclusion, a proposal is given for measures to improve the delivery of goods and the general flow of traffic.

Keywords: Problems, Measures, Survey, Load, Transport.

INTRODUCTION

Freight transportation in the world involves the movement of goods by sea, road, rail, and air, with sea transport handling the majority of global freight volume. Key factors influencing the mode choice are speed, cost, distance, and the nature of the goods, such as urgent shipments versus bulky items. The global freight market is a critical component of the world economy, enabling international trade and logistics, and is projected to grow significantly. In such conditions, quality transport, especially road freight transport, has imposed itself as an indispensable part of modern living. And the main prerequisite for a developed freight transport is the road infrastructure, which is often compared to the bloodstream of a modern society.

Compared to rail, water or air freight, road freight offers greater flexibility in terms of scheduling time and speed of delivery. It provides a door-to-door service and can easily adapt to customer requirements. It's more convenient for short-distance transportation and it's easy to keep track of where the goods are at the moment. There are provisions for continuous communication with the driver. And it's best suited for transporting goods in rural areas. In fact, this is the biggest advantage because without the development of road freight transport, no other transport can be realized.

Given that Bitola is a city that borders the Republic of Greece, it has good connections with the cities of Prilep, Kicevo, Ohrid, undoubtedly the flow of goods and cooperation with other companies is increasing. We are witnessing that our country is gradually approaching and improving communication with companies and

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companies from abroad with which it cooperates. It contributes to the exchange of goods, which means the easy, fast and high-quality distribution of goods from the producer to the consumer. This in turn imposes other additional activities in improving road infrastructure, building new roads, widening lanes, roundabouts for better transportation and a better standard of living. Hence the problems faced by carriers, i.e. not only good connectivity and communication is needed for the smooth delivery of goods, it is necessary to have good roads on which trucks will travel, to reduce restrictions, to introduce environmentally friendly trucks, etc.

LITERATURE REVIEW

In Europe, by 2050, freight transport is expected to increase by 80%, where this data shows that everywhere we will have an increase in kilometers travelled under load, with quality and reliable transport companies.

We don't always have a combination of different transportation systems to distribute goods, sometimes even over long distances goods are transported by truck, or by road infrastructure. Authors Stephan Kirsten, Andreas Lischke, and others, in the paper "Impact of road High Capacity Transport on EU freight transport" (2021), analyze the impact of high capacity and long distance road freight transport, as well as their impact on European freight transport and CO2 emissions.

The whole world is struggling with the harmful emissions that are predetermined by transport. Eco-friendly vehicles are being introduced, with no noise and zero pollution emissions, but still the emissions caused by the combustion of fuels like gasoline and oil cannot be reduced. It's not just passenger cars that pollute the air the most, it's also the heavy goods vehicles, which also have a percentage share in harmful emissions. So the authors: Mathias Boehm, Marlin Arnz and Joachim Winter, in the paper, "The potential of high-speed rail freight in Europe: how is a modal shift from road to rail possible for low-density high value cargo?" (2021), do an analysis of how freight can be transferred by railway with low density and high value, and how to increase the use of railway as a means of transporting goods. We show that high-speed rail freight is about 70% more expensive than the conventional lorry but emits 80% less CO2 emissions for the baseline parameter setting. The expected mode share largely depends on the cargo's value of time, while the implementation of a CO2-tax of 100 EUR/tCO2eq has an insignificant impact. The costs of handling goods and the infrastructure charges are highly influential variables.

Maria Jubiz-Diaz, Maria Saltarin-Molino, and others in the paper, "Effect of Infrastructure Investment and Freight Accessibility on Gross Domestic Product: A Data-Driven Geographical Approach" (2021), analyze the impact of infrastructure investment and accessibility to freight transport. Freight transportation can be defined as the movement of goods and services to customers to obtain a monetary reward. Poor quality transport infrastructure implies higher travelling times and costs. This indirectly affects the productivity of a region since transportation costs are directly related to sales prices. Therefore, infrastructure investments become important for improving the competitiveness of a region. The problem with these investments is that they take time and require a large amount of money. Consequently, it is extremely important to prioritise this type of investment. The farthest zones obtain higher benefits due to the gains in freight transportation accessibility produced by infrastructure investments compared to regions that are closer to seaports. The results show the increase in productivity from the access to a larger and more diverse base of inputs, such as raw materials, components, energy or labour, and broader markets for diverse outputs, in terms of intermediate and finished goods. Although the level of impact may be case-specific, the methods are relevant and could be extended and generalised to any other region with any type of economic development.

METHODOLOGY

Bitola is the largest urban center in the fertile and largest Macedonian basin of Pelagonia and the second largest city in the Republic of Macedonia. To the north of Bitola is the capital of Macedonia, Skopje (169 km), to the northeast is the city of Prilep (43 km), to the south is the city of Lerin (Greece) (33 km) and to the northwest are Resen (29 km) and Demir Hisar (29 km). Bitola is a town with a road and rail network, and the municipality consists of 64 villages. Most cities in Macedonia are chronically burdened with temporal and spatial traffic jams, noise, pollution, conflicts with pedestrians, cyclists and other motor vehicles. Such a city is Bitola, which does not lag behind other cities in the growth of the degree of motorization, spatial expansion of the city, low level of transport service with public urban transport, increasing concentration of activities, informal network of roads, increased flow of trucks

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through narrow and inherited infrastructure areas, all this leads to the degradation of the urban space, endangering the safety of traffic participants, etc. The transport network of the city of Bitola has highways, collector (collector), and local (service, residential, etc.). Main streets are the traffic routes that allow the flow of traffic in and out of the narrower area of the city.

\In the period from 20.05.2025 to 20.06.2025, a survey of truck carriers in Bitola was conducted. The questionnaire was drawn up in a word document. 15 main questions and 7 sub-questions were created. The honourable questions concerned the respondent and the transport enterprise in which he is employed, what type of transport the enterprise deals with, how often they carry out transport in the city of Bitola, what are the problems faced by the carriers, what is the current situation with the distribution of goods and a proposal for solutions to improve it (**Table 1.**). The survey was carried out on hauliers from the following transport enterprises:

Table 1. Carrier survey conducted by the following transport enterprises (Source: Prepared by the authors)

Transport enterprises		
Pero Transport - Bitola	Da - Ma Trnas - Bitola	Mkkom - Prilep
Buchin Komerc - Krusevo	Click Plus - Skopje	Kav Komerc - Kavadarci
Impiter Bitola - Bitola	Mi-Ka Transport - Ohrid	Bibi Transport - Kumanovo
Andrijana Trans - Krusevo	Public Utility Company Water Supply - Bitola	Marun Energy - Bitola
Public Enterprise Komunalec - Bitola	Upce Transport - Demir Hisar	Aliki Transport - Bitola
Dolenci Transport - Sopotnica	Nana Logistics - Bitola	Techa Trans - Resen

Problems faced by truck drivers in the city of Bitola are very numerous and from different points of view, in (**Table 2.**).

Table 2. Problems faced by truck drivers in the city of Bitola (Source: Created by the authors)

Infrastructure	Poor railway park
Low number of parking spaces/inappropriate parking of vehicles	Overcrowded traffic controls
Low economy	Unrivalled experience of other road users
Too much commotion at rush hour	Geometrical features of the existing ring

One of the questions in the survey was to hear the opinion of the carriers, which is their proposal measures to improve freight transport in the city of Bitola and it is shown in (**Table 3.**).

Table 3. Proposals to improve road freight transport in Bitola (Source: Created by the authors)

Improving infrastructure	Improvement of the fleet/ new vehicles with less pollution
Construction of a circuit	Expansion of the traffic lanes
Priority of special vehicles (plumbing, utility) over others	Construction of a logistics center
Improving logistics and transport	Construction of more parking spaces for trucks

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organisation	
Subsidies for the maintenance and improvement of rolling stock	Curfew during rush hour

RESULTS

The entire (light and heavy) transit traffic on the route from the Medjitlia border crossing to Bitola, and then to Prilep or to Resen and Ohrid, passes through the center of the city of Bitola or along some main city streets, which increases and complicates the normal functioning of the local city traffic and threatens the environment and the quality of life of the population.

To overcome this situation, there is a need to determine a completely new road direction, which would first of all take over the transit traffic, i.e. traffic that does not need to enter the central and wider area of the city of Bitola, which would first of all increase, the efficiency and speed of transit traffic, and at the same time local traffic would be reduced many times over and with that, air pollution and noise emissions in the city itself will be reduced, as a result of traffic, and thus the quality of life of the population will be improved.

One of the more frequent road routes in the Republic of North Macedonia is the road direction Prilep - Bitola, which is also a section of the alternative corridor East - West, which follows from the Miladinovci interchange on Corridor K-10, through Veles, to the Gradsko interchange, i.e. coincides with Corridor K-10 itself, from where through Rosoman, Prilep, Bitola, Resen and the Trebenishta interchange, it would be connected to Corridor K-8, whose section from Kichevo to Ohrid is currently under construction. The fact that at the moment a part of the Gradsko – Prilep road has been put into use, as an expressway, which is being built on some sections with a reduced highway solution, as well as the fact that in neighboring Greece, a modern highway connected to a highway continues from the Medzhitlia border crossing. traffic network throughout Greece. Also, the new highway from Prilep to Bitola is currently being built, with a length of 40 km. The highway will be modern with a total of six lanes, with three lanes on each side and an auxiliary alternative road.

After improving the accessibility of freight transport from other cities, it is best to divert those flows to another thoroughfare, or an expressway that will be a bypass outside the borders of the city of Bitola. So the vehicles that will come from Prilep, Kichevo or Ohrid on a neatly built overpass (overpass) will continue to move along an expressway to the Republic of Greece. Example of Fig. 1.

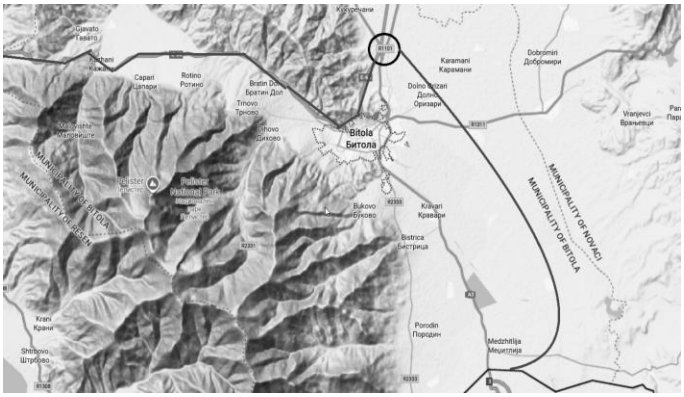

Figure 1. Construction of an expressway, a ring road to reduce the load on the area of the city of Bitola (Source: Made by the authors)

In addition to transporting goods by truck, it can also be done by rail. The railway from Bitola to the border with the Republic of Greece is 18 kilometers long, new tracks, signaling have been installed, 9 bridges, 30 safe railway crossings, a new station building and other accompanying elements have been built for smooth railway traffic and

passenger transport. The first railway – road connection of Bitola with Thessaloniki was established on July 13, 1894 when the population was provided with smooth travel, exchange of goods and stay in both cities. On the Macedonian side, the reconstruction of the line to Zhabeni has been done, and from February 1, 2023, the trains are running after 26 years of stoppage. Until now, the railway connection to Greece is not yet active. In order for railway traffic to function, large investments are needed in centers where goods will be stored, loading and unloading means, containers, combined transport (train + truck), logistics, reconstruction of railway infrastructure, constant maintenance, new and faster trains.

Prohibition/limitation of traffic of heavy goods vehicles in the city, hours can be determined when trucks can enter the city or transit, for example early in the morning or late at night.

To build and install warehouses, distribution - logistics centers outside the city, where the cargo would be loaded or unloaded and would continue to be distributed with smaller and ecological vehicles.

They are placed outside the urban area, with easy truck access and connection to main roads. Such logistics distribution centers can be placed in several locations in the territory of the city of Bitola, namely:

- Towards the Zhabeni industrial zone (Kapistec/Novaci), we already have factories and enough space there, an easy exit to Prilep and the Greek border. There is available infrastructure, water, electricity, just 12 km from the center of Bitola.

- Bukovski livadi/Kravari is a great place to build a center where all vehicles coming from the Republic of Greece will be able to load/unload or transship goods.

- While on the side of Prilep and Resen it is best to be along the E-65 expressway.

Local measures, strict control and fines for trucks moving in places where it is not allowed, better signaling and navigation for trucks.

In order to improve freight transport, it is necessary to make a combination of long-term (construction of a ring road, inclusion of the railway) and medium-term measures (restrictions, logistics centers).

CONCLUSION

Freight transport plays a key role in today's economy as it allows production and consumption to take place in locations hundreds of thousands of kilometers away from each other. As a result, markets are wider, thus stimulating direct competition between producers from different countries and encouraging companies to exploit economies of scale. During the research period, a survey of truck drivers was conducted in transport companies and in the terminal in the city of Bitola.

The limited access of more and more vehicles to central areas, the increase in the number of ecological zones and the increase in the need for peace for citizens leads to new challenges for the transport of goods. The use of environmentally friendly vehicles is a new method that is gaining momentum in the 21st century. The use of electric trucks, small, 0 emissions is considered to be the future of freight transport. Hybrid solutions are also being developed and used in road and rail freight transport. Hybrid solutions in road freight transport allow different advantages of both ways of energy to be exploited. For example, vehicles will be able to drive on electricity through city centers and quiet zones, and then switch to long-distance diesel mode where more range is required.

The construction of the Bitola – expressway Bitola – border crossing Medjitlia will have an extremely positive impact on the socio-– economic development of the region (Pelagonian), because the road infrastructure network is a basic prerequisite for the development of industry, the economy, with opportunities to create new jobs and increasing employment, facilitated and fast connection between R Macedonia and Greece, faster transport and exchange of goods and services, which will directly affect the increase of the population standard, improvement of the environment, improvement of the quality of living conditions and reduction of economic migration in the region.

Products from different transport companies should be combined collectively and loaded into one vehicle for delivery to the logistics center. This also increases the utilization of vehicle capacities and makes the use of infrastructure more efficient. At the same time, the number of trips to the city is optimized and reduced. Each vehicle no longer delivers the products to several different destinations, but they are actually unloaded in one place.

The integration of different types of transport is complemented by the use of innovative, fast cargo handling technologies. Along with an optimized interface, designing individualized and attractive networks allows them to improve capacity utilization in all modes of transportation and companies. Cities strive to introduce sustainable transport systems, systems that will be safe, without noise, without pollution, and that trend will be more and more observed in freight transport.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

REFERENCES

[1] Vaska Atanasova, Collection and analysis of transport data, Bitola 2010
[2] Monika Trpewska, "Planning and Implementing Logistics Centre Strategies: An Analysis of the D.B. Schenker Case – Master's Thesis, Štip 2017
[3] National Transport Strategy 2018-2030, December 2018
[4] Urban (CITY) Logistics, PhD, Jasmina Bunevska Talevska, Bitola, 2012
[5] Stephan Kirsten, Andreas Lischke1, Dr.-Ing. Carina Thaller1 and Prof. Dr. rer. pol. Gernot Liedtke (2021), "Impact of road High Capacity Transport on EU freight transport" Berlin, Germany
[6] Mathias Boehm, Marlin Arnz, Joachim Winter, ,,The potential of high-speed rail freight in Europe: how is a modal shift from road to rail possible for low-density high value cargo?" *European Transport Research Review* volume 13, Article number: 4 (2021)
[7] Maria Jubiz-Diaz, Maria Saltarin-Molino, Julian Arellana, Carlos Paternina-Arboleda, Ruben Yie-Pinedo, ,, Effect of Infrastructure Investment and Freight Accessibility on Gross Domestic Product: A Data-Driven Geographical Approach", Journal of Advanced Transportation (2021)
[8] Laird J. J. and Venables A. J., Transport investment and economic performance: a framework for project appraisal, *Transport Policy*. (2017)
[9] Maciulis A., Vasiliauskas A. V., and Jakubauskas G., The impact of transport on the competitiveness of national economy, *Transport*. (2009) 24, 93–99.
[10] Vaska Atanasova, Marija Stojanoska, ,,Forecast of freight traffic with the PTV VISION VISUM software tool of a small town", Veredas do Direito Direito Ambiental e Desenvolvimento Sustentável (2025)
[11] Nijolė Batarlienė, Darius Bazaras, ,, Solutions to the Problem of Freight Transport Flows in Urban Logistics", Appl. Sci. *2023,* 13*(7), 4214;*