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ANALYSIS OF THE CONCEPT OF POLLUTION REDUCTION THROUGH THE IMPLEMENTATION OF BICYCLE TRANSPORTATION

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Abstract: *This study analyzes a specific roundabout intersection, focusing on traffic flow and its connection to pollution levels. It aims to quantify and understand pollution at this location, with an emphasis on promoting cycling as a pollution reduction strategy. The research explores cycling as an eco-friendly alternative to personal vehicles, highlighting significant pollution reduction potential. This study contributes insights for policymakers and urban planners aiming to implement effective environmental and transportation policies.*

Keywords: *Roundabout intersection, traffic flow analysis, pollution , cycling , urban transportation policies.*

1. INTRODUCTION

In the pursuit of sustainable urban development and the reduction of environmental pollution, transportation solutions that minimize the impact of motor vehicles have gained prominence. One such solution, often underestimated but highly effective, is the promotion of bicycle transportation. This study embarks on a focused exploration of the potential of bicycle

transportation as a key strategy for reducing pollution levels within the context of a specific roundabout intersection.

Urban areas, particularly junctions and roundabouts, represent hubs of complex traffic dynamics, which can lead to elevated levels of air pollution due to the concentration of vehicular emissions. As a consequence, there is an increasing need to assess the feasibility and impact of bicycle transportation in addressing this environmental challenge.

This study concentrates its efforts on a distinct roundabout intersection, where we delve into an in-depth analysis of traffic flow and pollution generation. Our research aims to quantify the pollution emanating from this intersection and, importantly, to advocate for the adoption of cycling as a means to significantly diminish this pollutant burden. By harnessing statistical data derived from this intersection, we aspire to underline the remarkable potential of cycling as a sustainable and eco-friendly alternative, capable of curbing pollution levels in a specific urban setting. [1] [2]

2. THEORETICAL CONCEPTS

A vehicle emits approximately 4.6 tons of carbon dioxide annually. This number can vary depending on the type of fuel used and the number of kilometers driven.

How much carbon dioxide is created at the exhaust pipe when burning about 4 liters of fuel? Well, for 4 liters of gasoline, 8.887 grams are emitted, and for 4 liters of diesel, 10.180 grams are emitted.

For every kilometer driven, a car emits approximately 404 grams of carbon dioxide. In addition to carbon dioxide, cars produce methane and nitrogen oxide from the exhaust pipe and hydrofluorocarbon emissions from leaking air conditioning systems. While the emissions of these gases are small compared to carbon dioxide, their impact can be significant as they have a higher global warming potential. [3]

3. TECHNICAL RESEARCH

3.1. Objectives

- To assess the pollution levels at the studied intersection by identifying vehicular flow during peak hours and quantifying greenhouse gas emissions.
- To emphasize the benefits of cycling as an environmentally friendly mode of transportation and underscore the need for the implementation of bicycle lanes in Brasov to encourage people to choose cycling over personal vehicles while ensuring proper cycling infrastructure.
- To evaluate the potential reduction in traffic congestion and air pollution by implementing a network of bicycle lanes throughout Brasov, thereby contributing to a more sustainable and

environmentally friendly urban transportation system. To evaluate the potential reduction in traffic congestion and air pollution by implementing a network of bicycle lanes throughout Brasov, thereby contributing to a more sustainable and environmentally friendly urban transportation system.

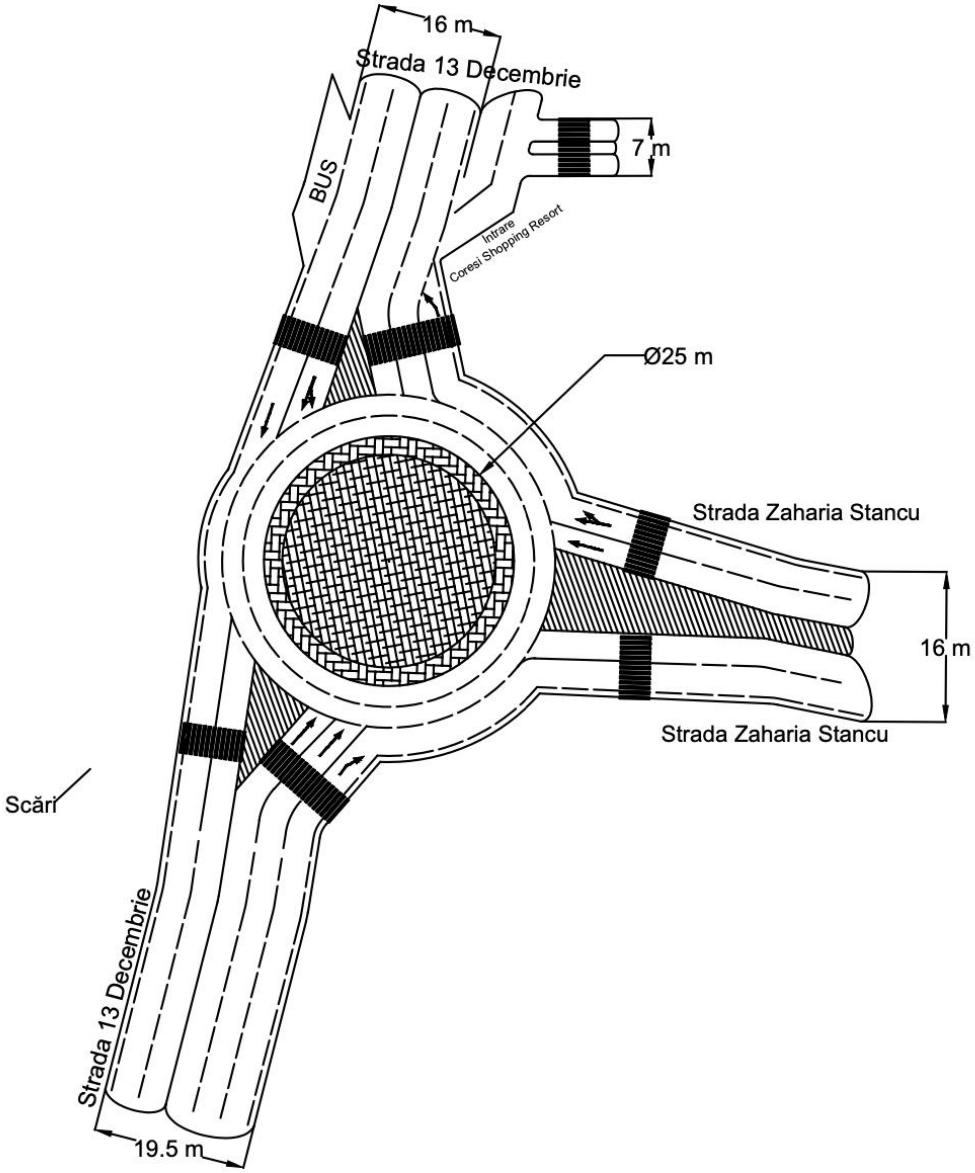

Figure 1 : The intersection under consideration

3.2. Methodology

The data collection method involved a team of data collectors who manually counted vehicles for each access point of the intersection. Subsequently, the total number of vehicles entering the intersection during peak hours was determined.

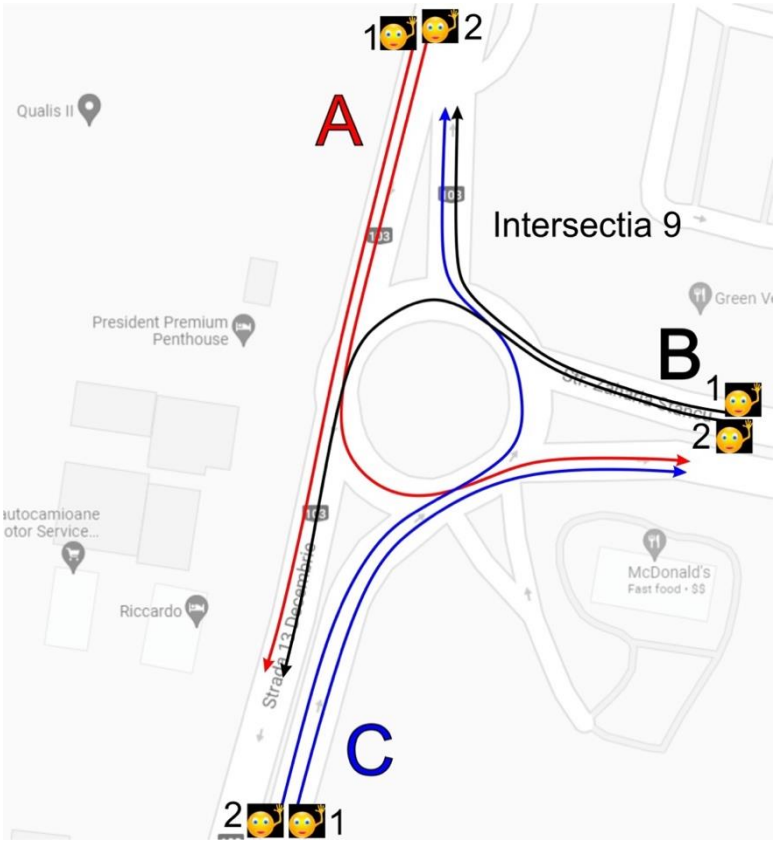

Figure 2: Manual data collection method at the intersection of 13 December Street and Zaharia Stancu Street

3.3. Results

Table 1: Total number of vehicles at the study intersection for two different time intervals

Time interval	*Acces*	*Number of vehicles*	*Total*
07:30-08:30	A	2010	3439
	B	418	
	C	1011	
16:30-17:30	A	2077	4273
	B	814	
	C	1382	

Therefore, following a simple calculation according to the data expressed above, it results that in the roundabout intersection of 13 Decembrie-Zaharia Stancu Street, the amount of carbon dioxide in the hourly interval 07:30-08:30 is approximately 1.389.356 grams (1389.36 kg = 1.3894 tons), and in the hourly interval 16:30-17:30, 1.726.292 grams (1726.29 kg = 1.7263 tons).

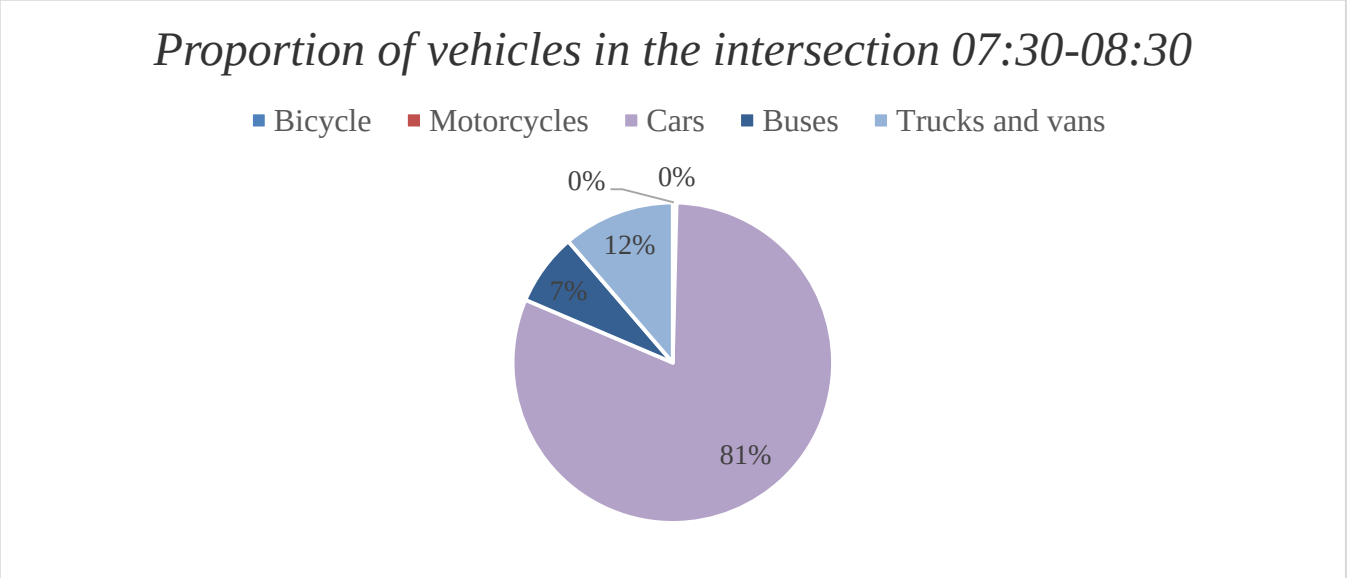

Figure 3: Proportion of vehicles in the intersection in the morning

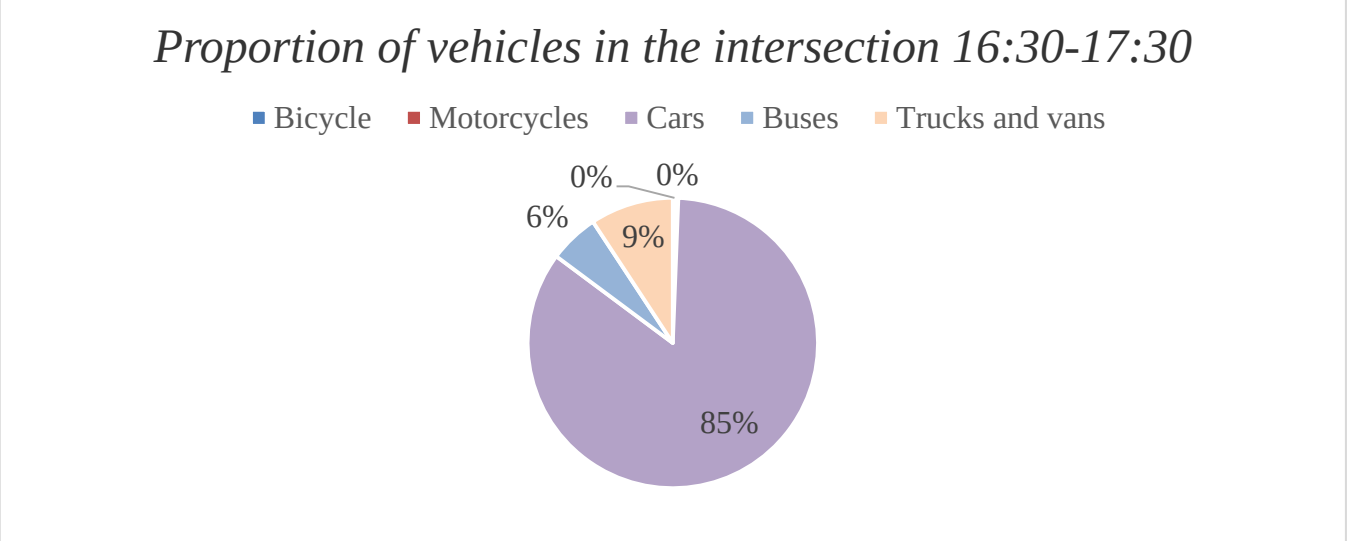

Figure 4: Proportion of vehicles in the intersection in the evening

4. Impact of Reinforcing the Existing Bicycle Lane on Pollution Levels at the Intersection

If the bicycle lane on the studied road section were to be reinforced, the potential reduction in pollution could be substantial. Encouraging more people to choose cycling over motorized transportation can lead to a significant decrease in emissions, resulting in cleaner air and a healthier environment

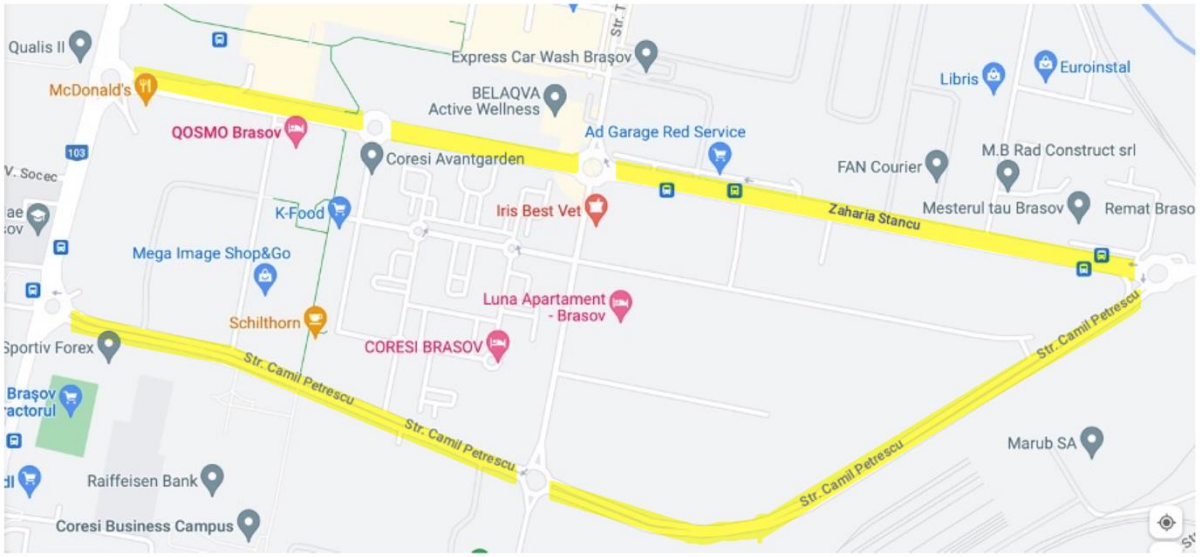

Figure 5: Existing bicycle lane on Zaharia Stancu Street

Research has shown that by promoting and enhancing cycling infrastructure, cities can reduce their reliance on conventional cars, leading to a substantial decrease in pollution levels. Studies such as those conducted by Pucher and Dijkstra (2003) and Handy and Xing (2011) emphasize the benefits of walking and cycling in improving public health and reducing emissions. These findings support the notion that bicycles produce minimal emissions, if any, during use, while also requiring significantly less space than automobiles on the road, as exemplified in the "Urban Bikeway Design Guide" by the National Association of City Transportation Officials (NACTO). [4] [5]

5. Conclusion

In conclusion, the analysis of the concept of pollution reduction through the implementation of bicycle transportation underscores the potential for substantial environmental benefits. By reducing the number of motor vehicles, reinforcing existing bicycle lanes, and creating more cycling infrastructure, we can significantly decrease pollution levels. This assertion is reinforced by the calculations made earlier, which highlighted the substantial reduction in pollution produced by vehicles in the studied intersection. Promoting bicycle transportation not only serves as a viable strategy for curbing pollution but also contributes to improved air quality, reduced traffic congestion, and enhanced public health. The findings of this study align with the broader global

efforts to foster sustainable urban development and mitigate the adverse effects of pollution.

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