Journal of Civil Engineering and Architecture 15 (2021) 529-533
doi: 10.17265/1934-7359/2021.10.005

Public Initiatives Aiming at the Cycling System in a City in Southern Brazil

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Abstract: The discussion about the use of the bicycle as a means of transport has been gaining importance on a global scale, although countries like Brazil still have urban mobility difficulties caused by how urban densification occurs, the growing number of motor vehicles and the lack of space for the construction of cycle paths in cities. The general objective of this manuscript is to analyze the result of public policies aimed at the implementation of bicycle paths, with the "Passo Fundo Vai de Bici" Program created to investigate the variations in intensity in relation to the areas served by the current incentive for active cycling mobility in the city of Passo Fundo (South of Brazil). Methodologically, Google Earth Pro satellite images were used to map the existing bike paths in the city. Subsequently, geographic coordinate points and altitudes of specific locations on the bike paths and bike sharing stations were collected, generating a database, transferred to the Qgis 3.10 software for the preparation of heat maps. The results showed the lack of integration between the cycling systems analyzed by the distance factor, needing to encourage discussions about its expansion and functionality, consolidating it as an urban public policy of local functionality to foster sustainable transport.

Key words: Urban sustainability, medium city, quality of life, cycling mobility, public policy.

1. Introduction

Bike paths consist of spaces designed for the movement of bicycles, which allows economically sustainable transport for millions of individuals on a global scale [1]. Another favorable factor regarding the use of bicycles as a means of transport is the fact that it does not emit polluting gases into the atmosphere [2]. Consequently, bicycle share market in China is in accession, generating in 2017, the equivalent to £1.18 billion, a growth of 8 times compared to previous years [2].

Through studies carried out in Poland (Europe), the use of bicycles, along with its shared system, allowed the mitigation of negative effects generated by urban density, including motor vehicle congestion, regardless of the time of circulation [3].

Discussions on encouraging the implementation of bicycle paths to improve urban mobility in Brazil represent a growing interest for part of the population on utilitarian commuting, leisure and health, enabling the diversification of commuting in urban centers [4]. The use of this means of transport reverts to benefits not just in mobility but also in issues related to social justice, public health, sustainable development and appropriation and perception of urban space [3, 4].

Through planning aimed at the implementation of bicycle lanes, sustainable mobility is encouraged. In addition to having low energy consumption and occupying little space on urban roads, in Brazilian cities, which concentrate congestion of motor vehicles, the use of bicycles can be 50% faster than the car [4, 5].

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In this context, the choice of the city of Passo Fundo as an object of study is justified because it is a consolidated Brazilian city, which, due to the need for urban mobility and leisure practices, only implemented its first stretch of bicycle path in 2014. In 2016, the City Hall of the city of Passo Fundo/RS introduced the free shared bicycle system, integrating the "Passo Fundo Vai de Bici" Program, which has 10 bicycle sharing stations spread across the urban area, totaling 100 bicycles available for use by the population.

This study seeks to show the importance that a well-structured cycle path system, combined with public policies in the city of Passo Fundo, can encourage active mobility and assist in addressing issues related to population mobility, contributing to possible analysis of expansion projects of the cycle path system. Although this movement in Brazil is happening late compared to Japan, China, United States, European countries, among other places, which for many years have enabled and encouraged urban mobility with the use of bicycle [6-9].

The general objective of this manuscript is to analyze the result of public policies aimed at the implementation of bicycle paths, with the "Passo Fundo Vai de Bici" Program created to investigate the variations in intensity in relation to the areas served by the current incentive for active cycling mobility in the city of Passo Fundo (South of Brazil).

2. Materials and Methods

In this scenario, the city of Passo Fundo, located in the southern region of the State of Rio Grande do Sul (Brazil), being the largest city in the northern region of the state, has an estimated population of 204,722 [10], with a fleet of 141,798 motor vehicles in 2021 [10]. This justifies the relevance of the study, with contributions related to active mobility, referring to the use of bicycles, since its urban fabric was not designed to accommodate only the flow of motorized vehicles.

This article contextualizes, in general lines, the importance of sustainable mobility when planning urban centers. Based on this, the current situation of cycling planning in Passo Fundo was analyzed. With a view to the sections that encourage active mobility, specifically related to the use of bicycles, a map of the current coverage of the existing bicycle paths and lanes in the city of Passo Fundo was generated, in addition to the mapping of bicycle sharing points.

The research is divided into the following methodological steps:

Stage I—The location of the study area at national and state level in the city of Passo Fundo was scored using the Qgis 3.10 software, using the IBGE database as the basis for the map [10]. An analysis of the current situation of the cycle paths was carried out. Firstly, Google Earth was used to collect data on geographic coordinates and altitude, both from important section points that served as guides to draw the design of the cycle path, as well as from the shared bike stations locations. After that, Qgis 3.10 was used again. Through these data collected by Google Satellite images, maps were generated in order to enable a clearer analysis of the areas receiving this service. This step is concluded with the application of a heat map at the bicycle sharing ports, applying a radius of 500 m to verify the areas covered by the system.

Stage II—Perception of the existing sustainable mobility in the city: in this stage, the results presented in the maps obtained in this study were analyzed. Thus, characteristics of the areas surrounding the cycle paths were observed, and how they relate to different points in the city of Passo Fundo.

Stage III—Based on the analysis of the current situation, a combination of paths was proposed, providing the observation of easier access to more bike paths in the city of Passo Fundo. Studies involving urban sustainability, through the implementation of projects that guarantee the use of alternative transport, such as the use of bicycles, are

extremely important for the development of the local economy, and for environmental preservation [11, 12], as the bicycle does not emit harmful gases to human health into the atmosphere [13].

3. Results and Discussion

The perception of the existing sections and their relationship with the city of Passo Fundo showed that the central region presents itself with a greater concentration of population circulation. However, one can not fail to consider the spread that has taken place over the years, resulting in the consolidation of new neighborhoods in the outskirts of the city of Passo Fundo.

The Master Plan for Integrated Development—PDDI created guidelines that descended on inductor road axes, with the implantation of the ring road to facilitate the flow of motor vehicles. These actions were taken with the objective of encouraging densification in other parts of the cities, reducing congestion on the roads located in the central area. Another relevant issue is the relation between the growth of the urban population, which increased 1%, from 2016, compared to the growth in the number of vehicles that was 9.4% [10, 14].

The relevance of thinking about sustainable mobility solutions [10, 14], in the case of Passo Fundo, and it is noticeable that actions have already started to be taken, with the implementation of the bicycle sharing program, entitled: “Passo Fundo Vai de Bici”. However, it needs growth and improvement, and such statements can be seen in Fig. 1, with regard to the lack of service on bike paths and bike sharing stations for other places in the city.

When analyzing the map represented in Fig. 1, it is observed the existence of four sections of bike paths, but they do not have continuity among them. It is perceived that bicycle paths as a form of utilitarian displacement, or even for transporting students, need continuity, providing a junction of paths, facilitating access to various regions and sub-centers of the city of

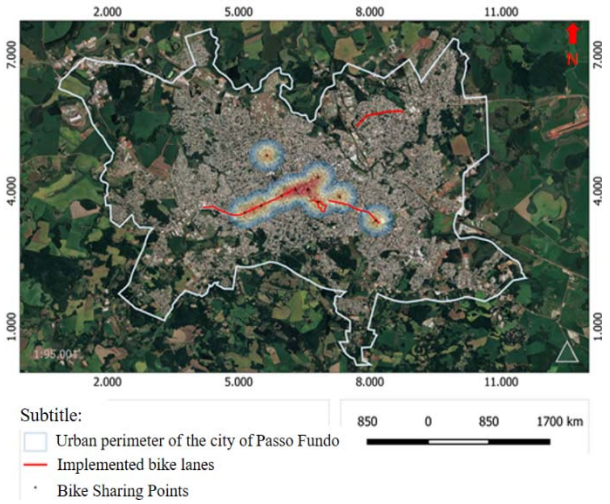

Fig. 1 Map of cycle paths and bike sharing stations in the city of Passo Fundo/RS.

Passo Fundo. The analysis also showed that the bicycle sharing stations could be equally expanded, so that they can cover more regions, including in places where there are already bicycle paths, a situation already found in a previous study [14].

The cycle path system covers an important area of the city of Passo Fundo, but it could be expanded, as it has a greater cycling potential than what is being offered. The continuity of the sections that are already consolidated would enable a continuous flow between important regions of Passo Fundo, making mobility, through the use of bicycles, more permeable within the urban fabric. Through this perception, Fig. 2 illustrates an idea of expanding the system, in order to contribute and encourage discussions about the importance of expanding and encouraging sustainable transport in the city.

Through this proposal (Fig. 2) of application of the cycling system in the city of Passo Fundo with shared bicycle stations it will be possible to provide this service to more users, contributing to the reduction of traffic jams and air pollutants due to the substitution of use of individual motor vehicles for bicycles. In this relationship, the bicycle is understood as an ecologically viable transportation means [15]. Since other countries have already implemented cycling systems decades ago, the city of Passo Fundo can

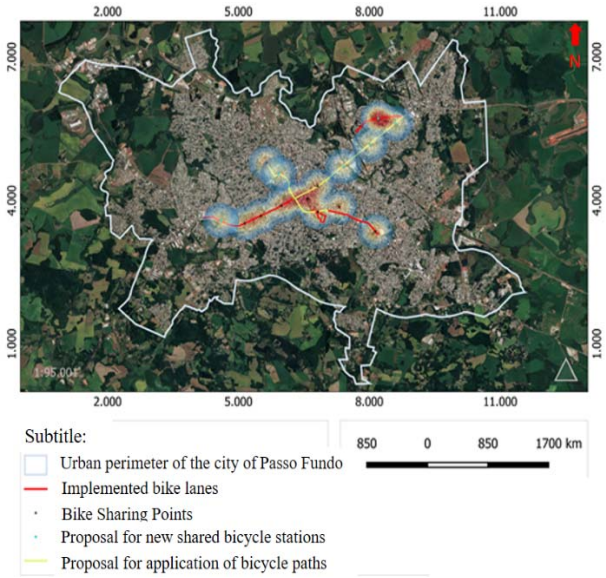

Fig. 2 Proposal for the implementation of future cycle paths and bicycle sharing stations for the city of Passo Fundo/RS.

learn from problems that have already occurred in other countries and try to solve them in advance, enabling an adequate functionality to the system.

4. Conclusion

Including cycling in mobility planning is of strategic importance in structuring a sustainable urban mobility policy. The planning of cycle paths must have a systemic view, integrating self-sustainable solutions with the means of public transport. In this case, it is recommended for the city of Passo Fundo, the continuation of the expansion of the cycling network system towards the shared bicycle stations.

In the case of the city of Passo Fundo, the initial attitude of implementing the cycling system has already been carried out, now it is up to the public authorities to continue expanding and improving this active mobility system. For future studies, it is suggested that other countries on a global scale can assess the implementation of cycling systems in Latin America, as some cities, such as the specific case of Passo Fundo, are recently implementing the system, and are beginning to understand their need for expansion.

Acknowledgements

The authors sincerely thank the Center for Studies and Research on Urban Mobility-NEPMOUR, IMED and PPGARQ/IMED for supporting this research. We also thank the Fundação Meridional-IMED for the funding provided through the institutional productivity grant. Thanks to the National Council for Scientific and Technological Development of Brazil for the research productivity grant (Process: 313040/2020-6) as well as to the Research Support Foundation of the State of Rio Grande do Sul (FAPERGS) for the research grant (Process: 21/2551-0000992-6).

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