

Micro mobility development and its challenges for Porto

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Author Note

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Abstract

In the past years, people have become more and more aware of the climate change crisis and cities have become more crowded. Also fueled vehicle transportation has become much more expensive, inefficient and bothersome as fuel has become much more expensive as well as cars, roads used by cars have to be maintained more often and also air and sound pollution caused mostly by cars has changed the idea of transportation for the general public.

To address that, governments and municipalities all over the world have been searching for solutions to give its citizens different possibilities to replace the car with other types of transportation, like giving more space to pedestrians, public transport or micro-mobility transportation. In this article, we will be focusing our attention to micro-mobility and especially to its situation in Porto as coming from other countries, we have been puzzled about the lack of bike lanes and friendliness of the city towards micro-mobility. Being ourselves mostly users of bikes in our home cities, we wanted to understand why micro-mobility wasn't developed as much in Porto as other cities in Europe or even like its neighboring cities like Aveiro. Apart from that, the societal benefits of increasing micro-mobility and its improvement on not only the economy of the city but also the quality of life of its citizens were highlighted by cities all over Europe and using them as an example would help Porto develop a secure and healthy urbanistic infrastructure that would very highly improve the city of Porto in all its senses.

After a deep research and understanding the barriers that Porto was facing, we understood that the principal was not the budget of the city or its lack of necessity, it was mostly due to a cultural issue as the car had always been in the center of Portuguese society. Due to that, other methods of transportation were set aside, but as we said before, people have changed and nowadays the citizens of Porto are looking for new mobility infrastructure. And the change has begun already with the recent addition of the metro to the city of Porto. Bike lanes will come too and in this article, we will talk about its potential in Porto and its benefits as well as trying to understand the reason they are so less developed now.

Keywords: Biking, Porto, Cycle lanes, Bike lanes, cycling economics, cycling benefits, Micro-mobility, challenges for micro-mobility, Bike culture

Introduction

In recent years, we have seen big cities move towards more green transportation, from improving public transport to building new bike lanes. This is due to multiple facts, first of all, people in the last years have become much more aware of the climate issues and they have been trying to reduce their climate footprint, also as population has increased and mostly of the jobs are still centralized in the big cities, transportation has become a real challenge and issue, so people have been looking for new ways to get to their work, and lastly, individual motorized transportation has become much more expensive in the last years due primary to a lack of resources.

Our generation has seen this change from first perspective, and we have also been part of the change as in our own countries. We have happily welcomed these changes in regards to greener transportation as they are cheaper and more efficient which is really helpful for people with less financial resources. And especially biking, it first started in the seventies in Europe in the Netherlands, and especially Amsterdam, as it was facing similar problems with transportation as other European big cities are facing now, with time, it started converting its streets and its city towards a much cleaner aired and easy to go around city as more reliable bike lanes where constructed.

Nowadays more and more European cities are already leading the way for zero emission transportation as well as our own cities (), it is obviously still evolving but the movement is there and the results can be seen as more and more citizens are using a micro-mobility transportation to go work, to university or whatever destination they need to get too. For us personally we have also gotten used to using micro-mobility transportation, and we thought of also using it in Porto as it was very practical and reliable in our own cities, but after biking around and getting to know the city after a few weeks, we quickly realized that micro-mobility wasn't yet included as a possible transportation in the streets of Porto as bike lanes are almost nonexistent, due to a high car usage the roads are in a bad condition, and usually cars weren't really used to share the road with other type of transportation than fast motorized ones like motorcycles or trucks.

This made the usage of micro-mobility transportation really dangerous and inefficient, as we had to share the same roads with very little protection with much faster and protected users. Having seen the differences between our home cities and Porto in terms of micro-mobility, we thought that this issue had to be spoken about and also understood as we wanted to know what Porto missed or needed to give their citizens a proper micro-mobility option.

Literature review

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To start, before diving into the cycling situation in Porto analyzing its urbanism and mobility solutions, we read more about the economic benefits that building cycling infrastructure and offering the possibility to its population to drive safely can have on the economy of that zone. Indeed, the costs of building safe cycling roads are a pretty common topic when this urgent subject is brought up, as Portugal not having that many resources compared to the northern European countries, the question on the necessity of having cycle roads is quickly answered by a “no. Flusche, Darren. (2012) cite all the great effect bike lanes and the increase in the number that bikers had on the economy which replies with many examples and very helpful for our research as it can answer one commonly asked question and can then further the discussion to not only the budget argument.

In this article, the economic benefits that are shown and proved are benefits that can perfectly be compared to a region of Porto, as they mention health costs, good ways to create jobs with efficient government spending, traffic congestion, cycling tourism, and many more. Following that, to get a much more realistic view on the situation in Porto as we stated in the introduction and not only have examples of other countries, we were happy to find Miguel Lopes, Ana Mélice Dias, Cecília Silva. (2021). article that used demographics and geo-locations of current neighborhoods to determine what would be the most effective ways to build the missing cycle lanes and also shows how critique the situation in Porto is, as how it is shown in the article, neighborhoods are not connected at all and cycling through them is not secure at all.

Solutions are shown and explained to show that there exists an efficient and economical way budget wise to have good functioning cycle lanes in Porto and especially how they could do to make sure that these would be used and practical for the citizens of Porto. This article is very helpful and will be a very good inspiration for our final work as it is really focused on the city of Porto and it has some really helpful details that data wise will be very helpful. Also following on that, in this article, they not only plan like we explain a few lines above how these bike lanes could be.

They actually ran tests and measured the effectivity on how the bike lanes would work, which for our work is really helpful as we don't have much data regarding existing bike lanes. Having an actual demographic and urbanism point of view, helped us understand that Porto could become a cycling capital in Europe and it was especially highlighted by Cecília Silva, João Teixeira, Ana Proença. (2019) which showed the potential that certain cities have to be a really good city for its citizens to use a different type of transportation that creates no ecological footprint and that makes their cities cleaner.

The argument they make about Porto being a city with the potential of being of Europe's best cycling cities is controversial as another argument that is made in the debate of if Porto would work

better as a city with bike lanes or not are that Porto is not as flat as the top countries in Europe like the Netherlands or Sweden. As it is shown in the article this is a common misunderstanding as a working cycling infrastructure made for the youngest to the eldest citizens does not depend on the degree of slope of a city and on its flatness, but actually on the good positioning and efficiency of the bike lanes. It obviously helps to have a flatter city as the planning will be much easier, but taking all that into account, not having a completely flat city can't stop the municipality from building rideable bike lanes for its citizens. This article will help us a lot to understand the importance of good infrastructure and will also help us answer some of the questions we have regarding the possibility of the connection of the whole state of Porto.

Now that it has been recognized, it has also been realized its real potential to make the economy of the city shine by developing the tourism of cycling for example. It is now important to give a more psychological view of the situation and to find ways of action to convince the inhabitants of Porto to start cycling. This is what Rosa Félix, Filipe Moura and Kelly J. Clifton (2019) have done in their article whose purpose is to encourage the use of bicycles in certain cities where the bicycle culture does not exist. Changing people's behavior regarding the benefits of cycling is considered one of the challenges of our time. Rosa Félix, Filipe Moura and Kelly J. Clifton (2019) highlights the fact that nowadays, the problem of LCM (Low Cycling Maturity) like Porto is becoming more and more widespread as many cities in Europe and South America use the car as their main means of transportation, whereas the use of the bicycle is proving to be an asset in terms of sustainability, equity, health and quality of life. Because these cities lack historical experience with bicycles, there is a need to understand and better inform city planners and stakeholders about what strategic infrastructure investments should be made and what programs should be deployed to increase bicycling's share of transportation and develop a bicycle culture.

In order to persuade people to use bicycles, it is also necessary to research and analyze perceived barriers and motivations to cycling, and then make decisions at that level. Rosa Félix, Filipe Moura and Kelly J. Clifton (2019) note that overall, although there is a general similarity between the barriers perceived by non-cyclists and cyclists (Factors related to perceived safety, effort, lack of a bicycle network, and bicycle ownership were considered relevant barriers for both groups of cyclists and non-cyclists), we conclude that there are fewer similarities between the triggers. However, we note that Personal concerns and interests are more relevant triggers for cyclists (e.g., environmental, health, physical, and political) and should be triggered to target with specific policy measures on an ongoing basis (as these are constant concerns for everyone).

The importance of a safe and efficient bike lanes importance is even more accentuated given that bicycle network issues represent the principle barriers for both cyclists and non-cyclists. This

additional information regarding the behavior of the inhabitants of Porto towards the barriers and the reasons to start cycling will be helpful in establishing our work because it brings us elements that can help the municipality of Porto to orient their actions and decisions, and make its population want to cycle. We can take as a trigger example the existence of a bicycle sharing system, which is a motivating factor for both cyclists and non-cyclists. In addition to being an element that could motivate the inhabitants of Porto to take up cycling, the usefulness and the benefits that bike sharing can generate is at the same time highlighted by João Filipe Teixeira, Cecília Silva, Frederico Moura e Sá (2022). Indeed, they show in their article that the use of bike sharing has had considerable positive effects on the environment during Covid 19 such as the reduction of greenhouse gas emissions given that certain means of transport such as the bus have been restricted in favor of walking and self-service cycling. Overall, the pandemic involved some good effects to the extent that it made self-cycling perceived to pose a lower risk of COVID-19 infection than public transit use, but perceived as riskier than the use of private modes (cars ...).

This study stated by João Filipe Teixeira, Cecília Silva, Frederico Moura e Sá (2022) will therefore be very useful for us given that it notes the positive effects of a very current event, the Covid-19 health crisis, on bicycle use, which has been increasing steadily over the past two years. This article highlights the fact that the shift away from modes of transportation such as public transport to new alternatives such as self-service cycling has very positive effects on the environment since it reduces greenhouse gases. In addition, knowing now that one of the fundamental factors encouraging people to use the bike more frequently is the well-being of the environment as well as their own personal health, the establishment of alternatives to public transport such as self-service cycling would be widely possible in a city like Porto, where this mode of transport is not developed at all.

Moreover, making more frequent use of more healthy and ecological means of transport such as bike sharing instead of the car has not only environmental but also economic benefits. A more usual use of cycles within cities like Porto would involve the decrease of health costs, good ways to create jobs with efficient government spending, traffic congestion and many more. This would put the city of Porto in a virtuous circle as the increase in bicycle use would have a positive impact on its economy, allowing the municipality of Porto to allocate an additional budget to the construction of even more efficient bicycle lanes than those already available, and facing the barriers to start cycling such as the lack of security and strong infrastructures. It would contribute to the change of perception of the inhabitants of Porto about cycling, as other methods would also allow, as explained by Tamara Bicalho and Cecília Silva (2019).

According to Statistical Office of the European Communities in 2021, Portugal climbed into the European leaders in bicycle production. According to the European statistical agency - Eurostat, last

year the country produced more than 2.5 millions of these two-wheeled vehicles. But almost all of them were exported. This puts Portugal next to such major bicycle manufacturers as Italy and Germany. Europe's largest bicycle factory is in Vila Nova de Gaia in northern Portugal. But only 5% is assembled here for the domestic market, the remaining 95% is exported, mainly to France, Spain, Germany and Poland. This type of transport is not often seen on the streets of Portuguese cities. According to the National Institute of Statistics, only 0.4% of people rode a bicycle in Porto in 2017. Motor transport still dominates here, accounting for almost 60% of trips in the capital and 68% in Porto, according to Eurostat. Unfortunately, there is no adequate cycling infrastructure in the city of Porto, no bike lanes and no places to park bikes safely. And because car drivers are not used to seeing cyclists on Porto roads, the average speed at which cars on Porto roads go, can be very dangerous for cyclists.

Neither can be said about the city of Aveiro, which may be three times smaller than Porto, but it is famous as the most bicycle-friendly city in Portugal. And it is all due to the fact that in 2000, the city of Aveiro launched a system of free bike rental "BUGA", which has changed the infrastructure, culture and made a huge impact to the level of tourism of this small town and made it famous throughout Portugal as "the most bike-friendly city in Portugal" and beyond.

Bicicletas de Utilização Gratuita de Aveiro (BUGA) system – in English, Aveiro Free Bikes – started in the year 2000 with 350 bicycles and about 30 parking spaces. BUGA became a pioneer system in Portugal of bike sharing network that for being so innovative gained great recognition at a national level. Despite the strong revelation that the system has been targeted, it has yet to be replicated elsewhere in the country. Apart from a few specific cases centered on universities (Minho) or urban parks (Porto), the only known similar case is BICAS of Cascais.

Methods

When conducting different kinds of research, there are usually two methods of gathering information. These methods often cause confusion - these are quantitative and qualitative research methods. They do not exclude each other, but on the contrary - favorably complement each other. For our work, we decided to use a "Quantitative methods" approach to collect information, because we needed to gather data expressed in precise numbers and graphs to support our theories and assumptions. The data we collected is factual information about our topic. In this method, factual information can be collected in a variety of ways (Surveys, Questionnaires, Experiments, Existing Data, Observation, Content Analysis and etc.). But despite the huge variety of research methods and techniques, the general scheme of activities implemented in the framework of research is simple and

clear enough. The main methods of information collection, which we used, are interviews, surveys, questionnaires and expert evaluation.

The most common methods of collecting primary information are surveys and/or questionnaires. They are used in about 90% of researches. And since those methods of collecting primary information provide firstly written or verbal address of researchers to a certain group of people (respondents) with questions, the content of which reflects the problem under study, and, secondly, registration, statistical processing and interpretation of the answers obtained, we used them as the main tool of collecting information for our research. The purpose of our questionnaire is to find out the subjective opinions of people, their preferences, convictions and attitudes regarding the lack of bicycle infrastructure, the lack of bike lanes in the city, and the benefits of the potential appearance of all of the above. Therefore, the application of the questionnaire method allowed us to:

1. Identify potential users of bike lanes in the city;
2. To carry out market segmentation according to the qualitative and quantitative characteristics of users/citizens;
3. To assess the awareness, perception, attitudes and requirements of users/citizens regarding the problem of the lack of bicycle infrastructure in the city
4. To identify the preferences of potential users and residents of the city in relation to the construction of bike lanes
5. To evaluate the effectiveness of the potentially created bicycle culture in the City of Porto
6. To identify the characteristics of potential users and residents of the city (socio-demographic, psychographic, behavioral), etc.

Expert evaluation - is the evaluation of the processes under study by qualified specialists - experts. Such evaluation is especially necessary when it is impossible to obtain unmediated information about any process or phenomenon. During our research, we often resorted to various verified sources of information, to various articles made by experts. Mainly it is some kind of statistical data, researchers conducted earlier and expert opinion.

We conducted a questionnaire, which started on 05/12/2022 and continues to this day, the target group for collecting information were students, residents of the city of Porto, of absolutely different ages. To perform our questionnaire, we used the tool "Google Forms", which is a completely free tool for creating questionnaires/surveys, polls and tests. Despite its quite simple interface and simplified constructor, the service allowed us to create interactive questionnaire of almost any complexity. Thanks to a wide range of tools Google Forms we were able to build a questionnaire, which includes questions of absolutely different types, which gave us detailed information on our respondents.

Another advantage of using this tool was the convenience and quick accessibility, which allowed our respondents to take our questionnaires regardless of geographic location, internet quality, or any other difficulties our respondents may have had to take part in our research.

Results & Discussion

A specific target audience: the new generation:

Therefore, we designed a questionnaire with 15 questions that would give us an overview of what the inhabitants of Porto think about the current situation regarding cycling, allowing us to confirm whether they also realize the lack of means of cycling in the city and whether they would be willing to use this means of transport more frequently if changes were made in the municipality of Porto. One of our other objectives, through this questionnaire, was to highlight the main barriers and motivations to cycling for the inhabitants of Porto, in order to help us later on to be able to propose the most optimal solutions that are in line with the demand of the community of the city of Porto. Therefore, we have established a total of 15 different questions that address several issues raised by the situation of cycling in the city and we have obtained a total of 30 answers, which is a rather large sample of people and allows us to provide a reliable assessment of the general point of view of the inhabitants. We wanted the majority of the answers to this questionnaire to come from people who meet two criteria: the first one is that they are Portuguese citizens living in the city of Porto, since they see with their own eyes the situation of cycling and its evolution over the days. The second criterion is age; we wanted to collect opinions from people between 16 and 25 years old, since these people represent the future generations and therefore, if the municipality of Porto had to take decisions in the future to change the case of cycling, it would be done with the objective of satisfying these people. We can clearly see in the first questions, which ask about the civil status of the respondent, that the objective was achieved: we obtained a majority response rate of 65.5% from students enrolled in a university institution, as shown in the bar chart. The objective of targeting a young audience was also successfully achieved, with 71.4% of respondents being between 16 and 25 years old (pie chart).

The quality of the infrastructure, source of problems and barriers to cycling:

Now, as we move into the next questions, we can see that the more we go into the answers to the questions, the more we realize that we are dealing with a big paradox: in fact, we observe that many people living in Porto own a bicycle (69% against 31% who do not), while when we know the real situation of cycling in this city, we can already guess that they do not use it often. This very infrequent use of the bicycle by the citizens of Porto could be explained by the lack of infrastructures deployed by

the municipality, which should ensure both the useful connection between different neighborhoods and the safety of the inhabitants. We saw earlier when we analyzed different articles that shed light on the barriers and motivations to cycling in Portuguese cities, that the quality of the infrastructure was a very big concern for both cyclists and non-cyclists. Through this questionnaire, we are able to confirm that respondents generally feel this barrier related to insecurity and lack of facilities (Although 37.9% of respondents indicate that they do not have a clear opinion about the infrastructure, 44.8% of them indicate that they are clearly not satisfied with the situation, compared to only 17.2% who are; the same is true for safety issues, with a total of 60.7% of respondents who do not feel safe when traveling by bicycle) and therefore prefer to use other means of transport rather than cycling: despite a high proportion of people owning a personal bicycle, they still find it difficult to use it frequently and use it very rarely or never (25% of bicycle owners say they use it very rarely, 21.4% say they use it once a week and 14.3% say they never use it).

The importance given to the environment:

As far as the environmental issue is concerned, we have drawn from our reference articles that Porto has an incredible potential and could become a great cycling city on a European scale, especially due to the environmental benefits that this could imply. In fact, an increasing use of bicycles in Porto would boost its economy, since it would mean a reduction in the costs of greenhouse gas emissions, an improvement in the level of health and therefore a reduction in health costs, a reduction in traffic congestion etc. The issue of environment and health are therefore linked, since living in an environment that favors healthy means of transport such as cycling has positive repercussions on the health of the population, and we can observe in the results of the questionnaire that the inhabitants of Porto are unanimously concerned about their health: 67.9% of the people use micro-mobility transportation with the aim of preserving or improving their level of health, and 82.1% of the respondents find that cycling on a regular basis is strongly beneficial for their health. They also seem to be highly sensitive to the issue of global warming: 67.9% of them are sure that developing a cycling culture in Porto will help traffic congestion.

A possible future for cycling culture:

With all the results we have collected, we can say that there is hope to improve the cycling situation in Porto and to develop a new culture that can be positive on many angles like environmental, economic, political etc. only if the municipality takes the right decisions (70.3% of the respondents say that if the government provided more favorable conditions to the use of the bike, they would be ready to use their bike more). Some of the answers must help to guide the government on the actions to be

taken to make the Porto community want to cycle, and at the same time they will help to meet the expectations of current and future users of micro-mobility vehicles. For example, it is now known that a majority of people want to have bicycle lanes all over the city (64.3%) and not only in specific places like the city center or in the areas outside the city. We also know that people want long-term storage of bicycles to be located near train, metro and bus stations (74.1%). There is also a strong desire for these storages to be placed at the exit of educational establishments.

Conclusion

In the course of our work and research we have successfully achieved the goal of collecting precise information by conducting a questionnaire, which involved at least 30 people who shared with us their subjective opinion on the big transport problem in the Port, specifically the problematic movement around the city on Micro-Mobility Vehicles. And also, one of the goals was achieved, which was the proper presentation of the problem to the residents of the city and to the management staff, such as the Mayor.

Our study identified several positive factors for the construction of bike lanes on the street and road network of the city of Porto. One of the main factors is that bike lanes will decongest the city's transportation infrastructure, allowing car drivers to move freely on the roads and more residents-pedestrians to move around the city on micro-mobility vehicles. Not without reason, in densely populated Asian countries, most residents move around the city on bicycles, acknowledging their advantages over cars and motorcycles. Micro-mobility vehicles allow you to create your own route without having to adjust to the schedule of public transport and the map of traffic jams. It is also useful because it will reduce the amount of pollutants emitted into the air by cars. In this way, the environmental component of the city will improve. This will reduce the proportion of the urban population with respiratory diseases Porto's micro-mobility vehicle infrastructure is just starting to develop, in some parts of the city bike lanes are being designed, bike parking lots are being built, rental facilities are being set up, competitions or a kind of mass bike rides are being organized. This idea should be supported and its further development should be promoted. Specifically, to gradually switch to this mode of transport in order to improve the quality of life in Porto.

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