

**Smart Cities and Sustainable Urban Mobility:  
An Analysis of Urban Indicators of Marau/RS****Eduardo Fernandes Antunes**

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**ABSTRACT**

The increasing problems related to urban mobility in Brazilian municipalities, caused mainly by uncontrolled urbanization and constant growth in the automotive vehicle fleet, is directly related to the difficulties presented in the public management of Brazilian cities, mainly with regard to urban planning. The objective of this article is to analyze users' satisfaction of the urban mobility system in a small municipality, as well as the condition of the city's physical characteristics, mainly identifying those that interfere with urban mobility, checking the most used modes in each sector of the city of Marau/RS and the mobility situation by age group and income, finding existing problems in each of the modes. To this end, a documentary survey was carried out on the object of study, a physical survey of the characteristics of the municipality, and a questionnaire with 84 respondents. The results obtained reveal the use of private cars as the main means of daily transport, correlated with low incentives and accessibility to sustainable modes of transport.

**KEYWORDS:** Smart Cities. Urban mobility. Sustainable Mobility.

**1 INTRODUCTION**

Urbanization is a phenomenon that has been increasingly intensifying around the world, bringing with it a series of challenges (PRADO; SANTOS, 2014). According to the Observatório das Metrôpoles (2013), such challenges are included in a series of items to be observed, analyzed and predicted, to guarantee the well-being of users of these cities. Among the "Urban Wellbeing Indices - IBEU" (our translation), analyzed in research in Brazilian cities, it was observed that mobility has the worst index among the analyzed factors. This index is the result of the growing need to use cars for transportation and the perception of increased time spent on daily trips, corroborating the need to search for solutions to the complex issue of urban mobility.

However, when considering that each city has socioeconomic, cultural and morphological particularities, it is necessary to propose alternatives consistent with municipal demands so that it is possible to reasonably achieve the satisfaction of system users, guaranteeing the principles of sustainability in its broadest concept. Therefore, the objective of this research is to analyze users' satisfaction of the urban mobility system in a small municipality, as well as the condition of the city's physical characteristics, mainly identifying those that interfere with their mobility, checking the most used modes in each sector of the city of Marau/RS and the mobility situation by age group and income, finding existing problems in each mode.

**2 LITERATURE REVIEW**

It is estimated that in 2050 the world population will grow by more than 25%, from the current 7.7 billion inhabitants to 9.7 billion, according to the United Nations (UN, 2019), and that approximately 70 % will live in urban centers. Furthermore, UN (2019) points out that the world population will approach the 11 billion mark in the year 2100. The serious increase in global urban agglomeration represents important challenges in the public management of cities. In Brazil, the urban population surpassed the rural population in the 1960s and, currently, according to IBGE (2020) approximately 85% of the population lives in urban centers.

According to He et al. (2014), the continuous expansion of the population in urban

centers requires the implementation of sustainable policies, since cities have been facing several obstacles regarding to their basic functionalities. These obstacles directly affect the population's quality of life, creating difficulties in managing natural resources; restrictions on urban mobility and transport systems; reduction in the life cycle of public infrastructures, among others (BATAGAN, 2011).

Such problems can be mitigated with the conscious use of current and future capabilities, aiming to improve efficiency and planning the organization of cities, using Information and Communication Technologies (ICTs) to enable a new system for smart cities (WEISS; BERNARDES; CONSONI, 2015). This means that the city must be able to connect infrastructures and technologies, always seeking innovation and efficiency, so that the sum between sustainability and quality of life in the city is achieved. In this sense, the search for Smart Cities must not deviate from effective planning, execution and maintenance of urban services and infrastructures, aiming at the interests of its actors, an essential factor in urban space (WEISS; BERNARDES; CONSONI, 2015).

However, the efficiency of mobility infrastructures in Brazilian urban centers is complex due to the concentration of population in these locations. For Guimarães Neto (2010), the solution to bottlenecks in movement of people within the urban network must occur through strategic planning, formulation of public policies and public and private investments. Therefore, one of the biggest challenges facing Brazilian and global cities in the 21st century is urban mobility, mainly referring to mass transport, understanding that the use of private vehicles is not sustainable or intelligent, reducing the quality of life of the inhabitants, understanding thus the importance of public transport and the need for new alternatives for urban transportation, whether in the implementation of different modes of transport or their integration (REALIDADES URBANAS, 2012).

For Giffinger et al. (2007), efficient urban mobility requires current and sustainable transport systems, accessibility and availability of data from ICT. Therefore, transport and logistics in urban areas must be optimized according to the conditions of energy consumption and local traffic, in addition to providing dynamic and multimodal information to users, in order to improve transport efficiency and ensure sustainability in public transport. through less polluting systems and fuels (NEIROTTI et al., 2014).

However, to plan efficient mobility, an in-depth study of how the population moves around the city is required, as well as the physical conditions linked to the modes adopted by users. From this, it is possible to establish the positive points about local mobility and propose suggestions that seek to improve urban mobility in the municipality under analysis.

### **3 METHODOLOGY**

Methodologically, an exploratory bibliographic study was carried out in order to collect information on sustainable urban mobility and understand the history and urban development of the city of Marau/RS, including the characterization and analysis of urban mobility in the municipality, based on documents from the City Hall of Marau - PMM (2020a, 2020b), as well as data from the Consolidated Report of the Urban Mobility Plan of the Municipality of Marau (MARAU, 2019), which include important information about urban planning and urban mobility

in the city.

The municipality of Marau/RS, located in the north of the state of Rio Grande do Sul (Figure 1), within a region known as the medium plateau (Brazilian Institute of Geography and Statistics - IBGE, 2019) is one of the fastest growing cities in the state, with an estimated population of 44,161 inhabitants in a territory of approximately 650 square kilometers (IBGE, 2019), with a population increase of around 80% in the last 30 years, considering its 25,167 inhabitants in the 1990 census, 28,361 in 2000 and 36,383 in 2010. This growth, according to PMM (2020a), occurs due to the installation of industries and the strengthening of trade. Despite a mostly urban population, the city has around 2,600 families who live off family farming through the production of cereals, milk, poultry and pigs (PMM, 2020a).

Figure 1 – Location of the city of Marau/RS



Source: Authors, 2023.

Recent data point to worrying rates in relation to individual motorized transport (cars and motorcycles) in Marau, the main means of transport adopted by the city's residents, which especially affects traffic in the city center, the sector where the main shops and municipal services are located, while public transport represents the smallest share among other modes (MARAU, 2019). In 2010, the city had 12,880 cars, recent data indicates that the fleet number is 19,651 (DENATRAN, 2020), increasing by 6,771 cars in this period. Compared to the increase of 7778 inhabitants (IBGE, 2019), the population increase rate is 21.37%, while that of the car fleet is 52.57% over a 10-year period of research.

The study and analysis of the physical characteristics of the object of study in a cartographic way, based on the road, topographic and urban spatial syntax map, allow the understanding of the physical factors that limit and drive movement at certain points in the urban network. Furthermore, it became necessary to prepare maps for the Space Syntax analysis of Total Connectivity and Integration of the city of Marau/RS, carried out by surveying municipal roads in AutoCAD software, allowing the file to be processed in DephtMap software. In this way, it was possible through space syntax to determine two topological steps corresponding to the objective, classified by chromatic heat scale, indicating the intensity in relation to the studied variable.

Also, a questionnaire was applied to verify the current situation of the urban mobility

system in Marau/RS, as well as the perception of users in relation to this system, evaluating the modes of transport in the city, seeking to understand the variables involved in the process, making it possible to diagnose the city's mobility condition.

The research questionnaire was carried out online, via Google Forms platform. Questions in the questionnaire were asked via Likert scale for objective questions, with answers ranging from 1 to 5, being: 1) I totally disagree; 2) disagree; 3) indifferent; 4) I agree; and 5) I completely agree; and, for more specific questions, multiple choice or descriptive answer method was used. The questionnaire was distributed via social media, aiming to reach a more diverse audience, and the period during which the samples were collected took place between October 6th and November 4th, 2020. Through a calculation carried out using the sample calculator (COMENTTO, 2020) to verify the necessary number of respondents for a significant quantitative research, considering the population of the city of Marau, 44,161 inhabitants (IBGE, 2020), with a sampling error of 9% and an accuracy of 90%, pointed out the need for 84 respondents.

Data analysis aims to explain and scrutinize the results found through population research, responding to the hypotheses raised by the studied bibliography. After consolidating data from Google Forms, they were analyzed in the statistical program SPSS (Statistical Package for the Social Sciences), using the non-parametric Cross Tabulation test, responsible for allowing the measurement of interaction between two questions in their variables (LAY; REIS, 2005). Thus, using the SPSS software, it became possible to generate tables and graphs with the percentages of each indicator, following the pre-established categories (LIMA; FREITAS; CARDOSO, 2019).

## **4 RESULTS**

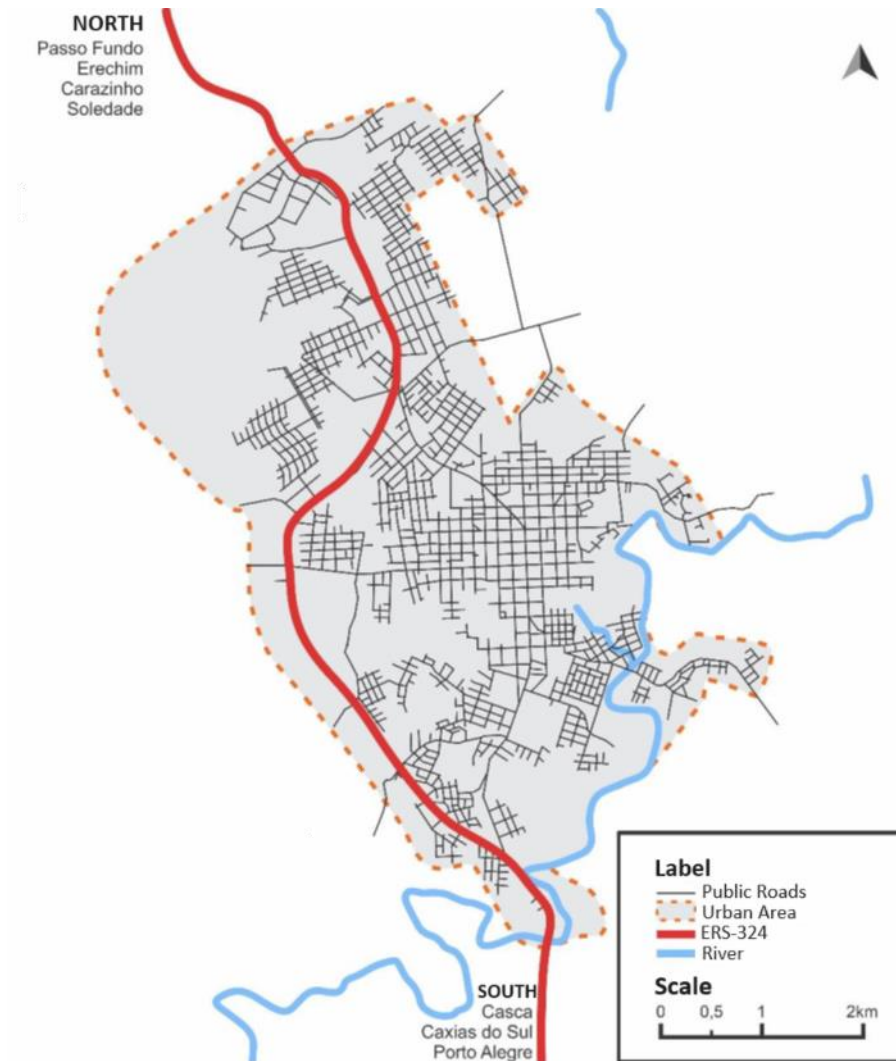
With the need to understand the physical characteristics of the object of study and observe points that may be hindering mobility, it was necessary to carry out surveys and analyzes of the municipality's urban network, more specifically the road and topographic network, in order to observe the layout of public roads and the interference of reliefs on them, enabling the understanding of the main factors that affect municipal urban mobility. To complement this, an urban spatial syntax study of connectivity and integration of the road network was carried out, allowing a visual analysis of the most connected or integrated points in the municipality. Furthermore, the questionnaire presents important data for understanding residents' mobility and satisfaction, as well as possible problems in urban transport systems.

### **4.1 Urban Matrix**

The urban area of the municipality of Marau/RS (Figure 2) is crossed by the ERS-324 highway, the main route responsible for access and evasion from the city, connecting with the neighboring cities of Passo Fundo (north) and Vila Maria (south), which surrounds the central area of the municipality on the west side. Another physical factor responsible for the limitation and intersection of roads is the Marau River, which limits the projection of the city on the

southeast axis, whose course runs northeast-southwest, preventing or hindering mobility between certain points in the city.

Figure 2 – Road map of the city of Marau/RS



Source: Adapted from Marau (2019, p. 62).

Furthermore, in addition to the highway and the river, it is possible to observe the projection of the road system of the municipal urban area, which appears to be fragmented and uneven throughout the urban network. In the central area, there is a regularity in the road network in an orthographic format, which disperses as it moves away from the centrality, transforming into intersections with roads with greater flow or into alleys.

#### 4.2 Urban Space Syntax

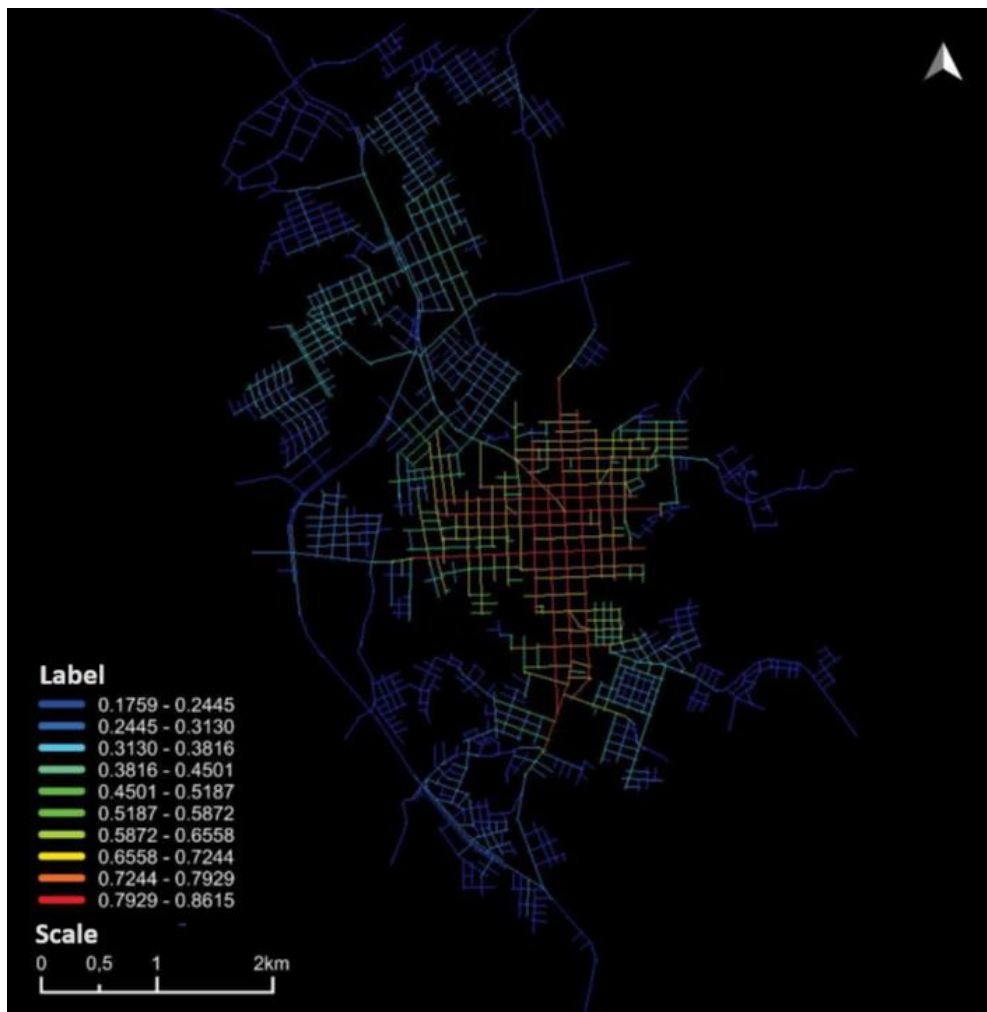
Below are two of the main variables of Space Syntax, which were studied in the municipality of Marau/RS, allowing the perception of urban space and the manifestation of



possible subcenters. The theory of Space Syntax is a set of methods and tools for spatial and quantitative analysis, measuring the efficiency of public spaces based on urban form and relating these results to social practices.

Connectivity is the most basic measurement and measures the number of segments that connect to each other. It is a simple but important measure to study the pedestrian scale, identifying the number of route possibilities that the pedestrian can enjoy. It can also be used as an indicator of the level of regularity of the mesh. On the map below, Figure 3, the connectivity metric of Marau/RS is presented, where one can observe, from the lines, the projection of the city's main arterial and collector roads, maintaining a regularity in its network, which allows for an ease of movement and connections, especially in the central area of the city of Marau. Also, the definition of the commercial and social center of the municipality is clearly identified, coinciding with the origin of the city, where there is good connection and accessibility. However, connectivity decreases in the most peripheral areas of the city or where roads are more isolated from each other, often under the influence of topography, reducing the flow of mobility.

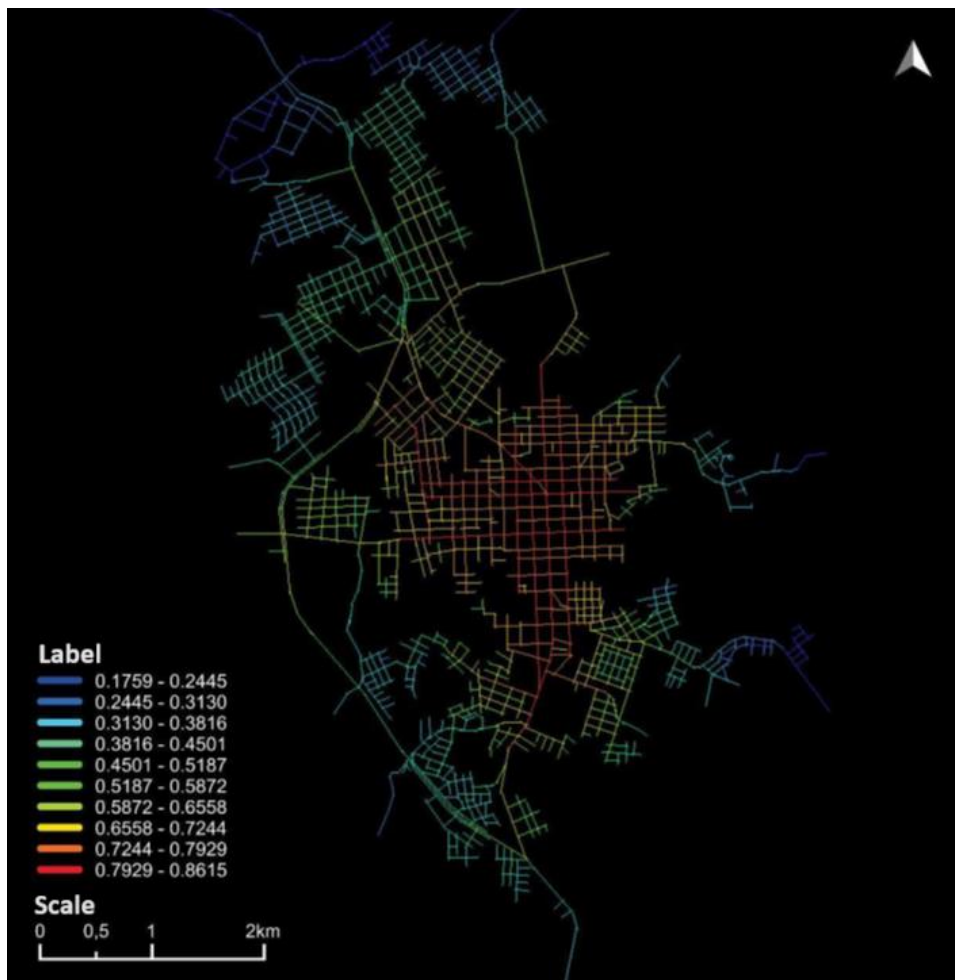
Figure 3 – Total connectivity map of the city of Marau/RS



Source: Authors, 2023.

Integration is based on proximity centrality. According to Hillier (2008), it refers to the ease of getting from one point to another in the city. In Figure 4 below, it can be seen that despite not having a high degree of connectivity, the city has an interesting integration due to the rectilinear network that requires less change of route when moving around urban space. Also related to the road network, and despite the difficulty of connecting at different points in the city, in general, the regular urban network allows for easier spatial legibility and user orientation regarding the origin and destination of travel.

Figure 4 – Integration map of the city of Marau/RS



Source: Authors, 2023.

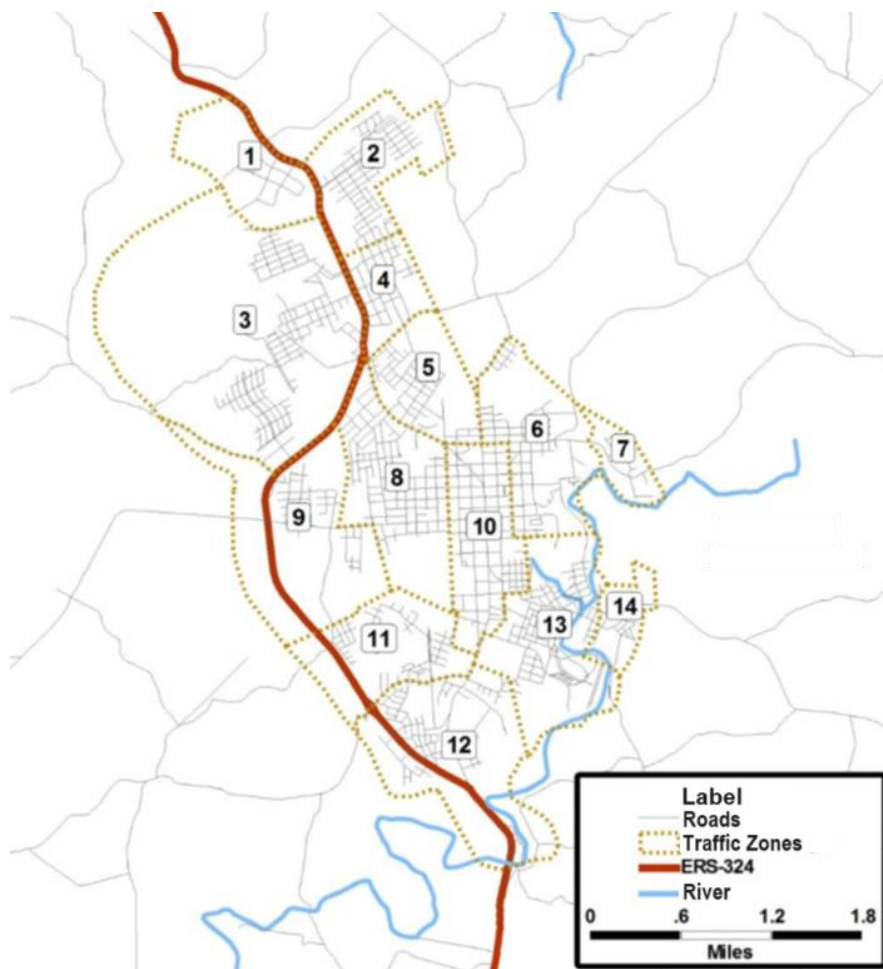
Through the integration metric it is possible to understand some important social processes, such as why some sectors have a greater flow of people than others, socio-spatial segregation, changes in land use and occupation, urban expansion, among others. factors.

### 4.3 Urban Mobility



From a survey carried out in 2017 in more than 700 residences in the 56 neighborhoods of the city of Marau to prepare the Consolidated Report of the Urban Mobility Plan of the Municipality of Marau – Plamob (MARAU, 2019), resulted in a rich database on population and mobility in the urban axis. Additional information on mobility was also obtained (MARAU, 2019), which helps to understand urban mobility in Marau. When preparing the survey regarding the municipality's mobility for the Plamob report (MARAU, 2019), the neighborhoods were grouped into sectors, to carry out an origin and destination - O/D research. The sectorization of the city allows for a wider sampling of population centers, resulting in 14 sectors for the urban area and 4 sectors for the rural area and destinations for other cities, configured as shown in Figure 5 (MARAU, 2019).

Figure 5 – Map of urban planning sectors and the road system



Fonte: Marau (2019, p. 62).

Plamob Marau (MARAU, 2019) presents guidelines for urban accessibility, the cycling network, the collective public passenger transport system, individual public transport – taxi, school transport, chartered transport, the road system, individual transport motorized vehicles, freight transport, road signage, road safety, and mobility related to the city's urban development, as well as improving control and management, encouraging fundraising for

integration projects and road infrastructure works , with priority given to pedestrians, public transport, road safety and non-motorized vehicles.

Next, data from the Plamob Consolidated Report (MARAU, 2019) is analyzed, as well as the results obtained from the research on the main means of transport used in the object of study, divided according to the sector of residence, age group and of the average monthly income. Also, satisfaction with the conditions involving these modes and the reasons why the population avoids walking in their neighborhoods is observed.

In the survey for the Consolidated Report, it was observed that cars are present in 79% of homes in Marau, followed by the motorcycle present in 13% of homes and, by the bicycle present in 4% of homes, in the remaining 4% of homes not there were no records of any type of vehicle (MARAU, 2019). Regarding the period of activity of residents, 57% carry out their main activity full-time, morning and afternoon, 8% in the morning shift and 16% in the afternoon shift, highlighting the role that Marau plays as a city of activities daytime (MARAU, 2019). In a quick analysis of the use of urban space, it is possible to identify that the high flow of people in the early afternoon can interfere with mobility, being the highest rate of activities (MARAU, 2019).

The quantitative research carried out via an online questionnaire obtained data referring to 84 residents of the municipality of Marau/RS, these belonging to 11 of the 15 sectors into which the municipality is divided. With similar age groups, 27 of those questioned (32.1% of 84) are between 18 and 24 years old, followed by 21 of them (25% of 84) who are between 40 and 59 years old, and, with 15 respondents (17, 9% of 84) being between 25 and 39 years old and the same number over 60 years old, while the smallest portion (7.1% - 6 of 84) is under 17 years old.

With the research, it can be observed that the significant majority of respondents (77.4% - 65 of 84), regardless of the housing sector, have individual motorized transport as their most used mode. The only exception is sector 6, in which the only mode used by residents is active transport. Among the collective and active modes, active transport is the second most used mode (19% - 16 of 84) followed by the use of public transport, which represents the minority of respondents. In an analysis of the sectors, the results of sector 10 stand out, with the majority (75.8% - 24 of 33 residents of the sector) opting to use a motor vehicle for daily transportation. Also, the expressive majority of residents of sector 3 (66.6% - 6 of 9), of sector 5 (80% - 4 of 5), of sector 8 (80% - 4 of 5), of sector 13 (85.7% - 6 of 7) and sector 11 (75% - 9 of 12) claim to travel using individual motorized transport in their daily routine. Furthermore, residents of sectors 4, 9 and 12 unanimously point out that they use their cars for daily commuting.

In relation to the age group, similarities are noted between the proportions of need for motor vehicles to move older individuals, where there were no significant divergences between the classes. The majority of respondents (73.8% - 62 out of 84), regardless of age group, stated that they use vehicles for transportation. However, the group under 18 years of age has the majority of respondents (66.6% - 4 of 6) indicating the use of active transport as the main mode of everyday life, while the remainder (33.3% - 2 of 6) indicate travel using cars, suggesting dependence on a qualified person responsible for their mobility. For the group of respondents between 18 and 24 years old, the use of motor vehicles stands out (85.2% - 23 of 27) as the main mode of everyday life, followed by the use of active transport, without the use of public

transport. Furthermore, for respondents aged between 25 and 39 years old, the motorized means of individual transport presents the greatest use (86.7% - 13 of 25), while active transport is used by the remainder of respondents. For the group of residents between 40 and 59 years old, the main mode continues to be individual motorized transport (67.7% - 14 of 21), followed by active transport adopted by 5 respondents and the use of public transport by 2 residents in this age group. Likewise, respondents from the group over 60 years of age opt mainly for individual motorized transport (86.7% - 13 of 15), while the minority opts for active transport and the same number use collective transport as a mode of use for the everyday.

For the relationship between the mode of transport adopted for daily use and the average family income, expressed in national minimum wages, in the group with the largest fraction of respondents, the average monthly family income is above 5 minimum wages, highlights there is a high level of use of automobiles for everyday life, with a significant adoption of the individual motorized transport mode (87.2% - 34 of 39), while demonstrating the low use of active transport by this portion of the population. Next, the group of Marau citizens with an average family income of 3 to 5 monthly minimum wages shows the use of vehicles by the majority of the group (70.4% - 19 of 27), followed by the adoption of the active transport system, while a respondent states that he uses public transport for his daily commute. For the group with an average income between 2 and 3 minimum wages per month, the use of vehicles as the main means of transport remains predominant (55.6% - 5 of 9), followed by the use of active transport and public transport, tied. While in the group with an average monthly income of less than two minimum wages, the most relevant mode is the use of vehicles for daily transportation (77.8% - 7 out of 9) followed by active transport, with no evidence of use of public transport. However, a statistically significant relationship (Cross Tabulation, Phi = 12.928, Sig. = 0.044) was found between the number of people in the residence and the number of vehicles in the residence.

#### 4.3.1 Individual Motorized Transport

Individual motorized transport represents the largest portion of the city's trips, with around 14 thousand trips daily, highlighting sector 10 with more than 6,500 daily trips, sector 8 with attraction and generation in the range of 1,700 trips, sector 3 generating in around 1,000 trips per day and sector 12 at the level of 850 trips per day (MARAU, 2019).

For Marau citizens who point to individual motorized transport as the main means of transport in their daily lives, when asked about their satisfaction with the mode, they state, on average, that they are indifferent or satisfied with the conditions mentioned in Table 1. Regarding road paving and signage public services, the largest portion of citizens are satisfied (40% - 36 out of 65), followed by the group that shows indifference (32.3% - 21 out of 65) in relation to this condition. As for the lighting of public roads, the majority of respondents (73.8% - 48 out of 65) expressed satisfaction. In analyzing safety conditions on public roads, the largest portion stated satisfaction (38.5% - 25 of 65), followed by the group that appears indifferent (32.3% - 21 of 65).

Table 1 - Level of satisfaction of respondents regarding physical conditions that interfere with the use of Individual Motorized Transport

Physical conditions	Satisfaction Level				
	1	2	3	4	5
Paving and signage of public roads	1 (1,5)	5 (7,7)	21 (32,3)	26 (40)	12 (18,5)
Public street lighting	1 (1,5)	4 (6,2)	12 (18,5)	32 (49,2)	16 (24,6)
Traffic volume on public roads	7 (10,8)	5 (7,7)	28 (43,1)	19 (29,2)	6 (9,2)
Safety on public roads	2 (3,1)	10 (15,4)	21 (32,3)	25 (38,5)	7 (10,8)
Availability of parking spaces on public roads	4 (6,2)	12 (18,5)	27 (41,5)	14 (21,5)	8 (12,3)

Source: Authors, 2020.

Note: The values in parentheses represent the percentage of respondents in the line in relation to the 65 respondents in this section.

However, when asked about the level of satisfaction regarding the volume of traffic and the availability of parking spaces on public roads, the group that stood out expressed indifference.

#### 4.3.2 Active Transport

According to the report, 9,613 trips are made per day on foot, in this mode the central area of the city, sector 10, is the largest generator and attractor, being the destination of 5,389 trips per day, 56.1% of trips, this due to its concentration of commerce and services. Sectors 8, 12 and 13 are at the level of 800 trips per day, and sector 3 with 549 trips on foot per day (MARAU, 2019).

For Marau citizens who point to active transport as the main means of transport in their daily lives, when asked about their satisfaction regarding the use of the mode in the research, they point out satisfaction in most of the conditions, except in relation to accessibility on public roads and sidewalks, where a large part of the respondents (43.7% - 7 of 16) position themselves as dissatisfied or very dissatisfied. Furthermore, Table 2 shows that the majority of citizens (75% - 12 of 16) say they are satisfied with the distribution of safety lanes for crossing public roads. Regarding paving and signage on roads and sidewalks, there were no significant differences and the largest portion of respondents (31.3% - 5 of 16) were indifferent. For the lighting of sidewalks and public roads, the majority of citizens who adopt active transport in their daily lives (56.3% - 9 of 16) say they are satisfied or very satisfied, followed by respondents who say they are indifferent (37.5% - 6 of 16) regarding this condition.

Table 2 - Level of satisfaction of respondents regarding physical conditions that interfere with the use of Active Transport

Physical conditions	Satisfaction Level				
	1	2	3	4	5
Paving and signage of public roads and sidewalks	1 (6,3)	3 (18,8)	5 (31,3)	4 (25)	3 (18,8)
Distribution of safety lanes for crossing public roads	-	4 (25)	-	8 (50)	4 (25)
Lighting of public roads and sidewalks	1 (6,3)	-	6 (37,5)	5 (31,3)	4 (25)
Accessibility on public roads and sidewalks	3 (28,8)	4 (25)	1 (6,3)	6 (37,5)	2 (12,5)

Source: Authors, 2020.

Note: The values in parentheses represent the percentage of respondents in the line in relation to the 16 respondents in this section.

Furthermore, when asked about the main reasons for avoiding walking in their neighborhoods, some interviewees commented that they avoid walking in their neighborhoods, mainly due to the lack of safety and infrastructure on public roads.

#### 4.3.3 Public Transport

Public transport in the municipality does not have a significant expression in relation to other modes, with a number of 1,354 trips per day, 10 times lower when compared to individual transport, also highlighting a greater number of destinations for sector 10, with 497 trips, (MARAU, 2019).

As in this research a small number of respondents (n=3) stated that public transport is their main means of transport in everyday life, data will not be presented quantitatively as they are not representative. Respondents reported that they were dissatisfied with the vast majority of conditions raised in the questionnaire (Public transport system, Distribution of bus stops, Bus line options, Maintenance of bus stops, Available bus schedules, Bus punctuality, Quality/ fleet maintenance, driver/conductor service, and bus ticket prices). Furthermore, residents who adopt this mode are unanimously indifferent regarding the number of bus stops and the cleanliness of the bus fleet.

## 5 CONCLUSIONS

According to the literature review, this research presents as a problem the urban mobility in cities, aiming to understand the particularities of a small city located in the interior of the state of Rio Grande do Sul, where a survey of physical conditions was carried out and, from the application of a questionnaire, it was possible to understand which modes are most used by sector, by age group and by income, and to verify which are the main problems existing in the means of transport, based on the level of user satisfaction.

From the road and topographic map, it can be seen that the municipality has good mobility flow, from the urban design it is possible to observe the possibility of a good understanding of the urban network, despite presenting some problems related to topography and connectivity. However, these conditions do not appear to be well used, since public transport does not serve the population. When analyzing the user satisfaction report, problems are observed in the use of public transport, mainly in relation to the inefficient management of this mode.

Furthermore, the morphology of the city, observed from space syntax analysis, allows for the proper development of active and collective transport, but the way in which neighborhood infrastructure is treated for walkability, the use of bicycles and public transport does not allow that the city achieves good mobility and accessibility performance. However, the urban fabric presents a clear possibility of implementing cycling paths or lanes from the main arterial roads, which are the avenues that cross the central area of the municipality, a place with greater flow and connectivity potential, however, there is no prospect of this implementation. Also, there are problems related to the physical characteristics of neighborhoods such as



topography, infrastructure, security and management that make walkability difficult.

When comparing data from Plamob Marau Consolidated Report (2019) with results obtained through this research, in relation to the use of transport, the differences in use between sectors and profiles of those who use them (age and income), deficiencies and potentialities between modals and challenges raised, one can observe the majority use of individual motorized transport, which is considered the most harmful means of transport for urban mobility, while the modal least adopted by the population is public transport, precisely the means with the greatest potential for mitigating the negative impacts of mobility in a city. Furthermore, the high rate of automobiles can be frightening when compared to the exponential growth it has been taking over the past few years. It is also observed that the use of individual motorized transport by residents is a constant in all groups analyzed, while the use of collective and active transport is mainly seen in sectors further away from the central area of the city, where there is less investment in infrastructure and equipment by the public authorities and a lower average monthly income rate is observed by the families analyzed based on the urban mobility questionnaire. Furthermore, observing the relationship between the diagnosis of the object of study and objectives of the Urban Mobility Plan, which aim to prioritize pedestrians, cyclists and the use of public transport, it is noted that in the municipality of Marau, due to its particularities in physical characteristics and their problems in the implementation and management of infrastructures, this is not what happens.

However, the majority of residents are satisfied with the conditions linked to Individual Motorized Transport. While for Active and Public Transport modes, users claimed indifference and dissatisfaction in a large part of the conditions, with a reasonable amount of the factors referring to management and public infrastructure.

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