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Urban Mobility in Assis - Brazil: Analyzing the Impact of Federal Legislation on Local Transport Planning

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ABSTRACT
The study seeks to analyze the effectiveness and compliance of the Assis Municipal Urban Mobility Plan, approved in 2023, with current legislation. Furthermore, it intends to evaluate the impact of the plan on promoting sustainable urban mobility patterns, identifying the main challenges and opportunities in its implementation. The research was conducted in stages using qualitative and quantitative methods. The first stage involved data collection through the text of the Municipal Plan, meeting minutes, public hearing reports and administered questionnaires. Next, a content analysis was carried out comparing the requirements established by Federal Law No. 12,587/2012. This study is part of the context of the need to update and effectively implement urban mobility plans in Brazilian cities, especially medium-sized ones like Assis. The academic relevance lies in the detailed assessment of legal compliance and the real impact of these plans on the quality of urban life, filling a gap in the literature on sustainable urban mobility and urban planning. The main results indicate that the Assis Urban Mobility Plan complies with current legislation, but also highlights areas that require improvements, especially in terms of accessibility, maintenance of cycling infrastructure and integration between different modes of transport.

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I. INTRODUCTION

The issues surrounding urban mobility in Brazil have always permeated political and academic discourse, particularly due to their impact on the urban environment. Neto and Galindo (2015) reflect on the legal and juridical aspects of the legal framework of Urban Policy, highlighting how the promulgation of the City Statute in 2001 "made the development of Public Transport Master Plans mandatory for Brazilian municipalities with populations over 500,000 inhabitants, initially focusing on motorized public transport."

The authors emphasize that, even in 2005, through Resolution No. 34 of the Cities Council, there was a change in the nomenclature, renaming it to the Transport and Mobility Master Plan (PDTM), opening the possibility of including "various modes of transport, respecting local specificities, and prioritizing pedestrians" (Neto and Galindo, 2015).

Several factors and problems associated with urban mobility in cities, especially public collective transportation, such as the total inadequacy of vehicles, road congestion, excessive air pollution, and increasingly violent accidents, have led to the need to revise strategies for promoting the sustainable mobility standards established in current legislation.

From this perspective, Federal Law No. 12.587/2012, known as the 'Mobility Law,' is an important milestone in the management of urban mobility in Brazil. This legislation defines principles and guidelines aligned with sustainable mobility concepts and makes the development of Urban Mobility Plans integrated with municipal master plans mandatory.

Promulgated in 2012, after years of discussions and debates, the law establishes guidelines and instruments to guide municipalities in planning transportation systems and road infrastructure that meet the population's needs and promote sustainable urban development. It also establishes the need for a systematic evaluation, revision, and updating of these plans, making the use of tools to monitor mobility conditions

essential. To address these challenges, the use of indices and indicators for diagnosing and monitoring urban conditions is a viable alternative (Oliveira and Silva, 2015).

The law also provides for the use of specific tools and indicators to assist in the evaluation and monitoring of mobility. The Sustainable Urban Mobility Index (IMUS), for example, diagnoses the mobility conditions of a municipality or metropolitan region, guiding planning and management policies. The application of the IMUS allows for the comparison of results between different municipalities, contributing to the continuous improvement of urban mobility conditions (Brasil, 2001).

The requirement for the development of Urban Mobility Plans is one of the pillars of the regulation. These plans must be integrated and compatible with municipal master plans, ensuring a coordinated and efficient approach to managing urban mobility. Approximately 3,065 Brazilian municipalities, representing more than 55% of the total, are required to develop and implement these plans, which must be periodically evaluated, reviewed, and updated (Brasil, 2001).

In 2015, the local media reported the non-approval of the Urban Mobility Plan "due to a lack of resources and personnel," according to the then Secretary of Works, Services, and Planning, Valter de Souza Filho. According to the secretary, the difficulty in developing the plan arises due to a lack of resources, engineers, and responsible technicians, as we only have three people to oversee all the city's works. The Urban Mobility Plan must be carried out in partnerships with private institutions, as well as state and federal governments. We do not have the resources to do it alone, as so far only 30% of the national municipalities have implemented it. There is also a bill proposed by Congressman Carlos Bezerra (PMDB – MT), through Law No. 7898/2014, to postpone it until 2018; however, we are striving to implement it as soon as possible (Filho, 2015).

From this perspective, there was a delay in the drafting of the referred law, and discussions only began in 2022. The aim was to "improve sustainable mobility for the city's residents by promoting accessible, efficient, and safe transportation for all." To achieve this, a public consultation was held through public hearings and questionnaires made available on the city's website to gather data and suggestions for transportation improvements.

With the approval of the plan in 2023, its implementation is expected to take place in 2024. Among the main actions planned are the construction of bike lanes, the revision of public transport line structures, and the integration of different modes of transport. However, it is essential to carry out a critical analysis to ensure that the plan complies with current legislation and meets the real needs of the population.

The overall objective of this research is to analyze the effectiveness and compliance of the Assis Municipal Urban Mobility Plan, approved in 2023, with current legislation, as well as to assess its impact on promoting sustainable urban mobility patterns. The research aims to identify the main challenges and opportunities in the implementation of the plan, in addition to verifying whether the proposed actions are aligned with the real needs of the population and contribute to improving the residents' quality of life.

II. MATERIAL AND METHODS

The research methodology aims to evaluate the effectiveness and compliance of the Municipal Urban Mobility Plan, focusing on the city of Assis-SP. The research will be conducted in phases, using both qualitative and quantitative methods to provide a comprehensive view of the plan's impact and implementation.

Phase I: Data Collection

The first phase involved gathering data such as the text of the Assis Municipal Urban Mobility Plan, meeting minutes, public hearing reports, and administered questionnaires. This initial phase allowed the transcription of the information contained in the reports and questionnaires used by the city government to investigate patterns in the responses of users.

Phase II: Content Analysis

After collecting all available materials, a content analysis was performed, comparing the requirements established by Federal Law No. 12.587/2012. This phase identified points of compliance and divergence between the plan and the legal framework.

Phase III: Review and Documentation

Finally, the last phase consisted of reviewing and drafting the text to ensure clarity and accuracy in the analysis and findings. This stage was aimed at ensuring that the findings from the earlier phases were clearly articulated and accurately reflected in the final report. The documentation process included refining the analysis, clarifying the key insights drawn from the content analysis, and ensuring that the conclusions were supported by solid evidence from the collected data.

This section presents the phase-wise description of the developed risk-impact assessment methodology.

III. THE URBAN MOBILITY PLAN OF ASSIS (BRAZIL)

The city of Assis, located in the interior of the state of São Paulo, was founded on July 1, 1905, by Captain Francisco de Assis Nogueira, through an act of land donation to the Catholic Church. There was later development with the arrival of the Sorocabana Railway (EFS), and in the 1950s, the road transport model became the most common in the city.

The transportation issues faced by Assis are not unusual for medium and large cities, such as the lack of accessible sidewalks, poor quality pavement, the formation of heavy traffic congestion, and the deterioration of public transportation systems in favor of private automobiles. It was in this context that, in 2022, the initial studies for the local urban mobility plan and policies to implement it began.

Initially, various representatives of civil society, such as architects and engineers from the city government, were involved, bringing different approaches to urban mobility. The main objective of this initial discussion was to provide an overview of the population's demands (Figure 1).

Figure 1: Public hearing on urban mobility plan for Assis city.

Through the minutes of this meeting, it is possible to observe that there was a division of topics, with the first being "Laws and Regulations Studied," highlighting which legislation served as the framework for this initial dialogue. The following laws can be mentioned: Ordinary Law No. 3/1918 – Code of Postures of the Municipality of Assis, Law No. 6766/1979 – Urban Land Parceling, Law No. 10.257 – City Statute, Law No. 12.587 – National Urban Mobility Policy, as well as various standards from the Brazilian Association of Technical Standards (ABNT). The material also included images to illustrate the most important aspects of the mobility plan, as seen in Figure 2.

Figure 2: Principles, Objectives, and Guidelines of the Mobility Plan.

Through the illustration, it is possible to observe various objectives to be achieved through the National Urban Mobility Policy (PNMU), with the first item being "Public and Collective Transport Service." Other relevant aspects are presented, such as universal accessibility in item IX and the integration of transport modes in item V.

Another topic addressed in this discussion was accessibility, which included a study conducted in 2010 involving individuals aged 10 years and older who have mobility issues. The data obtained show a significant number of individuals who have universal accessibility in the city for mobility (Table 1).

Table 1: Survey on Individuals with Reduced Mobility in Assis

Titles	Motor Disability	Visual Disability	Seniors Aged 60 to 69	Seniors Over 70
Cannot manage at all	452	202	-	-
Great difficulty	1812	2522	-	-
Some difficulty	4197	11407	-	-
Total	**6461**	**14131**	**7093**	**6350**

The table indicates three levels of mobility difficulty: cannot manage at all, great difficulty, and some difficulty. This survey highlights the need for urban mobility policies that address these specific demands of the population. The absolute number of people affected by this issue is over 26,000 in Assis. Most individuals with motor and visual disabilities experience some or great difficulty in mobility. Although the number of people who cannot move at all is smaller, it remains significant and requires special attention.

Despite the data highlighting the number of people needing accessibility, several issues must be addressed:

- **Insufficient Infrastructure:** Brazilian cities, including Assis, often lack adequate infrastructure to ensure the mobility of individuals with disabilities. Irregular sidewalks, lack of ramps, inadequate traffic signals, and non-adapted public transport are common problems.
- **Legislation and Implementation:** Although there are laws and regulations aimed at ensuring accessibility (such as Law No. 10.098/2000 and Decree No. 5296/2004), the effective implementation of these standards is often neglected. This is reflected in the persistent physical barriers in the urban environment.
- **Awareness and Education:** There is a need for greater awareness and education about the importance of accessibility, both for public managers and the general population. A lack of understanding regarding the needs of individuals with disabilities can result in mobility projects that do not address these demands.

The next topic to be discussed was Transportation, beginning with a current discussion about the legality of ride-sharing cars and the possibility of creating a municipal app to consolidate this service into a single platform. Ruiz and Tigre (2015) discuss in their work the incorporation of the app into an individual's life and its relationship with the city. The authors point out that this demand comes from the population, not from public authorities, making it a bottom-up decision.

They also clarify that there is a high potential for leveraging data and information for urban management, providing increasingly accurate and real-time diagnostics. Souza (2023, p. 3) addresses the issue of smart cities and the use of Information and Communication Technology (ICT) as a tool for urban planning and collective decision-making, such as public transport. The author further elaborates on the topic that smart city systems are highly welcome if they contribute to building more efficient and inclusive cities; smarter in their mobility, thanks to an urban planning system intelligently aligned with efficient public transport systems; safer by promoting inclusion; and timelier by utilizing connectivity systems (Souza et al., 2023).

Another topic addressed was bike lanes, presenting a survey of the bike lanes and bike paths currently implemented in the city, new connections with the city's deactivated railway, and possibilities for creating more exclusive areas for bicycles. In this regard, the bus lines for public transport were also a topic of discussion during the meetings.

The architecture sector of the city hall presented a report on the poor conditions in which the buses are found, highlighting the increasing deterioration of the bus fleet, the scarcity of companies interested in bidding for the public tender to take over local public transport, the lack of exclusive lanes for these buses, and the possible introduction of electrified lines.

As previously mentioned, the deactivated railway in the city was part of the discussion, with proposals for increasing lighting along its entire route, creating permeable pavement alongside the tracks, and finding a use for this space that has been unused for over 30 years. Later, the methodology adopted for implementing the mobility plan was presented, with the theoretical framework being the first point of discussion. It is evident that relevant authors and researchers in the study of urban dynamics were consulted for this stage (Figure 3).

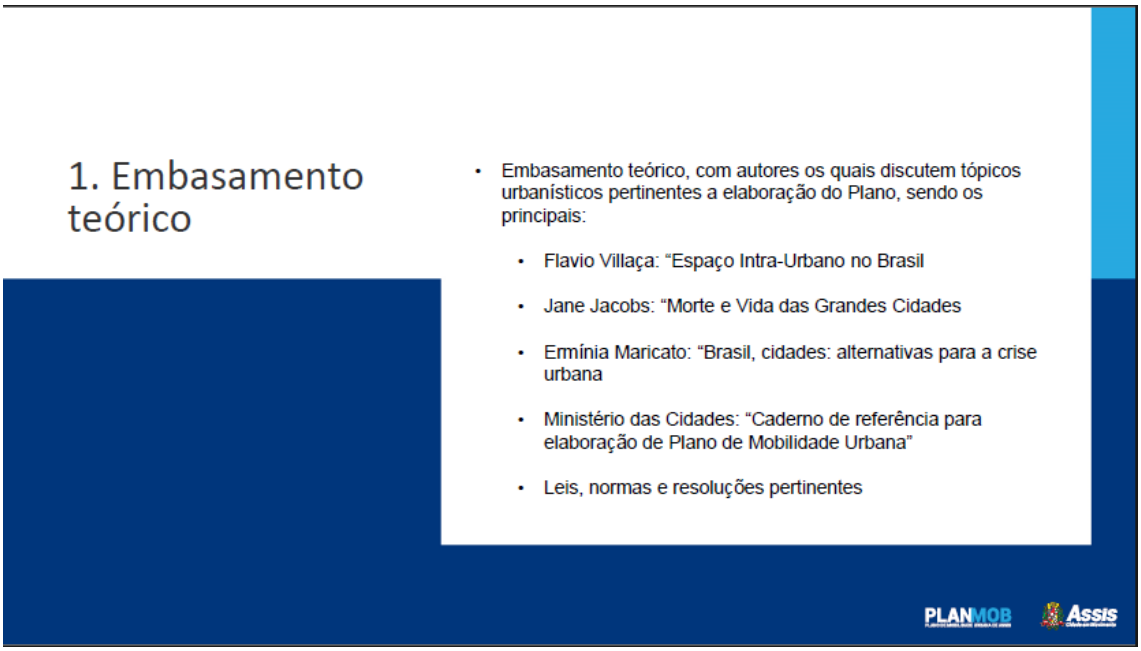

Figure 3: Theoretical Framework Presented by the City Hall of Assis

Notably, the presence of authors such as Villaça stands out, who in his work *Espaço Intra-Urbano no Brasil* (1998) outlines the structures of Brazilian cities, pointing out how the segregation and elitization of central areas and the displacement of the poorer populations to the fringes of the city only contribute to a more fragmented urban fabric. The author also highlights the need for a connection between public policies and a more equitable distribution of land for the less privileged population in his research.

Another work cited by the city hall is by author Jane Jacobs, *Vida e Morte das Grandes Cidades*, published in 1961 and still relevant today. The text argues that the vitality of cities is directly related to busy streets, mixed-use spaces, and greater interaction among residents. Her work emphasizes the need for policies that foster vibrant and inclusive urban life, challenging traditional concepts of urbanism and influencing generations of planners and architects.

The third work mentioned is by architect and urban planner Ermínia Maricato, *Brasil, Cidades: Alternativas para a Crise Urbana* (2001), which offers an in-depth analysis of socio-spatial inequalities in Brazilian cities and critiques urban policies that perpetuate these inequalities. Maricato advocates for the need for urban reform that includes fair housing policies, better urban land management, and greater public participation in urban planning.

In addition to these works, various regulations from the Ministry of Cities and resolutions were consulted to support the adopted methodology. The second part of the methodology pertains to the Diagnosis that should be conducted in the city to form working and discussion groups in 2023. It was decided that brochures would be used to obtain primary and secondary data, along with the creation of indicators. An online questionnaire open to the public for information gathering was also made available on the city hall's website (Prefeitura Municipal de Assis, 2023).

A 30-day interval between ordinary meetings and a 7-day interval for extraordinary meetings was established. The promotion of meetings and public hearings received encouragement to increase community participation. Urban analyses will be conducted through the creation of thematic maps using the data collected.

The third topic to be discussed was the Prognosis intended by the public sector. It was estimated that, after collecting information, analyzing it, and generating maps and graphs, it would be possible to understand the future impacts of urban growth on mobility. The goals of the law, as well as its strategic actions, could be established for the short, medium, and long term. Finally, an investment program in urban mobility was agreed upon, along with enhanced monitoring of urban structure and constant review of the plan.

The promotion of meetings and public hearings is essential to ensure active community participation in the urban planning process. The creation of thematic maps will allow for a clear visualization of areas needing improvement, facilitating informed decision-making. Furthermore, the collection of detailed data is fundamental to identifying mobility patterns and forecasting the impacts of urban growth.

The urban mobility investment program aims not only to improve existing infrastructure but also to promote sustainability and social inclusion. Investments in high and medium-capacity public transportation, such as urban trains and subways, are essential to reduce dependence on motorized individual transport and

decrease pollution. Integration among different modes of transportation and the creation of bike lanes and cycle paths are also important strategies to improve urban mobility (Prefeitura Municipal de Assis, 2023).

The constant review of the urban mobility plan is crucial to ensure it remains relevant and effective considering changing urban dynamics. Implementing a continuous monitoring system will allow for the quick identification of problems and the adoption of corrective measures. Additionally, community participation in the review process of the plan is fundamental to ensure that the needs and expectations of residents are met.

IV. RESULTS

In 2023, the results obtained from the data collection were made available, and the information was transposed into maps and graphs to facilitate the population's understanding of each discussed topic. The most significant results will be presented next.

The first topic is the inventory of the pedestrian circulation system, which includes accessibility conditions, characteristics of the sidewalks, such as width, materials used, slope, ramps, state of conservation, among others. The inventory of the circulation system for bicycles (bike lanes and cycle paths) also includes characteristics and state of conservation (Figure 4).

Figure 4: Illustration of Sidewalks Classified as Passable and Impassable

The documentation presented by the Municipal City Hall of Assis (2023) details the components of the Pedestrian Circulation System Inventory through its texts, addressing various aspects of sidewalks and their impact on accessibility, such as sidewalk width, which serves as an assessment to determine if the width is adequate for safe and comfortable pedestrian movement. Narrow sidewalks can hinder movement, especially for individuals with reduced mobility or those in wheelchairs.

There is also mention of the materials used for sidewalks, identifying and analyzing the types of materials employed in sidewalk paving. This includes checking if the materials are durable, slip-resistant, and suitable for different weather conditions, ensuring safety and comfort for pedestrians. The slope of these sidewalks was also recorded to determine if it is adequate for accessibility, especially for people with reduced mobility. Excessive inclines can make it difficult or impossible for wheelchair users and other pedestrians with mobility challenges.

Another evaluated item was the access ramps, through an analysis of the availability and conditions of access ramps on sidewalks. Ramps are essential to ensure that wheelchair users and other individuals with reduced mobility can access and use sidewalks independently and safely. The condition of the ramps was also assessed, looking at the overall state of the sidewalks, considering wear and tear, the presence of potholes, cracks, and other obstacles that may compromise pedestrian safety. Poorly maintained sidewalks can pose significant accident risks (Prefeitura Municipal de Assis, 2023).

The assessment also presents the Inventory of the Bicycle Circulation System, which examines the infrastructures dedicated to cyclists, such as bike lanes and cycle paths. This inventory addresses two main aspects, the first being the characteristics of bike lanes and cycle paths. The survey involved a detailed evaluation of the specifications of the infrastructures dedicated to cyclists. The main points considered include:

- **Width:** Measurement of the width of bike lanes and cycle paths to ensure they are sufficiently spacious for safe cyclist movement.
- **Signage:** Verification of the presence and adequacy of signage in cycling infrastructures, including ground markings, signs, and traffic lights specific for cyclists.
- **Separation from Motor Vehicle Traffic:** Assessment of the existence and effectiveness of physical barriers or markings that separate cyclists from motor vehicle traffic, increasing user safety (Prefeitura Municipal de Assis, 2023).

The second topic addressed is the state of conservation. This assessment checks the conditions of use for bike lanes and cycle paths, identifying potential problems that could compromise the safety and efficiency of cyclists' movement. The main aspects considered include:

- **Potholes and Cracks:** Identification of surface damages in cycling infrastructures, such as potholes and cracks, which can pose accident risks for cyclists.
- **Lack of Maintenance:** Evaluation of the frequency and quality of maintenance for bike lanes and cycle paths, ensuring they are always in good condition for use (Prefeitura Municipal de Assis, 2023).

The Inventory of the Public Transport Circulation System focuses on analyzing and identifying the routes used by public transport, as well as critical aspects for the efficiency of the system (Figure 6).

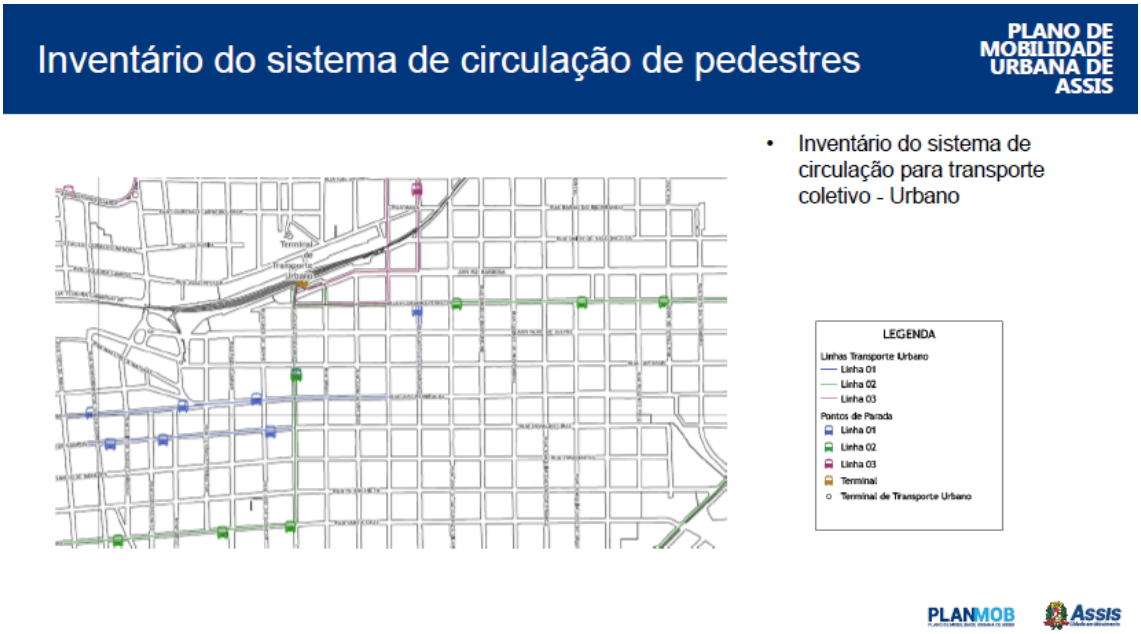

Figure 5: Illustration of Sidewalks Classified as Passable and Impassable

The proposal also outlines four main aspects of the inventory of the public transport circulation system, which are: the identification of Routes, involving the detailed mapping of the routes used by buses and other forms of public transport. This helps visualize and understand the paths that public transport vehicles take throughout the city. Another aspect is the hierarchy of roads, which consists of classifying roads according to their importance and use within the public transport system. The roads are organized into a hierarchy that may include main avenues, secondary streets, and local roads, based on their role in traffic flow.

The inclusion of urban and intermunicipal terminals in the proposal appears promising, with a study of the location and evaluation of the conditions of public transport terminals. The analysis focuses on the capacity of the terminals (the number of vehicles and passengers they can accommodate), accessibility (ease of use for everyone, including people with reduced mobility), and the connections offered (how the terminals interlink with other routes and modes of transport).

The document mentions the integration between pedestrians and public transport, analyzing the interactions and connections between public transport systems and pedestrian routes. The goal is to facilitate the transition between transport modes, ensuring that pedestrians can easily access public transport and move between different modes of transportation efficiently and safely (Prefeitura Municipal de Assis, 2023).

Finally, the last topic presented is the Traffic Control Inventory, which focuses on analyzing and evaluating the infrastructure for traffic monitoring and control. This inventory is crucial for ensuring efficient traffic management in the city and encompasses three main aspects (Figure 7).

Figure 6: Positioning of Cameras and Traffic Lights in the Urban Area of Assis

This topic addressed the location of cameras, with the aim of identifying and mapping the positions of surveillance cameras spread throughout the city. These cameras are essential for monitoring vehicle flow, detecting congestion, accidents, and other situations that may affect traffic. The presence of cameras allows for a quick response to problems and the implementation of measures to improve traffic flow.

The signaling of electronic traffic lights involves analyzing the signage present on the roads, ensuring that all signaling devices are functioning correctly, are visible, and are positioned effectively to guide drivers and pedestrians.

The last subject discussed was the description of the capabilities and operations of the traffic control center and its responsibility to examine the technological capabilities and operational methods of the center responsible for monitoring and electronically supervising traffic. This includes the technologies used for monitoring and control, such as real-time traffic management systems, and the procedures adopted to coordinate responses to traffic incidents (Prefeitura Municipal de Assis, 2023).

V. DISCUSSION AND CONCLUSION

Compliance with legal standards and the implementation of effective public policies are crucial for promoting safer, more inclusive, and sustainable urban mobility in Assis. However, this compliance should not be viewed merely as a formality but as a real and ongoing commitment to addressing the needs of the population. Therefore, assessing the applicability of the city's new urban mobility plan is not only necessary but urgent to ensure that the desires of the community are genuinely met.

As noted in this work, there has been a significant delay in developing the plan, often justified by a lack of technical staff and financial resources. This situation not only prevented the municipality from securing federal funding but also delayed essential investments in the field of urban mobility, perpetuating a cycle of inaction and frustration among citizens. The reality is that the lack of planning and resources is not just a logistical issue; it reflects a lack of political commitment to resolving the mobility problems faced daily by residents.

Once the discussion about the plan began, important advancements were made, particularly regarding public participation in hearings. The mobilization of the community, which demanded changes and made claims, should be recognized as a positive step, but it is necessary to question: to what extent are these demands truly being heard and integrated into the planning? Public participation cannot merely be a ritual; it is essential that it has a real impact on the decisions shaping urban mobility.

The conduct of detailed inventories on pedestrian, bicycle, public transport, and traffic control systems in Assis represents a significant advancement in urban planning. However, these assessments, if not accompanied by concrete actions, run the risk of becoming mere technical documents with no practical effectiveness. The data collected and presented in maps and graphs are powerful tools that should inform and guide public policy development, but it is crucial that this data translates into real interventions on the streets of the city.

Respect for accessibility laws, such as the Brazilian Inclusion Law (Law No. 13.146/2015), is fundamental to ensuring the rights of people with disabilities and promoting a more inclusive city. However, the mere existence of legislation does not guarantee its implementation. The analysis of bike lanes highlighted the need for safe and well-maintained infrastructure, but the reality on the streets often does not reflect this ideal. The lack of maintenance and the precariousness of bike lanes can discourage cycling, contradicting what the City Statute (Law No. 10.257/2001) establishes regarding sustainable mobility and urban quality of life.

The hierarchy of roads and the analysis of urban and intermunicipal terminals provided valuable insights for optimizing routes and improving terminal conditions. However, it is imperative that these analyses are not merely academic exercises but result in effective actions that genuinely enhance the experience of public transport users. Compliance with the Urban Mobility Plan (Law No. 12.587/2012) must be a constant commitment and not an objective to be achieved only on paper.

The inventory of the traffic control system highlighted the importance of a robust infrastructure for traffic monitoring and management. The strategic placement of surveillance cameras and the assessment of traffic signalization are essential for ensuring traffic fluidity and road safety. However, the effectiveness of these technologies relies on a management system that is prepared to respond quickly to incidents, which often does not happen due to a lack of investment in training and technology.

For these initiatives to be successful, continuous critical analysis and rigorous monitoring of the implementation of plans are essential. Public participation through public consultations and the use of evaluation tools are fundamental to ensuring that the adopted policies genuinely meet the needs of the population and promote sustainable urban development. Transparency and accountability are indispensable elements in this process.

In summary, although the challenges are numerous, the commitment to improving urban mobility is essential for building more inclusive, accessible, and sustainable cities. However, this improvement cannot be achieved merely through plans and proposals; it must be reflected in concrete actions that address the community's demands. The continuation of planning efforts, combined with collaboration between governments and society, is crucial for achieving the established goals and transforming urban mobility in Brazil into a reality that serves all citizens, without exception.

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