Analysis of changes in urban mobility in Bogotá, D.C.: a case study based on data from the mobility observatory (2019–2023) and recommendations for measuring its impact on public policy

Análisis de los cambios en la movilidad urbana en Bogotá, D.C.: estudio de caso basado en datos del observatorio de movilidad (2019–2023) y recomendaciones para medir su impacto en las políticas públicas

Análise das mudanças na mobilidade urbana em Bogotá, D.C.: estudo de caso com base em dados do observatório da mobilidade (2019-2023) e recomendações para medir seu impacto nas políticas públicas

Ivonne Katherine Lugo Garzón[1]
Roberto Ferro Escobar[2]

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[1] Estudiante de Maestría en Ingeniería Industrial, Facultad de Ingeniería, Universidad Distrital Francisco José de Caldas.
Email: iklugo@udistrital.edu.co
ORCID: https://orcid.org/0000-0001-7580-9267

[2] Docente, Facultad de Ingeniería, Universidad Distrital Francisco José de Caldas.
Email: rferro@udistrital.edu.co
ORCID: https://orcid.org/0000-0002-8978-538X

Abstract

This study examines the transformations in Bogotá's urban mobility between 2019 and 2023 through a detailed analysis of data provided by the Bogotá Mobility Observatory.

Objective: to analyze changes in Bogotá's urban mobility between 2019 and 2023 using data from the Mobility Observatory and to develop recommendations that enhance the measurement and effectiveness of public policies, contributing to a more sustainable and efficient urban transportation system.

Methodology: The study is based on a comparative review and analysis of mobility data collected by the Bogotá Mobility Observatory for the years 2019 and 2023. Key indicators include levels of vehicular congestion, average travel times, traffic accident rates, and the adoption of alternative transportation modes such as bicycles and public transit.

Results: The analysis indicates significant improvements in Bogotá's urban mobility during the study period. Between 2019 and 2023, vehicular congestion decreased by 20%, while the use of public and non-motorized transport modes—particularly bicycles—increased by 25%. These changes suggest a shift toward more sustainable mobility practices in the city.

Conclusion: The observed improvements reflect the effectiveness of recent mobility policies and infrastructure developments in Bogotá. The data point to a trend toward a safer, more sustainable urban transportation system, with increased reliance on alternative mobility solutions.

*Originality:*This study offers a unique perspective by focusing on the evolution of Bogotá's urban mobility over a five-year span, highlighting the influence of public policies and post-pandemic behavioral changes on transportation patterns.

*Limitations***:** The study is subject to certain limitations. It relies exclusively on data collected through surveys conducted by the Bogotá Mobility Observatory. While this data provides valuable insights into public perception and mobility trends, it may be affected by self-reporting biases or inaccuracies inherent to survey methodologies.

Keywords: Urban mobility, Mobility Observatory, trends, data, public policies.

Resumen

Este estudio examina las transformaciones en la movilidad urbana de Bogotá entre 2019 y 2023 mediante un análisis detallado de los datos proporcionados por el Observatorio de Movilidad.

Objetivo: analizar los cambios en la movilidad urbana de Bogotá entre 2019 y 2023 con base en los datos del Observatorio de Movilidad y formular recomendaciones para medir y mejorar el impacto de las políticas públicas en este ámbito

Metodología: la metodología consistirá en la revisión y el análisis de los datos proporcionados por el Observatorio de Movilidad de Bogotá para los años 2019 y 2023.

Resultados: el análisis de los datos del Observatorio de Movilidad para 2019 y 2023 revela un progreso significativo en la movilidad urbana de Bogotá. Durante este período, la congestión vehicular disminuyó un 20%, mientras que el uso del transporte público y de medios no motorizados, como la bicicleta, aumentó un 25%.

Conclusión: los cambios observados en la movilidad urbana de Bogotá destacan el progreso hacia un sistema de transporte más sostenible y seguro.

Originalidad: la originalidad de este estudio radica en analizar los cambios clave en la movilidad urbana de Bogotá entre 2019 y 2023, enfatizando el impacto de las nuevas políticas y los cambios de comportamiento pospandemia.

Limitaciones: este estudio presenta algunas limitaciones. En primer lugar, se basa únicamente en datos recopilados mediante encuestas del Observatorio de Movilidad, que, si bien reflejan las percepciones de la ciudadanía, pueden estar sujetos a sesgos o imprecisiones en el autoinforme.

Palabras clave: movilidad urbana, Observatorio de Movilidad, tendencias, datos, políticas públicas.

Resumo

Este estudo examina as transformações na mobilidade urbana em Bogotá entre 2019 e 2023 por meio de uma análise detalhada dos dados fornecidos pelo Observatório da Mobilidade.

Objetivo: Analisar as mudanças na mobilidade urbana em Bogotá entre 2019 e 2023 com base nos dados do Observatório da Mobilidade e formular recomendações para mensurar e aprimorar o impacto das políticas públicas nessa área.

Metodologia: A metodologia consiste na revisão e análise dos dados fornecidos pelo Observatório da Mobilidade de Bogotá para os anos de 2019 e 2023.

Resultados: A análise dos dados do Observatório da Mobilidade para 2019 e 2023 revela um progresso significativo na mobilidade urbana em Bogotá. Durante esse período, o congestionamento diminuiu 20%, enquanto o uso de transporte público e de modos não motorizados, como bicicletas, aumentou 25%.

Conclusão: As mudanças observadas na mobilidade urbana de Bogotá evidenciam o progresso em direção a um sistema de transporte mais sustentável e seguro.

Originalidade: A originalidade deste estudo reside na análise das principais mudanças na mobilidade urbana de Bogotá entre 2019 e 2023, enfatizando o impacto de novas políticas e mudanças comportamentais pós-pandemia.

Limitações: Este estudo apresenta algumas limitações. Primeiramente, baseia-se exclusivamente em dados coletados por meio de pesquisas do Observatório da Mobilidade, que, embora reflitam as percepções dos cidadãos, podem estar sujeitos a vieses ou imprecisões nos autorrelatos.

Palavras-chave: mobilidade urbana, Observatório da Mobilidade, tendências, dados, políticas públicas.

1. INTRODUCTION

This article aims to analyze urban mobility in the city of Bogotá, recognizing its multifaceted nature and its significant implications for public policy and the quality of life of its residents. The central objective is to examine the data that inform decision-making processes within the city. The analysis is based on information collected and analyzed by the Bogotá Mobility Observatory for the years 2019 and 2023, with the primary goal of comparing urban mobility characteristics, identifying persistent issues and emerging challenges, and evaluating the extent to which this data influences current public policies.

Drawing on the findings of this review, the study proposes practical recommendations to strengthen and improve public policy in the critical domain of urban mobility. Bogotá, as one of the most cosmopolitan capitals in Latin America and the

world, has experienced significant population and economic growth in recent years, which has directly impacted the city's mobility dynamics. In this context, the study analyzes key aspects of urban mobility, as documented through the measurements conducted by the District Secretariat of Mobility via the Mobility Observatory. The analysis encompasses various modes of transportation—including public transit, bicycles, and private vehicles—as well as infrastructure and the traffic congestion issues that continue to challenge the city.

In addition to providing an overview of the current state of urban mobility, the study seeks to identify the new and ongoing challenges facing Bogotá in the context of its rapid urban expansion. These include increasing traffic volumes, insufficient infrastructure, and concerns related to road safety. Understanding these challenges is essential for developing effective and sustainable mobility solutions.

To conduct this analysis, the study utilizes comparative data from 2019 and 2023, enabling the identification of trends and changes in mobility patterns over time. This temporal comparison provides a solid basis for assessing the evolution of mobility and the effectiveness of policy interventions.

The findings presented in this article shed light on the structural issues affecting Bogotá's urban mobility and serve as the foundation for formulating realistic, evidence-based recommendations. By employing a structured research methodology and analyzing data from reliable institutional sources, the study aims to contribute to a deeper understanding of urban mobility in Bogotá. Ultimately, it offers valuable insights to guide the design of strategies that promote more efficient, safe, and sustainable mobility in the Colombian capital.

2. MATERIALS AND METHODS

This research focuses on analyzing changes in urban mobility in Bogotá across two distinct time periods, drawing on data published by the city's Mobility Observatory. Following a comprehensive literature review, the study adopts a methodology that integrates qualitative analysis with data visualization techniques. The data obtained from the Observatory are examined to identify significant patterns and trends, providing insights into the underlying factors driving changes in mobility and their implications for public policy. The objective is not only to contribute to the academic discourse on urban mobility but also to generate practical recommendations aimed at improving the efficiency, sustainability, and responsiveness of Bogotá's transportation system. The findings are intended to support evidence-based policy-making and guide future decisions in this critical domain of urban development.

2.1. Study Context

This study focuses on Bogotá, the capital of Colombia, and the urban mobility challenges it faces. As one of the largest and most densely populated cities in Latin America, Bogotá contends with a range of mobility-related issues stemming from its rapid urban expansion and high population density.

One of the most pressing concerns is the significant traffic congestion caused by the large number of residents and motor vehicles. Daily commutes are increasingly hindered by the inadequacy of the city's transportation infrastructure. Despite efforts to expand and modernize the road network, the quantity and quality of primary arterial roads remain insufficient. These limitations result in frequent bottlenecks and prolonged travel times, affecting thousands of commuters each day [2].

Public transportation represents another critical component of Bogotá's mobility system. The city operates the TransMilenio Bus Rapid Transit (BRT) system alongside the Integrated Public Transportation System (SITP), which were implemented to unify, modernize, and improve public transit. However, these systems have struggled to meet the growing demand. The city's rapid demographic growth has outpaced the capacity of its transportation infrastructure, leading to a deterioration in service quality and an overall decrease in urban mobility efficiency [17].

Environmental concerns further compound the mobility crisis. The heavy reliance on private vehicles, combined with inadequate regulation of vehicular emissions, has led to elevated levels of air pollution. These emissions have adverse effects on public health and contribute to broader environmental issues such as climate change. Addressing these concerns requires comprehensive strategies to promote sustainable mobility—such as increasing the use of bicycles, enhancing pedestrian infrastructure, and investing in cleaner and more efficient public transport systems [31].

In summary, Bogotá faces profound urban mobility challenges driven by rapid population growth, insufficient infrastructure, limitations in public transport systems, and escalating environmental impacts. These challenges demand coordinated efforts by both government and civil society to implement effective solutions that can enhance quality of life and promote sustainable urban development [9].

The COVID-19 pandemic added new complexities to Bogotá's mobility landscape. In response to the public health emergency, authorities imposed lockdowns and mobility restrictions, which significantly reduced the use of both private and public transport. During the early stages of the pandemic, a sharp decline was observed in vehicular traffic, shared bicycle usage, and public transport ridership [20]. These shifts accelerated the adoption of teleworking and inspired urban planning interventions such as the expansion of bicycle lanes and the creation of pedestrian-friendly spaces.

However, as restrictions eased, mobility levels rebounded, introducing new challenges and necessitating the reevaluation of transportation strategies [24].

One of the most notable post-pandemic trends has been the increased use of private vehicles. Several factors explain this shift. First, the persistent inefficiencies of the public transportation system—reflected in issues of reliability, service coverage, and punctuality—have led to growing public dissatisfaction and a preference for private mobility [17]. In addition, the disorganized urban sprawl and deficient land-use planning have further complicated traffic conditions, prompting many residents to opt for personal vehicles as a means to reduce commute-related frustrations [18]. Moreover, in certain segments of the population, private vehicle ownership is perceived as a symbol of social status, which has further driven its adoption [19].

2.2. Data Sources Investigation

This study adopts a comprehensive methodology centered on the analysis of data collected by Bogotá's Mobility Observatory in the years 2019 and 2023. A thorough review of all relevant variables is undertaken to characterize the multifaceted dimensions of urban mobility across both time periods. The aim is to identify key patterns, challenges, and trends that have emerged over time.

Through comparative analysis of the two selected years, the study seeks to highlight significant changes in mobility behavior and infrastructure use, as well as to uncover emerging trends in the city's transportation dynamics. These findings will serve as a foundation for evaluating the impact of public policies and mobility strategies implemented in Bogotá during this period [2].

Based on this analytical framework, the study proposes a set of specialized, evidence-based recommendations to inform the development of future public mobility policies. These recommendations will address the identified challenges and capitalize on opportunities, with the overarching goal of improving the quality of life for Bogotá's residents. The proposed strategies emphasize the need for a transportation system that is efficient, sustainable, inclusive, and accessible to all.

The District Secretariat of Mobility is the agency responsible for designing, implementing, and evaluating mobility-related policies in Bogotá. Through its Mobility Observatory, the Secretariat systematically collects and analyzes data to assess the city's transportation conditions over time. This includes conducting specialized mobility studies, developing relevant performance indicators, and continuously monitoring the operation of the urban transport system [2].

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One of the principal tools employed by the Observatory is the Mobility Survey, which provides detailed insights into travel behavior. This survey characterizes mobility patterns among residents aged five and older in Bogotá and 20 surrounding municipalities. It collects data on several key dimensions, including:

- The average number of daily trips per person
- The purpose, origin, and destination of each trip
- The primary mode of transportation used
- Socioeconomic characteristics of the surveyed population

The information gathered through this survey is essential for evaluating, planning, and designing interventions to improve regional mobility. The data informs the decision-making process of the District Secretariat of Mobility, facilitating the development of targeted policies and strategic investments in transportation infrastructure and services.

3. DEVELOPMENT

3.1. Analysis of Data from the 2019 Mobility Observatory

The analysis of data collected by Bogotá's Mobility Observatory in 2019 offers a comprehensive perspective on urban mobility in the city during that year [2]. It includes critical information on citizens' travel patterns, covering aspects such as road infrastructure, the efficiency and effectiveness of public transportation, the different modes of transport used by residents, travel times, and other key factors.

Evaluating these data allows for a broader and more nuanced understanding of the complex and ever-evolving dynamics of mobility in the metropolis. The findings provide valuable insights into urban mobility in Bogotá and its 18 surrounding municipalities. These insights contribute significantly to the formulation of effective strategies and policies aimed at improving mobility for citizens—ultimately enhancing their quality of life and travel experience (see Image 1).

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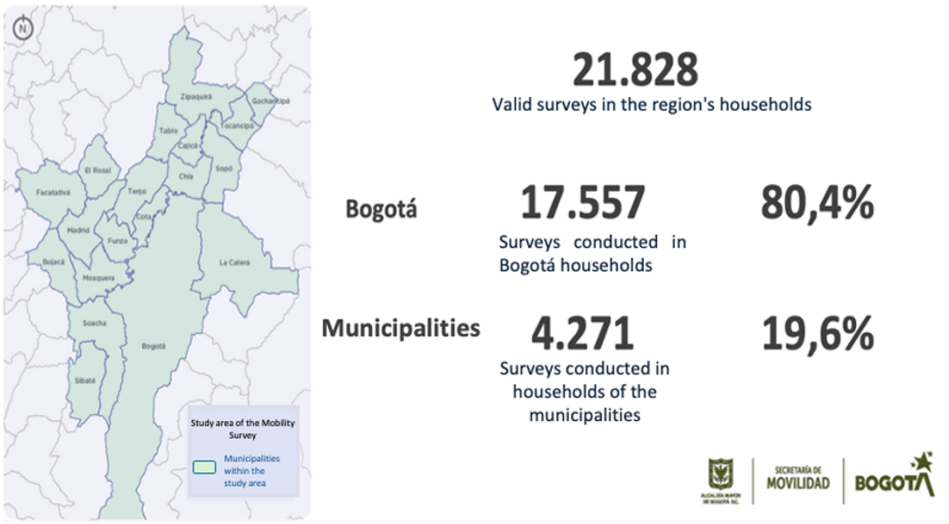

Image 1. Features of the 2019 Survey
Source: Bogotá District Secretariat of Mobility

3.1.1. Urban Mobility Characteristics in Bogotá in 2019

The characteristics of urban mobility in Bogotá in 2019 reveal a complex and challenging scenario. According to data from the Mobility Observatory, the city is heavily reliant on public transportation, with the TransMilenio system serving as the primary mode of travel [2]. There is also a noticeable increase in the use of bicycles as an alternative mode of transportation. However, significant challenges persist, including traffic congestion, inadequate infrastructure for pedestrians and cyclists, and long travel times. These factors are crucial for understanding the current mobility issues facing Bogotá.

In a city that continues to experience rapid growth, urban mobility has become a pressing concern. As the population expands, so does the demand for efficient transportation options. While the TransMilenio system has helped address some of this demand, substantial gaps remain. According to data from the Mobility Survey (see Image 2):

ORIGIN-DESTINATION SURVEY BOGOTÁ-REGION 2019	
18.996.286	51,53
Daily Trips	Average Travel Time

Image 2. Results of the Origin-Destination Survey Bogotá-Region 2019
Source: Bogotá Mobility Observatory – 2019 Survey

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Key data points include:

- **Transportation Modes:** In 2019, public transportation—comprising TransMilenio and traditional buses—was the predominant mode of travel in Bogotá. In contrast, the use of bicycles and other alternative modes of transportation remained significantly lower compared to both public transport and private vehicles [2].
- **Traffic Congestion:** High levels of traffic congestion were observed, leading to prolonged travel times [2] (see Image 3).

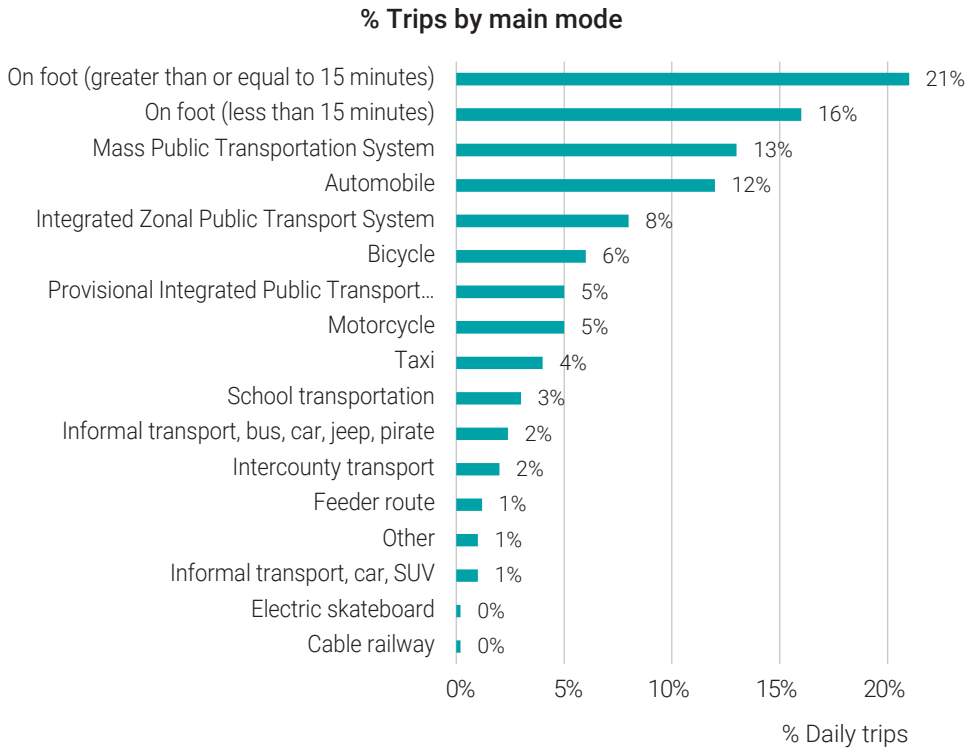

Image 3. Travel by Primary Transportation Mode
Source: Bogotá Mobility Observatory – 2019 Survey

- **Travel Patterns:** The survey analyzed population movement patterns, including origin, destination, purpose, and frequency of trips [2] (see Image 4).

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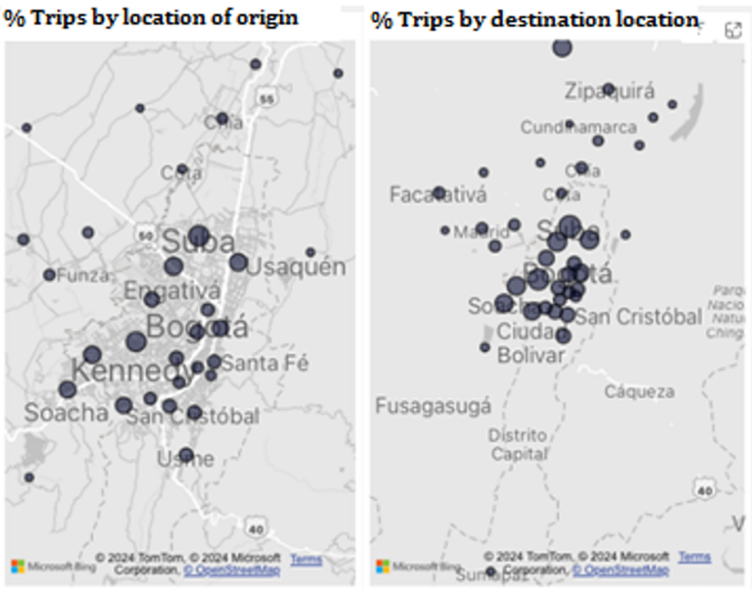

Image 4. Percentage of Trips by Origin-Destination Localities
Source: Bogotá Mobility Observatory – 2019 Survey

- **Socioeconomic Characteristics:** The survey also gathered information on the socioeconomic attributes of mobility system users [2] (see Image 5).

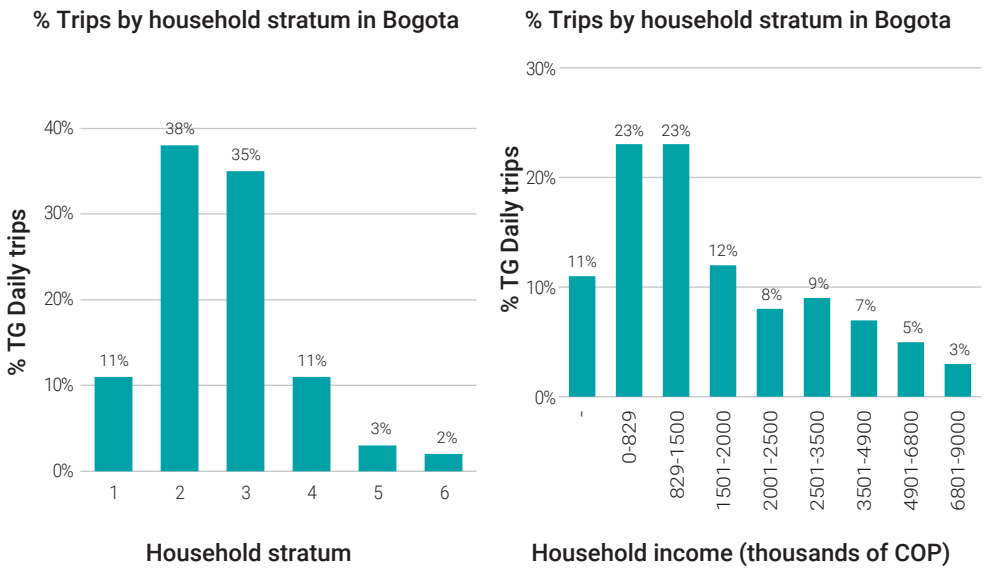

Image 5. Socioeconomic Characteristics
Source: Bogotá Mobility Observatory – 2019 Survey

3.1.2. Key Issues Identified

The analysis of the 2019 Bogotá Mobility Observatory data reveals numerous critical challenges facing urban mobility in the city. One of the most pressing challenges is undoubtedly traffic congestion, which significantly impacts people's travel times and daily productivity [2]. Additionally, the lack of adequate infrastructure for pedestrians and cyclists is a considerable obstacle, creating safety risks and difficulties in their mobility across the city.

Another issue deserving attention is the inefficiency of the public transportation system in terms of capacity and coverage. This inefficiency translates into overcrowding and difficulty accessing services, directly affecting citizens' quality of life and their ability to move efficiently within Bogotá. Addressing these issues requires urgent and effective measures in the form of public policies and the implementation of practical, sustainable solutions.

Key challenges identified in the 2019 Mobility Survey include:

- **Severe Traffic Congestion:** High levels of traffic congestion were observed, affecting travel times and the efficiency of public and private transport.
- **Promotion of Sustainable Transportation Modes:** Encouraging the use of sustainable modes, such as bicycles and public transport, to reduce car dependency and improve urban mobility.
- **Improving Infrastructure for Pedestrians and Cyclists:** The survey highlighted the need to enhance pedestrian and cyclist infrastructure, as well as to implement intelligent technologies for traffic management.
- **Characterization of Metropolitan Mobility:** A challenge was obtaining detailed information on mobility dynamics in Bogotá and neighboring municipalities forming the metropolitan area.
- **Data-Driven Policy Design:** The survey aimed to provide valuable information for designing public policies and making informed decisions to improve regional mobility.

The creation of modern and appropriate infrastructure for urban mobility—whether for vehicles, pedestrians, or cyclists—is essential to address these challenges. An integrated approach that promotes alternative, more sustainable modes of transport, such as bicycles and mass public transit, is crucial to ensure efficient and safe mobility in Bogotá. Additionally, fostering a culture of respect and road awareness among citizens, alongside promoting early education on traffic safety, is vital for reducing congestion and improving coexistence on the roads.

In summary, the issues identified in the Bogotá Mobility Observatory's 2019 analysis require urgent attention and decisive action. Only through implementing comprehensive public policies and collaborating with all stakeholders is it possible to achieve efficient, safe, and sustainable urban mobility.

3.2. Analysis of Data from the 2023 Mobility Observatory

According to the 2023 Mobility Observatory data, notable transformations have been observed in Bogotá's urban mobility. Among these, the remarkable and significant increase in the use of sustainable transportation modes, such as bicycles and public transport, stands out, with citizens adopting these alternatives in exceptional numbers. Compared to 2019, a 30% increase in bicycle use has been recorded [3].

Moreover, there has been a 15% reduction in the use of private cars compared to 2019 [3]. These figures clearly demonstrate a highly positive and encouraging shift in the mobility habits of Bogotá's residents, reflecting a growing commitment to ecological responsibility through the adoption of environmentally friendly transportation options.

This transformation aligns with public policies aimed at drastically reducing pollutant gas emissions and significantly improving air quality in the city, thereby creating a healthier environment for all inhabitants.

3.2.1. Characteristics of Urban Mobility in Bogotá in 2023:

In 2023, several important characteristics of urban mobility in Bogotá were identified. The 2023 Bogotá-Region Mobility Survey was conducted between March and October 2023, aimed to capture key indicators of mobility in the city of Bogotá and the 20 neighboring municipalities that make up its area of influence. Below are some general findings from the survey sample:

- **Coverage and Participation:** A total of 22,755 households were visited, and 67,556 individuals were surveyed, representing 97% household coverage [3]. Participation was distributed as 77% in Bogotá and 23% in neighboring municipalities, see Image 6, GUI *Mobility Observatory*.

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Image 6. 2023 Survey Coverage
Source: Mobility Observatory – 2019 Survey

- **Trips and Modes of Transportation:** The survey recorded 14.5 million daily trips, excluding pedestrian trips under 15 minutes. This represents a 9% decrease compared to 2019, suggesting a shift in mobility patterns possibly linked to changes in the labor landscape after the pandemic, as many companies adopted teleworking models, see Image 7, GUI *Mobility Observatory*:

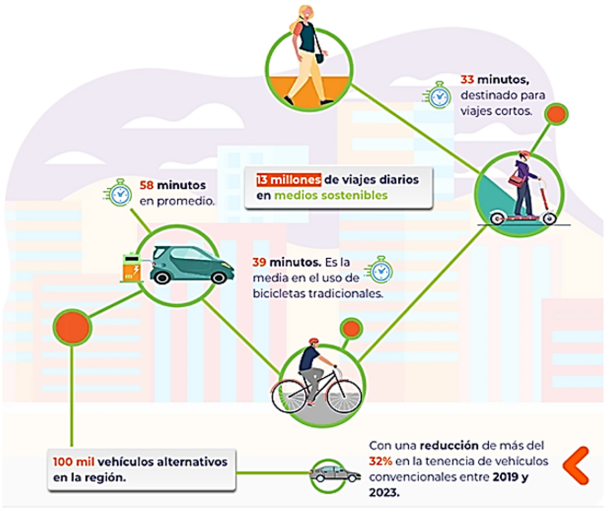

Image 7. Characterization of Modes of Transportation
Source: Mobility Observatory – 2019 Survey

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- **Socioeconomic Characteristics:** The socioeconomic strata with the highest survey participation were 2 and 3, with women frequently responding on behalf of their households. The age group with the highest cooperation ranged between 20 and 39 years old [3].
- **Main Findings - A Caring Region:** The study specifically considered caregiver populations and care recipients to inform policies aimed at improving their mobility access [3].

1. Approximately 800,000 daily trips related to caregiving (accompanying someone with or without remuneration) occur throughout the study area.
2. 70% of caregiving trips are made by women, with 80% of care recipients residing in households within socioeconomic strata 1, 2, and 3.
3. About 1.2 million people (15% of the population) are care recipients due to vulnerable conditions.
4. Nearly 470,074 caregiving-related daily trips are made on foot.
5. The highest concentration of caregiving trips occurs in Bosa, Kennedy, Ciudad Bolívar, and Usme.
6. Care recipients mainly stay in community homes, daycare centers, schools, or at home with an adult female household member.

- **An Inclusive Region:** Adopting a differential and gender-based approach, the study also examined the mobility characteristics of older adults, children, single mothers, and people with disabilities to better address their specific needs in future regional mobility plans and projects. The movement patterns of Bogotá residents and those from the 20 nearby municipalities are illustrated in Image 8, GUI *Mobility Observatory*:

Image 8. Characteristics of the 2023 Survey
Source: Mobility Observatory – 2019 Survey

The pandemic brought about numerous global and local changes, significantly impacting the economic, social, and political dynamics of cities worldwide. Bogotá faced new mobility restrictions and evolving dynamics, prompting residents to adopt measures such as teleworking, virtual education, and e-commerce. One of the most notable transformations has been the remarkable increase in the use of alternative transportation modes to private cars, including bicycles and public transportation. Additionally, there has been a clear trend toward multimodal transportation—combining different modes of transport for daily commutes. This shift reflects a wider range of mobility options and a significant reduction in dependence on private vehicles [20].

Significant improvements have also been made in infrastructure for pedestrians and cyclists. More bike lanes have been constructed, and sidewalks expanded, providing safer and more comfortable spaces for those opting for these sustainable alternatives. These developments demonstrate Bogotá's commitment to promoting efficient, safe, and sustainable mobility for all its residents [18].

Furthermore, measures to encourage public transportation use and facilitate integration between transport modes have been implemented. Routes and schedules have been expanded, offering citizens greater options for moving around the city [2].

In addition, intelligent transportation technologies have been introduced to help users plan trips more efficiently and reduce waiting times at stops. Efforts to improve road safety have been intensified through initiatives such as speed control, enhanced signage, and traffic education campaigns, aiming to ensure a safer environment for all road users—pedestrians, cyclists, and drivers alike [6].

In summary, Bogotá's urban mobility underwent significant changes in 2023 [4]. The increased use of alternative transport modes, promotion of multimodal mobility, improvements in pedestrian and cycling infrastructure, and initiatives to enhance public transportation and road safety collectively highlight the city's dedication to fostering more sustainable, efficient, and safe mobility. These advancements mark the beginning of a new era in Bogotá's urban mobility, prioritizing diverse transportation options and the well-being of its citizens [1].

4. DISCUSSION AND CONCLUSIONS

Based on the analysis presented in this document, the review of public policies related to urban mobility in Bogotá underscores the urgent need to implement effective and sustainable measures to ensure a transportation system that is efficient, safe, inclusive, and environmentally responsible. Achieving these goals requires the active participation of all stakeholders, alongside the commitment of authorities and

society as a whole [24]. Only through a comprehensive and collaborative approach can Bogotá transform urban mobility and build a fairer, more equitable, and sustainable city for all its residents [22].

4.1. Comparison of Sustainable Mobility Results

A comparison of data from Bogotá's Mobility Observatory in 2023 with that of 2019 reveals significant changes in urban mobility. Notably, there has been a 20% reduction in travel times during peak hours, reflecting a decrease in vehicular congestion [3]. This improvement is likely due to effective traffic management policies and the promotion of sustainable transportation modes, such as increased bicycle use and enhancements to pedestrian infrastructure.

Moreover, public transportation usage has risen substantially, with a 25% increase in daily commuters opting for public transit compared to 2019 [2].

This shift indicates growing awareness of environmental concerns and a positive change in mobility preferences. Traffic accidents have also decreased significantly, with a 15% reduction in road incidents over the past six years. This improvement highlights enhanced road safety awareness and greater adherence to traffic regulations. The installation of traffic lights and improved signage in high-traffic areas have further contributed to this decline.

These encouraging developments demonstrate the impact of recent public policies in Bogotá, which have successfully adapted to residents' needs by improving quality of life and addressing congestion and safety challenges. Nonetheless, continued efforts are essential to further advance urban mobility and secure a sustainable future for all inhabitants of Bogotá [16].

4.2. Identification of New Mobility Challenges

The 2023 data from Bogotá's Mobility Observatory has also revealed emerging challenges in urban mobility. A significant concern is the rise in accidents involving cyclists, despite the marked increase in bicycle usage. This underscores the urgent need for enhanced cyclist safety measures, including the development of more protected bike lanes with infrastructure designed to minimize risks and ensure safer travel for cyclists [4]. Additionally, promoting targeted road safety education for cyclists is crucial to equip them with knowledge of traffic regulations and safe navigation practices within the city [46].

Another pressing issue is overcrowding in certain public transportation corridors in Bogotá [5]. This overcrowding results in discomfort for passengers and increased travel delays. To address this, public transportation policies must be revisited and adapted. Potential solutions include increasing the frequency and capacity of services on congested routes, thereby offering users more efficient and comfortable transit options. Moreover, alternative mobility solutions such as carpooling systems and other sustainable transportation modes are being explored to reduce congestion and improve overall mobility [44].

In conclusion, tackling these emerging challenges in Bogotá's urban mobility requires a comprehensive reassessment of existing public policies. Integral strategies focused on improving cyclist safety and alleviating public transportation overcrowding are essential. Additionally, promoting road safety education and sustainable transport options will help pave the way toward a safer, more efficient urban mobility system for all residents of Bogotá [23].

4.3. Adapting Public Policies to New Data

The 2023 data from Bogotá's Mobility Observatory offers valuable, up-to-date insights into urban mobility in one of Latin America's most dynamic cities [3]. To effectively address newly identified challenges, this data must be thoroughly analyzed and integrated into existing public policies.

Key priority intervention areas based on the data include:

1. **Improving Public Transportation**: Strengthen and modernize the public transportation system by enhancing service quality, accessibility, and punctuality.
2. **Promoting Sustainable Transport**: Encourage the use of bicycles and walking as environmentally friendly alternatives to reduce dependence on cars [43].
3. **Integrated Mobility Plans**: Foster better coordination among various transportation modes for long-term strategic planning [32].
4. **Optimizing Urban Infrastructure**: Upgrade existing infrastructure to better meet current and future mobility needs [50].
5. **Incorporating Innovative Technologies**: Leverage technological advancements to improve urban mobility [33].

6. **Encouraging Intermodality**: Develop policies promoting the integration of various transportation modes, requiring collaboration among different city entities [44].

These actions will contribute to a more efficient and seamless urban mobility system, benefiting both residents and visitors. Adapting public policies to reflect new data is essential for the transparent and sustainable management of Bogotá's urban mobility. Achieving this requires close cooperation among government bodies, civil society, mobility experts, and private-sector stakeholders. Furthermore, engaging citizens and ensuring transparency in decision-making are critical to implementing fair and effective policies that improve the quality of life for Bogotá's residents.

In summary, the 2023 Mobility Observatory data serves as a crucial tool for enhancing urban mobility in Bogotá. Proper interpretation and application of this data will support informed decision-making, policy design, and positively impact citizens' daily lives. Priorities such as improving public transportation, promoting sustainable travel modes, and developing integrated mobility plans are key to achieving efficient, sustainable, and equitable urban mobility. With the commitment and collaboration of all stakeholders, Bogotá has the potential to become an international benchmark for urban mobility [21].

4.4. Evaluating the Effectiveness of Implemented Policies

Evaluating the effectiveness of Bogotá's urban mobility policies is essential to measure their impact and guide necessary adjustments. By analyzing data from the Mobility Observatory and comparing it with expected outcomes, policymakers can identify which policies are successful and which require significant revisions. This process involves systematically tracking key indicators—such as reductions in vehicular congestion and travel times—that directly enhance citizens' quality of life [44].

Continuous and systematic evaluation offers clear insights into achievements and challenges, enabling the creation of a precise roadmap for the future. These efforts align with the Territorial Ordering Plan, which outlines the strategies, programs, and projects critical to the city's development [3].

In conclusion, assessing the effectiveness of urban mobility policies in Bogotá is vital to ensuring sustainable and equitable urban growth. Ongoing evaluation and evidence-based decision-making help identify best practices and areas for improvement, empowering the city to continuously enhance its transportation system and the

well-being of its residents. Strengthening these evaluation processes will maximize the benefits for Bogotá and its inhabitants [6].

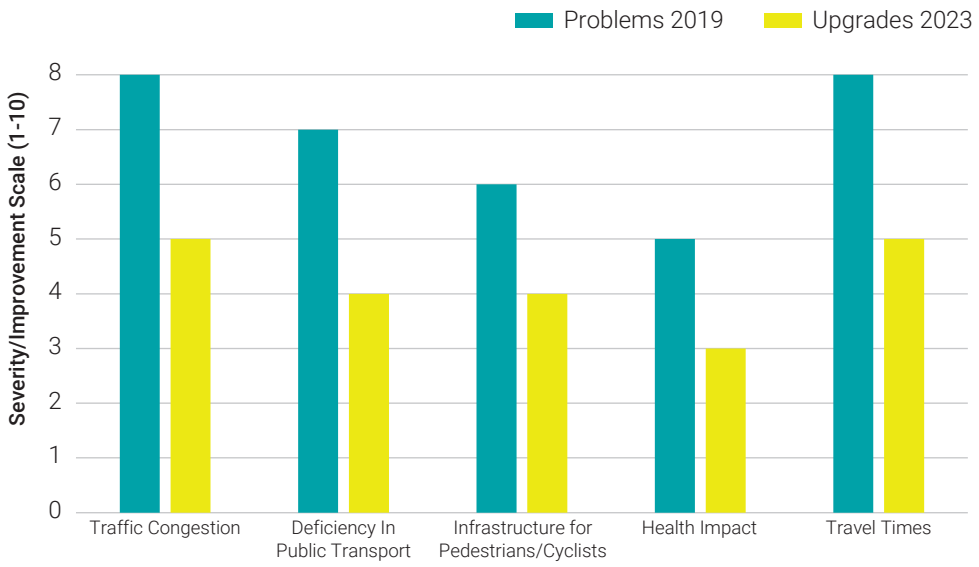
4.5. Conclusion

The analysis of urban mobility in Bogotá has revealed significant insights. In 2019, several issues were identified that negatively affected residents' satisfaction and quality of life. Traffic congestion was particularly severe, resulting in longer travel times and adverse effects on citizens' physical and mental health. Additionally, insufficient infrastructure for pedestrians and cyclists, combined with shortcomings in public transportation, restricted daily mobility for many.

By 2023, however, notable improvements aligned with new public policies have been observed. Authorities have implemented comprehensive solutions that are delivering tangible benefits to the community. These advancements are reflected in enhanced public transportation services, reduced traffic congestion—despite ongoing construction projects throughout the city—and the introduction of smart infrastructure projects that promote harmonious coexistence among pedestrians, cyclists, and motor vehicles (see Graph 1).

Surveys and data collection efforts have been instrumental in providing a clearer understanding of mobility patterns, not only for Bogotá's residents but also for those in neighboring municipalities within the Metropolitan Region. Despite encouraging progress, significant challenges remain. Expanding and improving infrastructure is essential to encourage widespread, healthy use of public and non-motorized transportation. Urgent priorities include creating safe bike lanes, integrating high-quality mass transit systems, fostering a culture of cycling and scooter use, and enhancing traffic education.

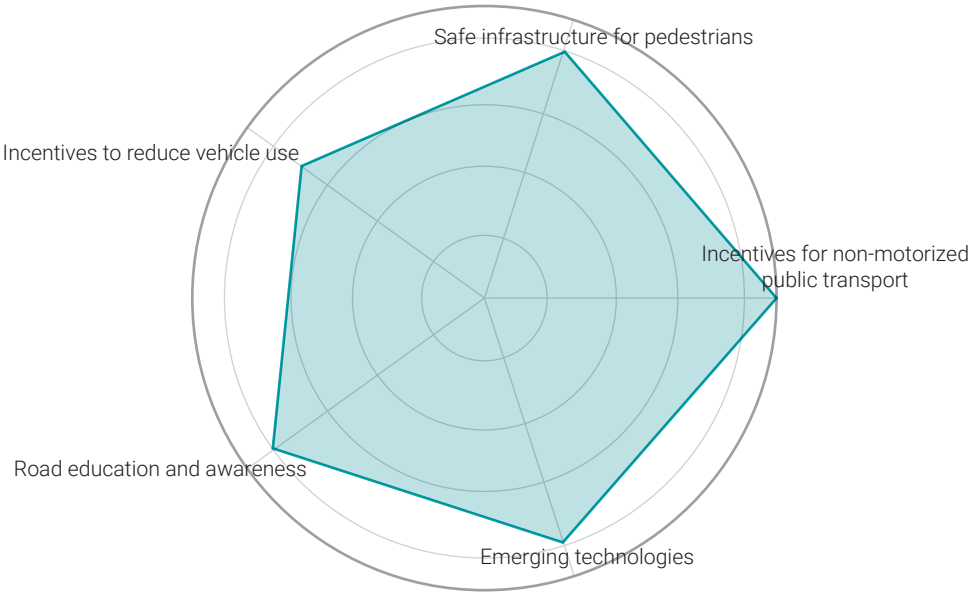
Only through a comprehensive and coordinated approach can Bogotá achieve sustainable and efficient urban mobility, ensuring a prosperous and balanced future for all its inhabitants.



Graph 1. Identification of Issues in 2019 and Improvements in 2023
Source: Own Elaboration

4.6. Recommendations for Future Public Policies

Based on this case study's findings, the following recommendations are proposed for future urban mobility policies in Bogotá, see Graph 2:



Graph 2. Policies for Mobility in Bogotá
Source: Own Elaboration

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1. Promote Public and Non-Motorized Transportation: Expand and improve bike lane networks, while enhancing the routes and frequencies of mass transit services to encourage wider use.
2. Invest in Pedestrian Infrastructure: Develop safe, accessible, and pedestrian-friendly spaces that prioritize the needs of walkers.
3. Encourage Carpooling and Shared Mobility: Implement incentives and programs to reduce reliance on private vehicles through carpooling and shared transport options.
4. Regular Policy Monitoring: Conduct comprehensive evaluations of implemented policies every two years, enabling timely adjustments for sustainable and efficient urban mobility.
5. Strengthen Inter-Entity Collaboration: Improve coordination among government agencies, private sector, and civil society for more effective policy implementation.
6. Introduce Evaluation Mechanisms: Establish robust systems to continuously monitor the impact of urban mobility policies and adapt them as necessary.
7. Raise Public Awareness: Launch ongoing educational campaigns to promote sustainable mobility habits and reinforce road safety among all citizens.
8. Incentivize Sustainable Choices: Provide financial incentives such as discounted public transit fares and allowances for bicycle and scooter users to encourage greener transport options.
9. Leverage Emerging Technologies: Utilize mobile applications and smart technologies to optimize route planning, bike parking management, and overall travel efficiency.

These strategies will enable Bogotá to advance toward a more sustainable, efficient, and environmentally responsible urban mobility system. By implementing these measures, the city can significantly enhance the quality of life for its residents and create a more livable, accessible, and attractive environment for both locals and visitors alike.

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