Public transport in Bogotá

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Public transportation in Bogotá.

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[Abstract.]

This thesis analyzes the public transportation system in Bogotá, Colombia. This system often operates as a complicated, often inexplicable, assemblage of different parts and operational segments. The city's mobility network characterized by fragmented infrastructure, diverse actors, and varied service quality presents a unique and challenging context for urban living. The research approaches this challenge through the dual lenses of Systemic Design and User Experience (UX) principles. Systemic Design provides a way to understand this complicated, decentralized entity by examining the connections between policy, infrastructure, technology, and human behavior. This approach is critical for understanding why the system, despite its scale, frequently leads to outcomes that are both unpredictable and frustrating for the regular user.

This thesis aims to map the points of friction and opportunity by studying the key components in detail. The current fragmented operational model results in significant gaps in service delivery, where efficiency and comfort are often sacrificed. The goal is to go beyond simple fixes and find ways to make real changes in the way citizens interact with the transportation system. As a result, the thesis proposes the development and detailed specification of a strategic design intervention. This intervention can take many forms, such as an artefact, a service model, or a redesigned environment. All of these are carefully designed to improve the overall user experience. The main goal is to make public transportation easier to use for everyone, improve the experience for passengers, and encourage people to take ownership of and feel connected to the city's transportation spaces. This work serves as a critical step toward transforming Bogotá's chaotic bus system into an integrated, humane, and sustainable way for people to get around the city.

Esta tesis es una carta de amor a Bogotá: a su gente, a los recuerdos que vuelven sin prisa y a las pequeñas enseñanzas que la ciudad deja caer casi sin querer. Es también una carta a la casa, a esa ciudad que olvida con facilidad y que, aun así, guarda una memoria secreta bajo la lluvia.

Le escribo al frío, a la llovizna y al granizo que aparecen como si formaran parte de un antiguo rito; a la inmediatez que emerge en medio de esperas interminables; a los destellos inesperados que interrumpen la rutina; a los encuentros improbables que parecen guiados por un orden que nadie ve pero todos intuimos. Le escribo al primer rayo que se asoma entre las montañas en un día de neblina, y a los atardeceres que, de vez en cuando, tiñen de naranja una ciudad que muchos imaginan gris.

En el intento de definirla entendí que Bogotá no se deja atrapar por las palabras. Es esquiva, contradictoria, casi un oxímoron que se despliega con naturalidad: un lugar donde lo imposible suele encontrar su forma.

Agradezco a quienes me acompañaron en este recorrido, a los que permanecen y a los que ya no, pero cuya presencia sigue, sutil, en la memoria y también en las calles que alguna vez compartimos.

[Agradecimientos.]

[Index.]

1

Bogotá

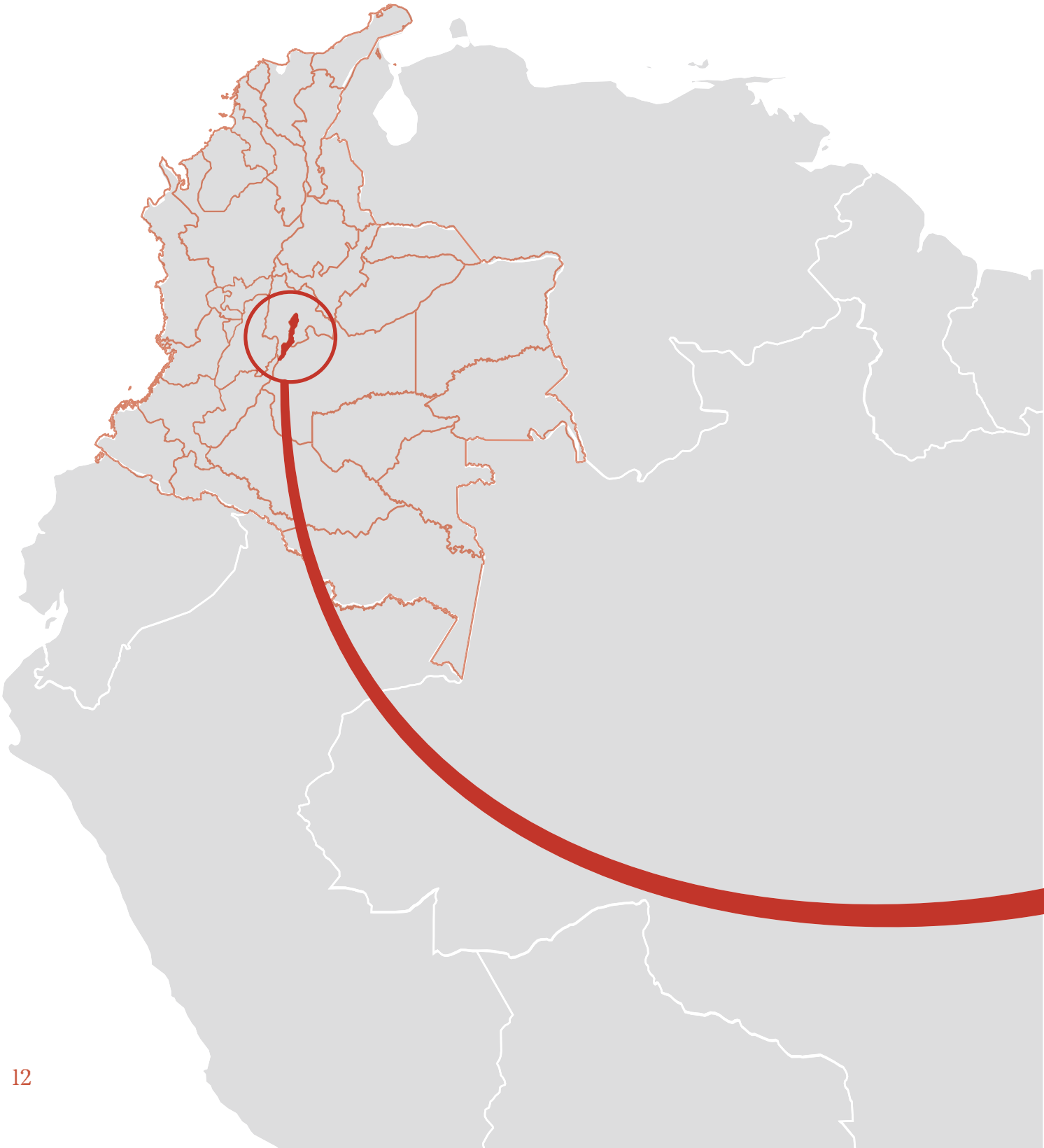
Borrowed City, Shared Memory.

Bogotá is not a city you can casually overlook; it captivates the observer, like a puzzle that refuses to be solved. It is not just streets and buildings; it is made of fragments, old layers melting into newer ones. Every morning, it changes shape, barely remembering what it used to look like. This text encourages taking a step back to see the bigger picture and viewing the city's struggles as part of its daily rhythm. The thesis explores its flaws, contrasts, and missed promises alongside times of daily resistance. The goal is to shape a complete view of Bogotá that is less focused on stats or tags and more in sync with its rhythm, silent corners, and clashing energies.

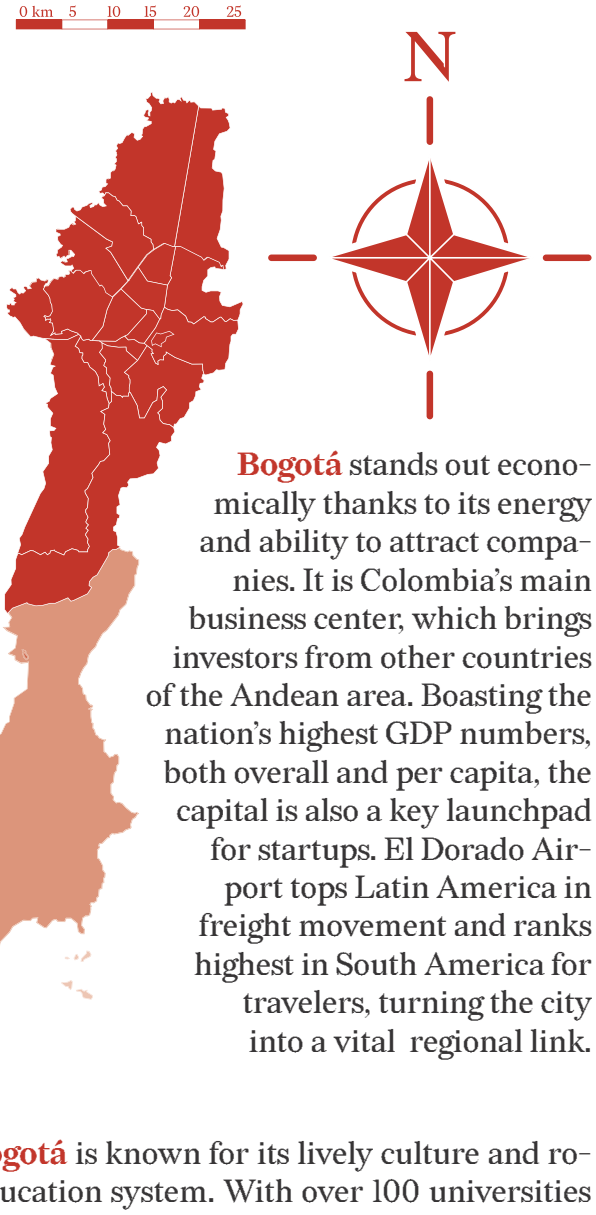
In this context, public transportation reveals the city's authentic character. It is not just about getting from one place to another; it is a moment where stories, histories, and journeys overlap unexpectedly. Public transport works as a bridge, connecting distant neighborhoods and loose memories while offering opportunities that change daily between the center and the periphery. The city reveals itself through its buses and bus stops. During shared waits, brief exchanges among strangers, and rides that turn into unplanned encounters, the city exposes itself.

In this city, getting around is not just about moving ahead; it is about how people share life, hold on to the past, or even picture what might still happen.

Bogotá Colombia



Bogotá, also known as the Capital District, is Colombia's capital city and is located in Cundinamarca. Although it is part of a department, it operates independently under national laws. The city is divided into twenty zones, each led by a local mayor and an elected board, reflecting the city's complex governance structure. It is the hub for politics, business, culture, and society. It hosts major government bodies. It has a significant impact on everyday life across the nation.



Founded on August 6, 1538, **Bogotá** is located in the middle of a highland plain of the same name, which is part of the Cundinamarca-Boyacá region. The city rests at an elevation of around 2,625 meters, which is much higher than most capital cities.

The weather remains mild year-round due to its high altitude, avoiding both extreme heat and cold. The city is thirty-three kilometers long from north to south but only half that distance from east to west. It fits perfectly within a space bordered by rolling hills rising along its eastern edge.

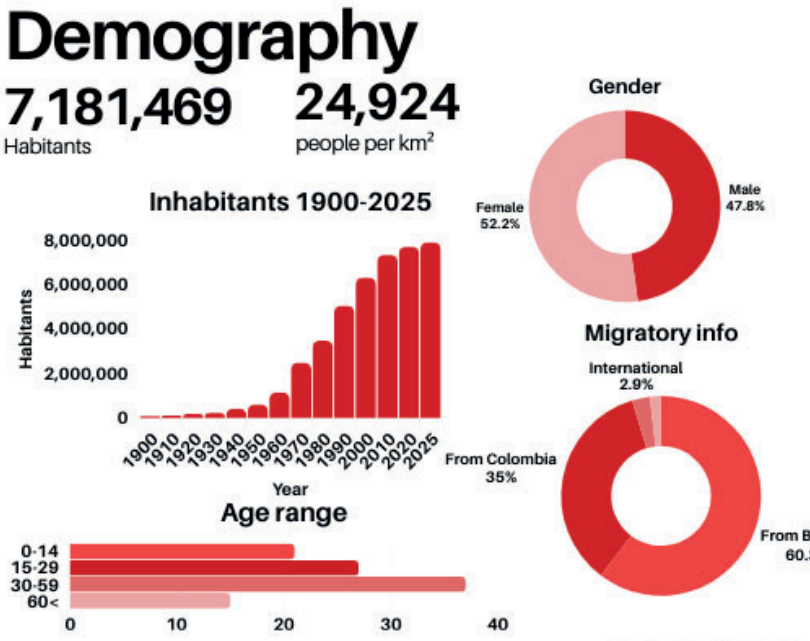
Bogotá stands out economically thanks to its energy and ability to attract companies. It is Colombia's main business center, which brings investors from other countries of the Andean area. Boasting the nation's highest GDP numbers, both overall and per capita, the capital is also a key launchpad for startups. El Dorado Airport tops Latin America in freight movement and ranks highest in South America for travelers, turning the city into a vital regional link.

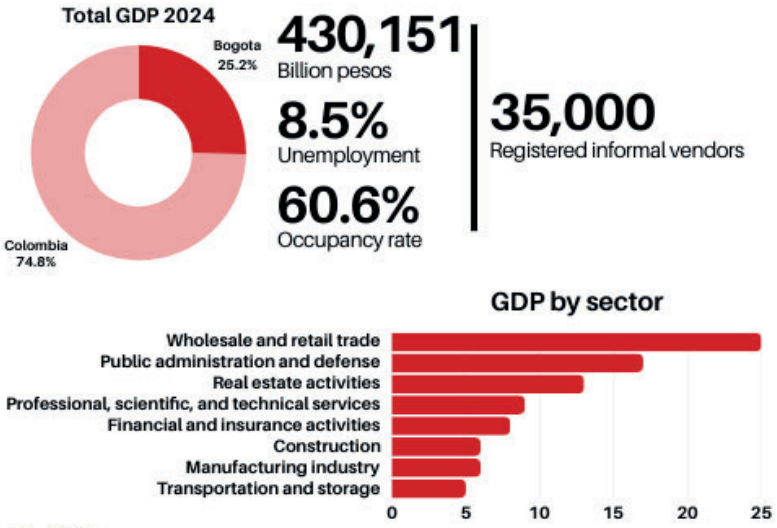
Bogotá is known for its lively culture and robust education system. With over 100 universities and research hubs, it is a major learning hub. There are lots of museums, theaters, and libraries, which is why people call it the *"Athens of South America"*

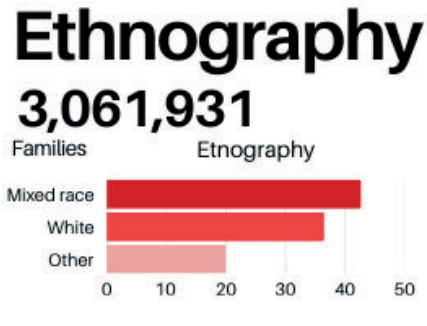
History blends with the present, variety is everywhere, and toughness runs deep, so the city is always changing.

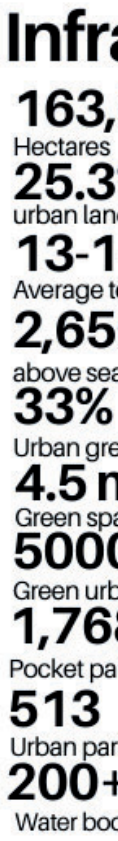
Holistic map

Two cities exist side by side.

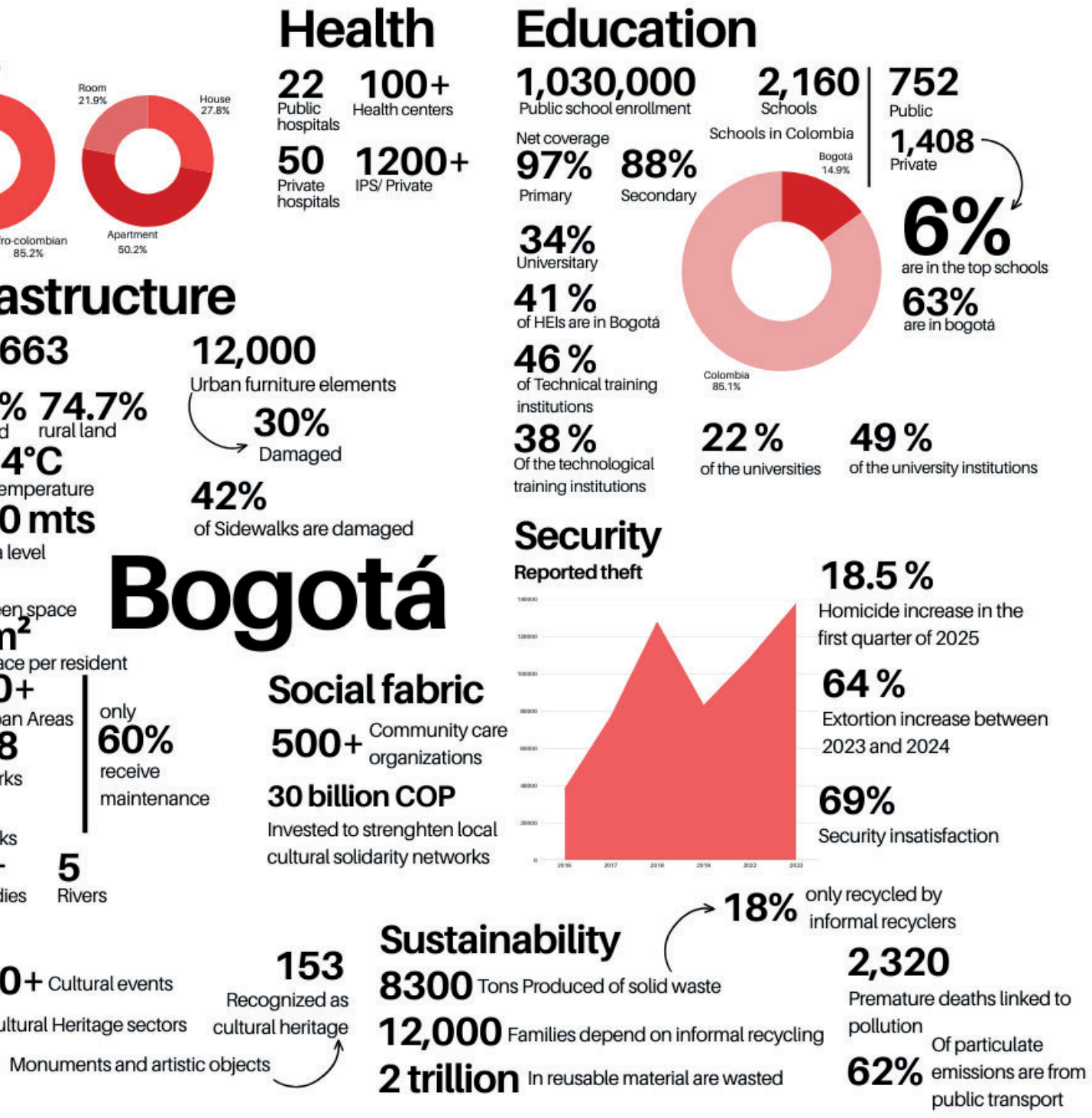








The data map provides a holistic analysis of Bogotá, revealing a city of stark contrasts characterized by a significant population (7.18 million inhabitants) and a high rate of informal employment (34%), where a large portion of the cultural economy also stands out (63% of the Colombian economy). The urban infrastructure shows major challenges, such as the deterioration of sidewalks (42% damaged) and insufficient park maintenance, while mobility and the environment are under pressure, with 62% of particulate emissions coming from public transport and a heavy reliance on informal workers for recycling. Furthermore, the perception of security is low (69% dissatisfaction) despite existing social solidarity networks, underscoring a disconnection between formal development and the daily realities of its residents.



Territorial Structure

The Architecture of Belonging.

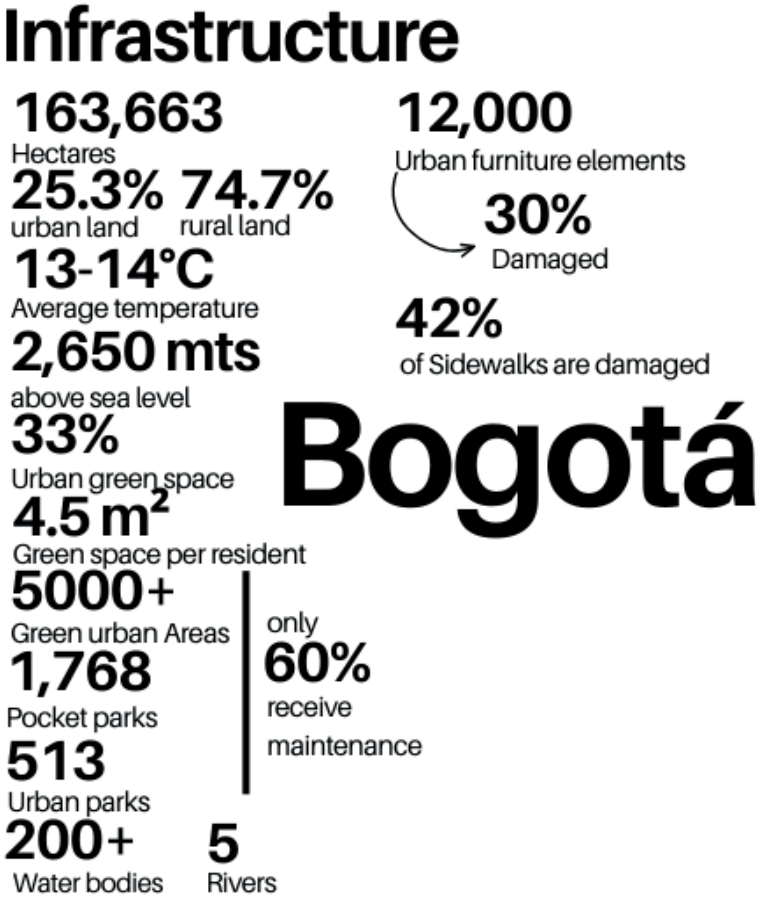
Bogotá is divided into 20 localities that group more than 1,900 neighborhoods within the urban area. The Sumapaz locality retains its rural character (Secretaría de Cultura, Recreación y Deporte de Bogotá, n.d.). Each locality has a Junta Administradora Local (JAL), a citizen representation body that participates in territorial planning, controls public services, and promotes community participation (Gobierno de Bogotá, n.d.-b).

These bodies allow for closer management between the district administration and citizens, which guarantees decentralization and the exercise of social control (Departamento Administrativo del Servicio Civil Distrital, n.d.).

From a constitutional point of view, Bogotá is recognized as a capital district, a special administrative entity that, with the country's 32 departments, makes up Colombia's 33 territorial units (Gobierno de Bogotá, n.d.-a). Although it has its own legal regime, Bogotá is also considered a municipality.

This gives the city both departmental responsibilities and local authority, placing it in a unique administrative position within Colombia's political and territorial organization (Duque-Duque & Molina Caro, 2020).

Understanding Bogotá's territorial and administrative configuration is essential to grasp how the city's political, social, and urban dynamics take shape across its diverse localities.



The city has a complex institutional structure made up of various entities that serve specific roles in public management.

This territorial and administrative structure is crucial for understanding the city's political and organizational functioning. At the same time, it defines the city's identity as fragmented yet connected, where each neighborhood has its own social, cultural, and economic dynamics reflecting the territory's internal diversity (Secretaría de Cultura, Recreación y Deporte de Bogotá, n.d.).

In this way, we can interpret Bogotá's development as the result of multiple voices and urban rhythms, where the articulation between central institutions and local governments is key to manage the daily life of a city that, although legally unified by decree, continues to be profoundly plural and heterogeneous in its population (Duque-Duque & Molina Caro, 2020).

Geography

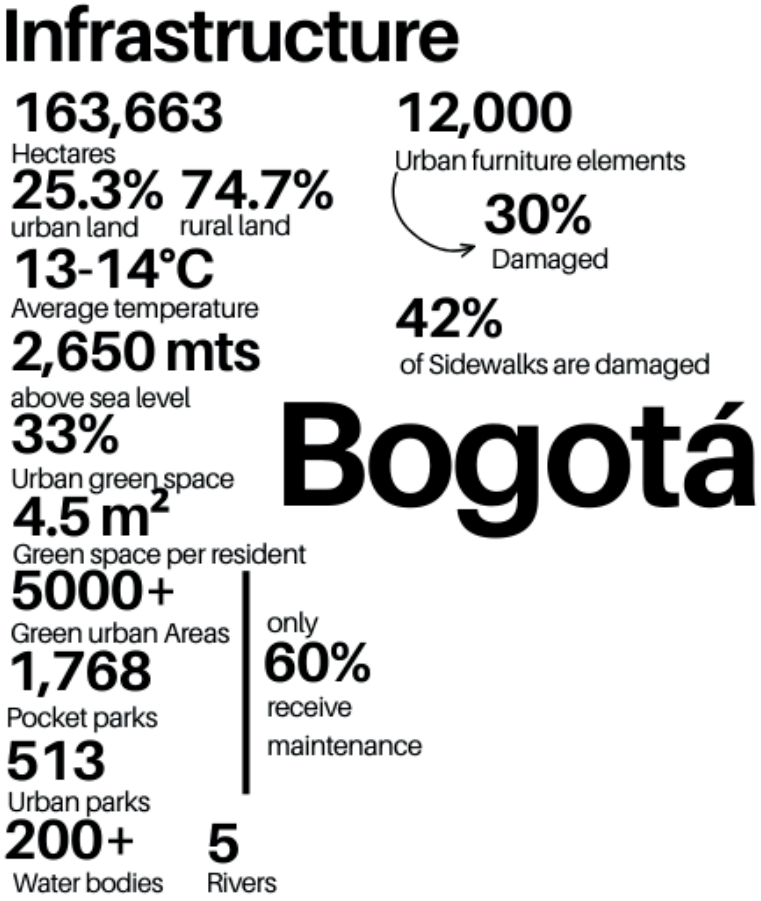
The City among the Stars.

Bogotá is located in the savannah that shares its name, on the Cundinamarca-Boyacá highlands in the departments of Cundinamarca and Boyacá. It is situated at an average altitude of approximately 2,630 meters (8,630 feet) above sea level. This makes it one of the highest cities in the world, and after Quito and La Paz, one of the highest capital cities (Secretaría Distrital de Bogotá, 2004). The city covers a total area of about 1,636 square kilometers, of which about 378 square kilometers is urbanized (deultimominuto.net, 2023). A long time ago, most of this area was a lake, and you can still see some of it in the wetlands around Suba. However, most of these lakes have been covered by urban expansion. (University of Bath, n.d.).

The Sumapaz páramo, considered the largest in the world, defines Bogotá's natural environment. It is located south of the city in the locality of the same name (Secretaría Distrital de Bogotá, 2004; Bojacá, Gil, & Schrevens, 2011). To the east, the city is surrounded by the Cerros Orientales, including Monserrate and Guadalupe. These mountains reach heights of over 3,100 meters and can be visited via cable car or funicular. These mountains play a fundamental ecological role as water regulators and biodiversity corridors (University of Bath, n.d.; MDPI, 2019).

The Bogotá River crosses the city from north to south, forming the main hydrological axis of the savannah. However, domestic, and industrial discharges have seriously polluted it for decades (Japan International Cooperation Agency [JICA], 2004). Other important rivers, such as the Tunjuelo, Fucha,

Bogotá's geographical and environmental setting provides the foundation for understanding the city's urban development, ecological challenges, and the climatic conditions that shape everyday life.



San Francisco, and Juan Amarillo, run through the urban territory and flow into the Bogotá River, forming an essential water network for the capital's wetland system (Secretaría Distrital de Bogotá, 2004).

Urban growth has given rise to a metropolitan area that integrates neighboring municipalities, such as Soacha, Chía, Cota, Mosquera, and La Calera. Although these municipalities administratively belong to the department of Cundinamarca, they functionally integrate the Bogotá metropolitan area (Secretaría Distrital de Bogotá, 2004). This process reflects the city's continued territorial expansion and creates significant challenges in terms of regional planning and environmental sustainability (MDPI, 2019).

Bogotá has a temperate mountain climate (subtropical high-altitude, or Cfb, according to the Köppen classification), with temperatures generally ranging from 5 °C to 19 °C and an annual average of around 13.7 °C (University of Bath, n.d.; Gamba-Sánchez, 2015). The city experiences two rainy seasons (March–May and October–November) and two dry seasons (January–February and June–August), reflecting the rainfall pattern typical of the Colombian Andes. Fog is frequent, with an average of 220 days per year, and there are occasional hailstorms accompanied by drastic temperature drops (Resolve Cambridge, 2015). May tends to be the warmest month, October the wettest, and January the coldest and driest. Extreme temperature records range from -7.1 °C to 30 °C, indicating high climatic variability in this Andean city (Resolve Cambridge, 2015; Gamba-Sánchez, 2015).

Geography

Pain points.

1. Political Division and Localities
Bogotá's districts operate within a top-down system that leaves them with limited freedom, despite each district having unique social, economic, and ecological challenges. This system prevents them from effectively addressing local issues. When general city policies do not align with what neighborhoods care about, actions fall short. At the same time, inconsistent resources across offices increase social inequality and make people feel more disconnected from decision-making processes.

2. Natural Boundaries
Though Bogotá's growth is shaped by natural limits that protect the city, these areas face pressure from unplanned development, illegal construction, and waste pollution. Even though they provide wildlife pathways and rich ecosystems, and help buffer climate shifts, their value is often underestimated. They are often seen as obstacles rather than essential support systems in urban development.

3. Land Use and Sprawl
The capital of Colombia continues to extend in all directions without restraint, gradually invading rural areas and delicate ecological systems – often lacking adequate infrastructure or services. Informal neighborhoods have popped up everywhere, often without basic layouts, green areas, or links to wider city networks. The lack of coordination in housing plans, transit routes, and zoning decisions has fragmented the city's structure. At the same time, the loss of farmland around urban areas weakens access to food and natural stability.

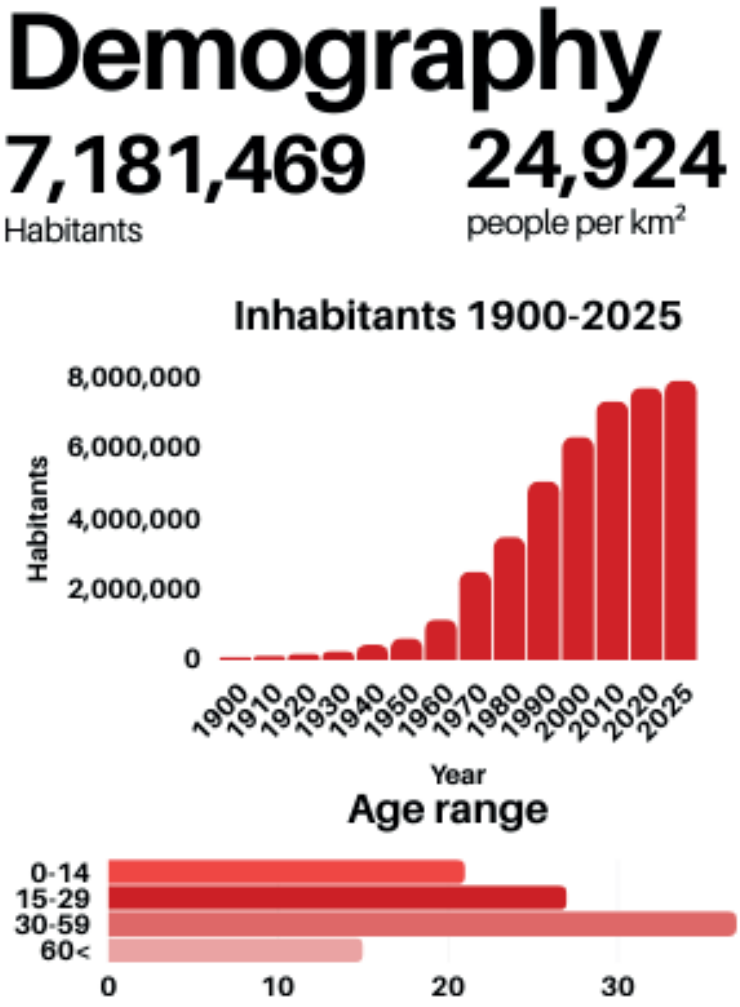
4. Geographical Risks
Floods and landslides hit Bogotá's poorest neighborhoods the hardest, particularly affecting those living in temporary homes on hillsides or in low-lying areas where water collects. Even though hazard maps and safety strategies are available, their implementation depends on location, while urban growth continues to spread into dangerous areas. As global warming causes storms and rainfall patterns to intensify, disasters strike more frequently and with greater impact in areas that never had solid defenses to begin with.

Demography.

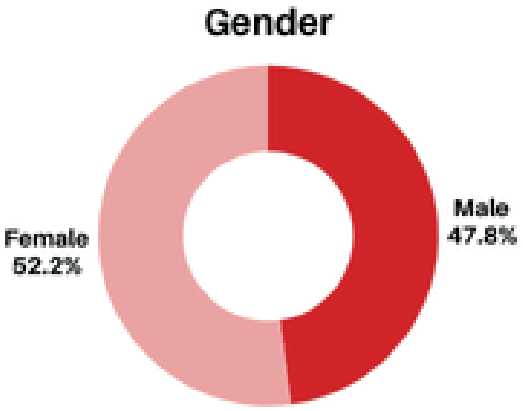
Everyone's city, & no one's.

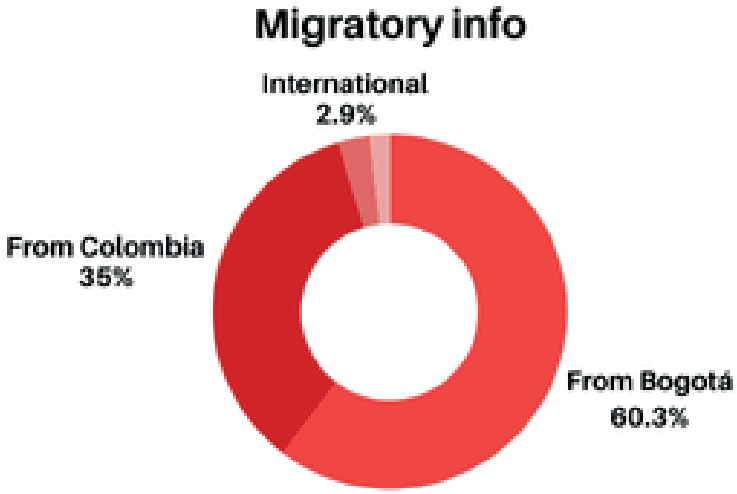
With a population of over eight million, Bogotá is not only Colombia's largest city, but also one of Latin America's key urban centers (CityPopulation, 2020). In recent years, its population has grown steadily, not only due to more births, but also due to migration (Cuervo, Ramírez, Barbieri, & Rangel-Rigotti, 2018). Thanks to this surge, Bogotá has become a diverse yet mixed-up city, defined by deep social and economic divisions, where diverse ways of life coexist just streets apart (Guevara & Shields, 2019).

Examining age demographics reveals that Bogotá's population is young; in 2022, individuals aged 25 to 34 accounted for nearly 19 percent (Urbistat, 2022). This creates challenges and opportunities, particularly regarding education, employment, and participation in local activities. Besides that, though not as significant, certain areas are attracting more elderly residents, so rules must adapt to meet the needs of this growing demographic. As for gender, men and women are nearly equal in number, though their everyday lives and financial situations affect them differently (Galindo-Silva & Herrera-Idárraga, 2023).



Understanding Bogotá's population dynamics is key to grasping how the city's rapid growth, social contrasts, and cultural diversity shape its evolving urban identity.





605,376

Venezuelan

The city has experienced a constant flow of people, not only from overseas, but also from different regions of Colombia. People escaping conflict, and searching for jobs. Some are arriving from foreign lands, including lots of Venezuelans lately.

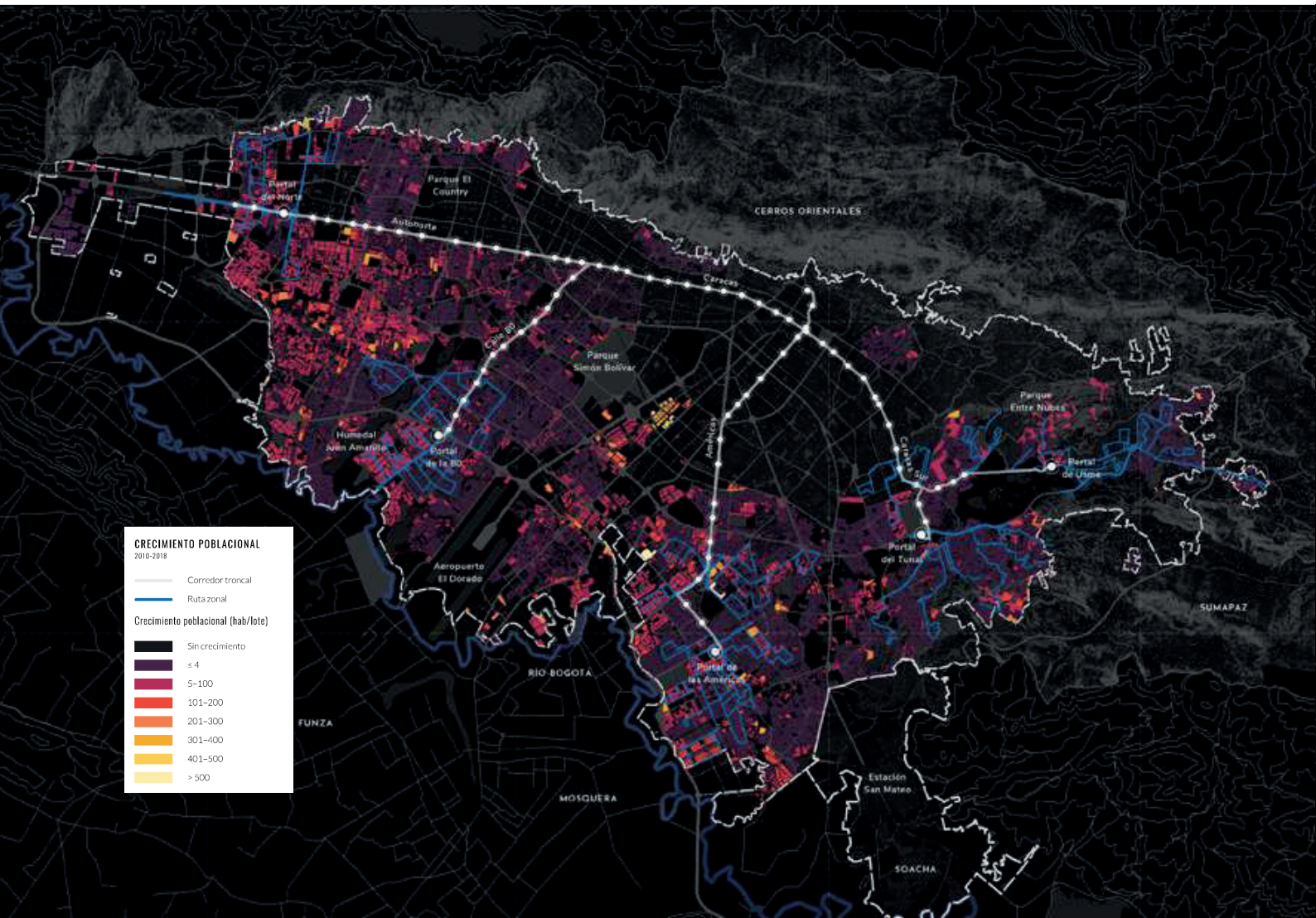
All of these people have changed how Bogotá lives. They have brought new habits, languages, and everyday patterns (Olaya, Eslava-Rincón & Varini, 2023). The city hosts diverse communities, including Afro-Colombian, Indigenous, Raizal, and Palenquero, with more mixed-origin individuals appearing every year, which quietly pushes the city's character in different directions (Guevara & Shields, 2019).

These qualities influence daily life in Bogotá. Growth comes from the constant interaction between generations, cultures, and individual experiences, creating a dynamic and connected urban atmosphere. Every street corner and bus stop becomes a place where diverse lives cross paths.

Population growth maps.

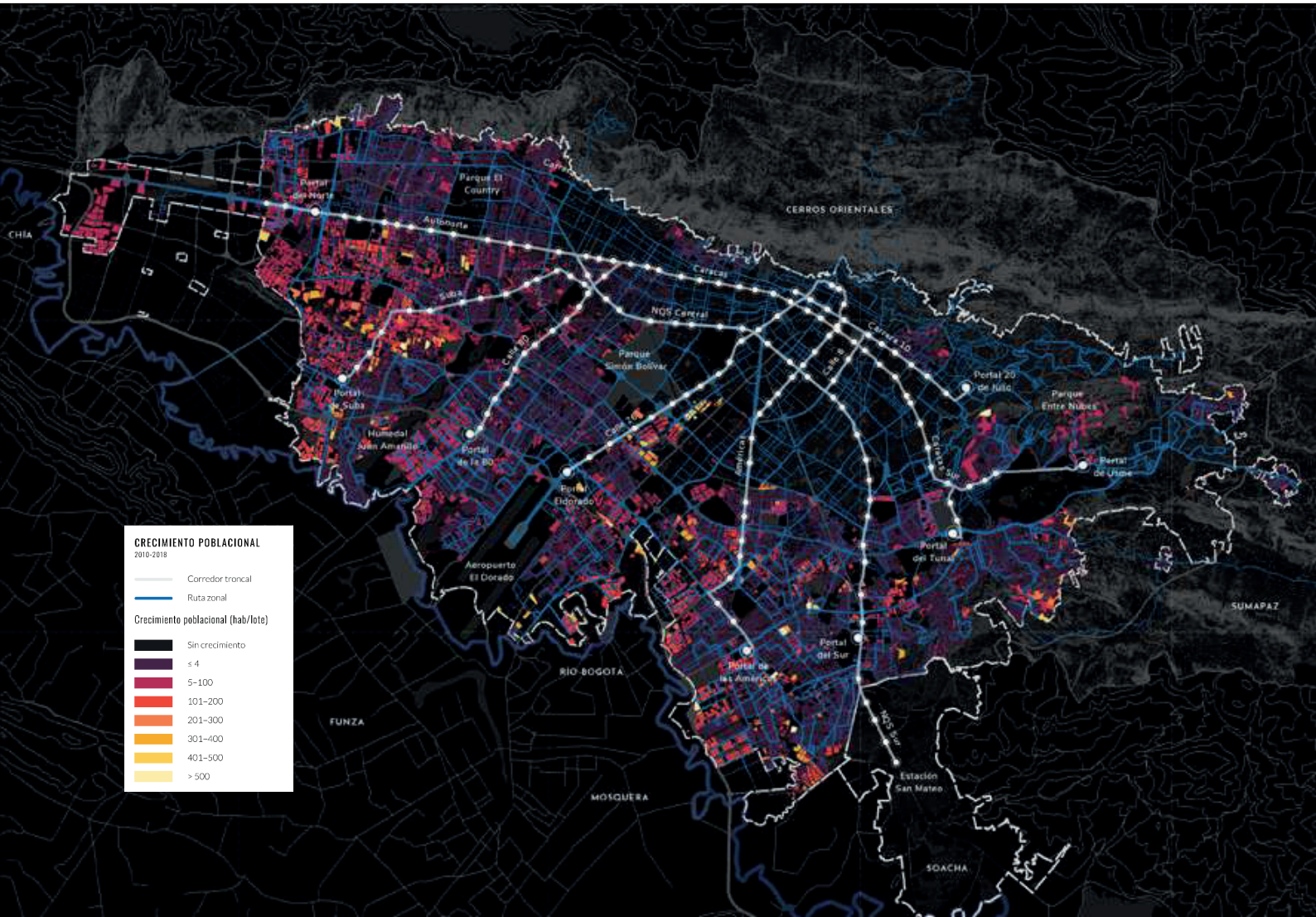
(2000-2005)

This map illustrates population growth in Bogotá between 2000 and 2005, emphasizing the spatial correlation between demographic expansion and emerging public transportation infrastructure. The colored data points highlight areas of accelerated growth, particularly in peripheral zones where new transit routes are being developed. The visualization reveals how urban expansion tends to concentrate in regions gaining access to mobility services, suggesting that transportation availability plays a key role in shaping settlement patterns.



(2010-2018)

This map captures Bogotá's population growth between 2010 and 2018, emphasizing the expansion of urban settlements in peripheral zones where public transportation infrastructure has recently emerged. The visual distribution of colored overlays reveals that areas experiencing the most rapid demographic increase are those newly connected to transit networks, particularly in municipalities like Soacha, Ciudad Bolívar, and Mosquera. This pattern suggests a strong link between mobility access and urban expansion, highlighting how transportation development can catalyze population shifts.



Demography.

Pain Points.

1. Population Distribution by Localities
Bogotá's 20 districts are significantly different in terms of population density, access to basic necessities, and quality of life. This creates an imbalance that affects the amount of demand placed on services, transit, and parks. Overcrowded areas such as Kennedy, Bosa, and Suba struggle with outdated systems, while more suburban neighborhoods receive more resources per person. Efforts made for the whole city do not always fit these differences, so some areas have too few resources.

2. Age and Life Cycles
The city's layout and support systems do not meet people's needs at different stages of life. Children have few playgrounds that are easily or safely accessible, and teens have few places to have fun or be creative. Seniors deal with poor access and limited care options. Transit routes, walking paths, and local meeting places tend to overlook age-specific challenges, leaving many people out while resources remain unused.

3. Internal and External Migration
Bogotá is taking in large numbers of Venezuelans, as well as displaced rural residents. Most of them end up on the periphery of the city, where basic services are limited. This creates informal settlements, increases exposure to natural hazards, and weakens community ties. Although varied cultures add life to neighborhoods, support systems still fall short when it comes to combating discrimination or providing equal access.

4. Gender Composition.
Women in Bogotá often experience problems when trying to move around safely or find opportunities to grow. Transit setups and shared spaces don't usually consider potential dangers, such as harassment, or how women often travel for childcare duties, which means making a few short trips during less busy times. The lack of childcare support in some neighborhoods also makes it more difficult for women to join the workforce.

5. Household Size and Structure
Even though more people live alone or with multiple generations under one roof, the city's housing still focuses on standard family units. Due to this trend, larger families often end up squeezed into tight spaces, while smaller families face higher rents. However, shared areas fail to match real-life living patterns.


movistar arena
movistar arena

Infrastructure & Public Space.

Whose city is truly built for?

The growth of Bogotá's city center reflects past residential choices that influenced construction styles. Due to financial limits and a lack of financing options, informal homes emerged across hillsides and in outer areas. While some residents live in publicly funded housing developments, others have built unapproved homes. These unplanned structures are located beside planned complexes, having been shaped by urgency rather than policy. These attempts to address the housing shortage create deeper gaps between the rich and poor (Guevara & Shields, 2019; Peñaranda Currie, 2022). A system designed to bring order to urban spaces has instead created invisible and real barriers, dividing neighborhoods and limiting interaction between social groups (Duque-Duque & Molina Caro, 2020).

In this case, the problem is missing infrastructure. When many places don't have enough clinics, schools, reading spaces, or green areas, growth slows and residents miss out on necessary resources. Even when these services are available, they are often too crowded or poorly located, creating the perception that urban planning favors certain zones while ignoring others (Valencia, 2016; Inostroza, 2017).

Small details such as streetlights or street signs can influence how people feel about public spaces. Take Bogotá, for example. Its public systems are falling apart. Bus shelters offer little to no cover, the seating is broken or missing, there are few garbage cans, and maps confuse rather than help.

Geography

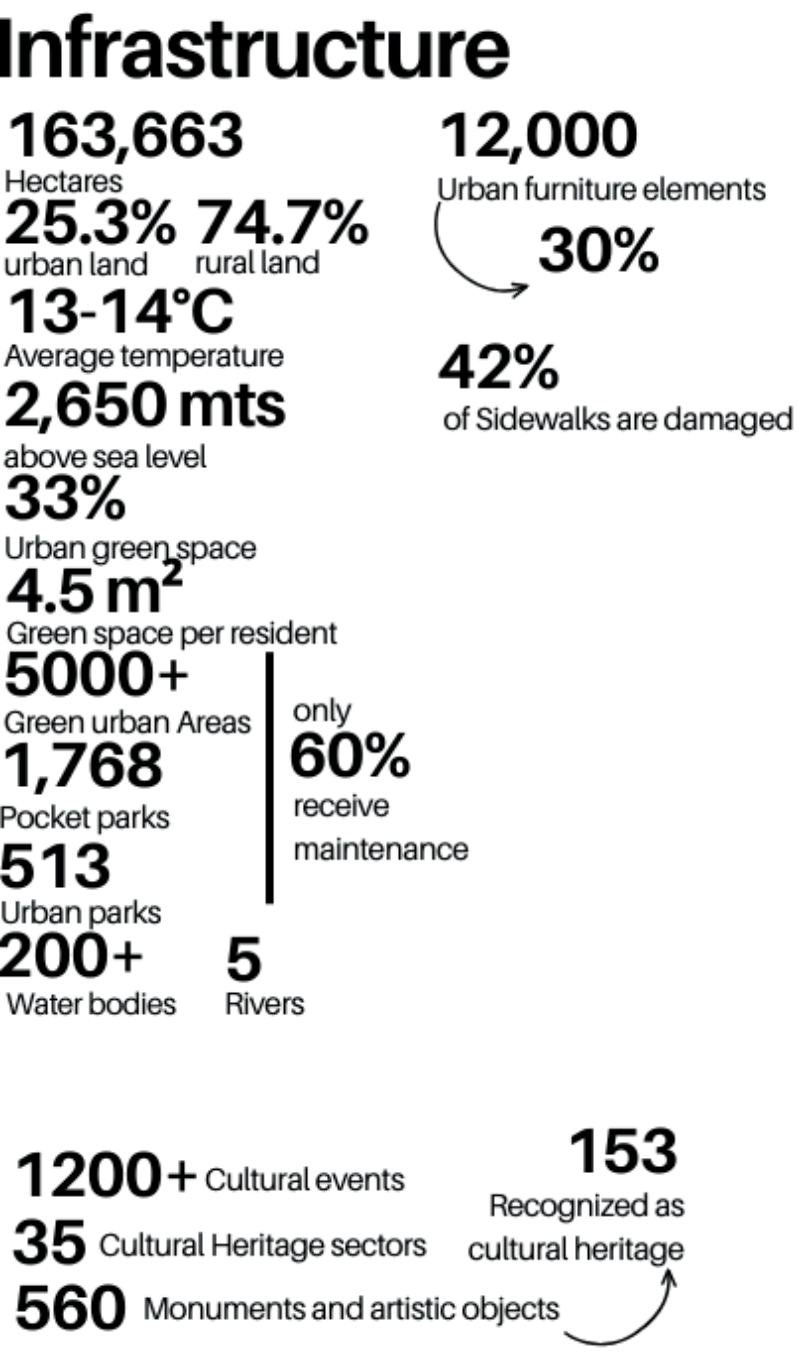
Culture

7,199 Buildings of cultural interest

63% Colombia's cultural economy

600,000 Visitors to book faire

Understanding Bogotá's urban form requires examining how historical housing patterns, uneven infrastructure, and the condition of public space have shaped the city's stark spatial and social divides.



When the most basic services fail like this, it becomes tougher to get around, and certain neighborhoods start to feel ignored (Urbanización informal en Bogotá, 2022).

A key issue is the condition of public spaces. Damaged walkways, poor lighting, and areas that feel unsafe can decrease people's sense of belonging and make it difficult to move around, especially for those who have difficulty moving, such as older adults, children, and people with mobility issues. When spaces are not safe or accessible, neighbors have fewer opportunities to gather and connect, which slowly weakens community bonds and confidence in city life (Inostroza, 2017; Valencia, 2016).

Lastly, improving and expanding urban areas can cause unexpected issues. Large construction projects, which are usually designed to boost appeal or attract investment, tend to push residents out, reshaping neighborhoods without regard for daily life there. This brings up a key question:

Who is the city really built for?

This reveals an ongoing clash between the Bogotá planned by authorities and the Bogotá lived by its people, which adapts unofficially beyond control (Yunda & Sletto, 2016; Socioeconomic Residential Segregation and Income Inequality in Bogotá, 2021).

Infrastructure & Public Space.

Pain points.

1. Housing and Popular Urbanism
Bogotá's residences are a mix of informal houses, unplanned districts, and random govern projects, shaped by inconsistent policies and deep social divides over the years. Many neighborhoods were established without a layout or basic services, leaving residents without legal rights or safe housing. Official housing efforts often worsen the situation rather than improving it.

2. Collective Facilities
Where clinics, classrooms, reading areas, and playgrounds are missing or limited, entire neighborhoods miss out on the resources that help people grow. In many growing areas, homes are built before services are established, forcing people to travel long distances just to meet their basic needs. This damages the community connections that public spaces usually build.

3. Urban Furniture and Signage
Benches, bus stops, trash cans, and directions signs small elements that help people get to know a city and feel at home are often missing, broken, or placed incorrectly in many areas of Bogotá. When these items are damaged, people get lost easily, feel out of place and pushed aside, particularly newcomers, the elderly, and people with limited mobility.

4. Public Space Quality and Maintenance
Cracked paths, dim lamps, and abandoned areas pop up all over town, affecting movement, security, and neighborhood dynamics. If routine fixes are skipped, things will only get worse over time. Fear of these places will keep people away, slowly killing everyday meeting places and the feeling of being at home.

5. Urban Renewal and Expansion
Large-scale construction projects often cause friction as people worry about losing their homes or their neighborhoods changing too quickly. Expanding into new areas may lead to the same old problems: unreliable utilities, damaged nature, and locals feeling left out when decisions are made, wondering who really benefits from all this city planning.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Governance & Public Policy.

Weak processes erode citizen trust.

The way Bogotá plans and manages its land shapes the way the city is run. How space is used affects expansion, where services are provided and which areas are ignored (Domínguez, Sierra & Cuervo Ballesteros, 2021). This isn't neutral; it's tied to the power and money that keep old imbalances going (Yunda & Sletto, 2017). The location of construction projects has the power to determine the distribution of opportunities and the quality of life for millions.

A key factor here is how money and public resources are managed. Where cities choose to invest shows which areas get attention and which don't. If funding is concentrated in major developments, fairness across regions suffers, widening the gap between the city centre and the surrounding areas (OECD, 2016). Therefore, budgets are not just dry paperwork; they reveal what leaders actually care about when building urban spaces.

Citizen involvement and ways in which people can hold power to account are seen as a sign of a strong democracy. Even though there are official channels for public participation, the effectiveness of these channels depends heavily on whether citizens can genuinely influence outcomes. If participation just becomes a formality, faith in government fades and the bond between leaders and residents becomes fragile (Latin American Research Review, 2021).

Bogotá's governance and land-management practices reveal how power, resources, and public participation shape the city's spatial inequalities and everyday urban life.

From this perspective, the way cities are governed should be evaluated not only based on open processes, but also on whether all types of city resident are heard.

The way public areas are managed shows the ongoing tension between official regulations and how people actually use them. Where laws limit the use of streets, plazas, or green spaces, they often come into conflict with informal sellers, community groups, and local residents (Galvis, 2017). This reveals that shared spaces are not just about concrete and design; they are also places where law, survival and identity collide.

Finding a middle ground between agents remains difficult. Without clear connections between city and regional bodies, efforts become fragmented, initiatives are delayed, and results are compromised (OECD, 2022). If offices don't work together, urban action fragments, each piece pursuing its own path instead of a shared goal. Currently, Bogotá's leadership is inconsistent, sometimes promoting broader access and at other times perpetuating patterns that divide and exclude.

Governance & Public Policy.

Pain points.

1. Urban Planning and Land Management
Because Bogotá keeps growing faster than its city plans can keep up with, homes end up far from schools, clinics, and transit. Because zoning laws aren't enforced, informal neighborhoods appear suddenly, and empty lots are bought up for profit. This increases the gap between rich and poor and leads to construction in forests and flood zones.

2. Budget Management and Public Resources
Public funding isn't distributed evenly; flashy city-center initiatives usually receive funding instead of addressing the real needs of peripheral areas. Election timelines lead to rushed decisions, and slow implementation and incomplete projects reduce the effectiveness of the funds, slowing progress to achieve fair regional development.

3. Citizen Participation and Oversight
Although there are ways for people to get involved, many don't believe it makes a difference. Those on the periphery often get overlooked, while oversight groups lack the power and resources to ensure that organizations follow through, which makes people lose faith in democracy.

4. Public Space Regulation and Norms
People often run into trouble when using public spaces because official rules don't align with how people actually live, especially those working informally. When laws are applied unevenly and structures remain rigid, it creates friction, generating feelings of unfairness and shutting out flexible, community-driven ways to manage common spaces.

5. Interinstitutional Coordination
City departments and town leaders rarely go together, goals clash and collaboration suffers. When cooperation breaks down, tasks are repeated, help falls short, and opportunities for real solutions to tough city issues are missed.

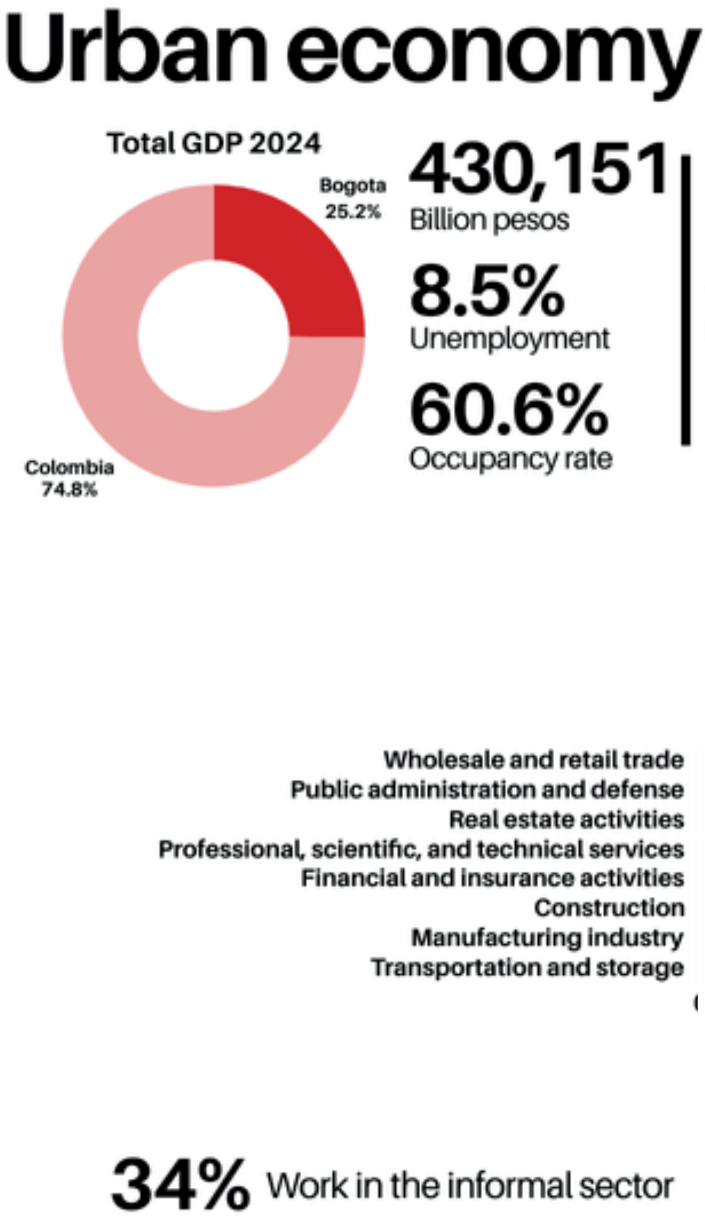
Urban Economy.

Informality is Bogotá's real economy.

The city economy of Bogotá shows an uneven balance. Formal trade follows tax rules and land use regulations, while street vendors take over sidewalks without permission. These vendors are driven by survival needs and systemic barriers (Calderón Díaz, Manrique Chaparro, & Day, 2020). This divide creates conflict over public spaces, especially in areas with heavy foot traffic, yet it also reveals how many households rely entirely on informal work to survive. Far from being sidelined, unregistered businesses form a vital network that keeps many communities afloat (WIEGO, 2023).

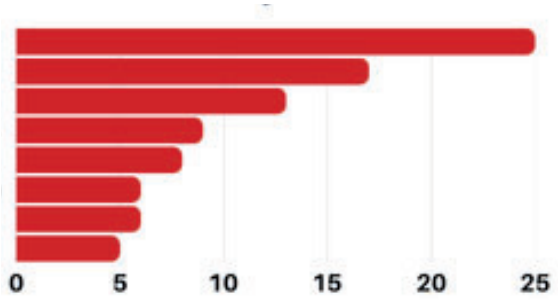
Starting your own business online has become a common way to make money in cities lately, especially for younger people who have gone to college and have easy access to the internet. Startups and rideshare apps are becoming more prevalent in areas such as Chapinero, Usaquén, and around the international center places where skills, cash, and connections already exist (BBVA Spark, 2025). However, this tech wave hasn't reached every part of town. Outer neighborhoods are stuck relying on old options and struggle to come up with fresh ideas. This disparity in access deepens city divides, turning uneven tech access into another form of inequality (World Bank, 2023).

Bogotá's traditional economic hubs, including Chapinero, historic downtown, and the industrial areas of Puente Aranda and Fontibón, still drive much of the city's output.



Bogotá's economy is shaped by contrasts between formal businesses, informal work, and uneven access to opportunities.

35,000
Registered informal vendors



13% Informal employment gender gap increase

However, they stand out next to the periphery, where growth is minimal, jobs are scarce, and many rely on aid or informal work. This uneven distribution of business activity keeps some districts dominant while leaving others behind, preventing equal access to jobs across the city (Patiño & Salcedo-Pérez, 2021).

Promoting job access through training, financial aid, and assistance with starting small businesses has become a central goal of public hiring and income strategies. However, these approaches have not been effective enough in addressing deep-rooted unemployment or informal work structures (Banco de la República, 2025). Poor alignment between growth plans and actual local demands has weakened the effectiveness of these strategies, particularly among at-risk groups such as young people, women, and displaced individuals (Calderón Díaz et al., 2020).

People often overlook the everyday survival strategies built into local connections, such as exchanging goods, helping neighbors, caring for others, and making things at home. Standard economics tends to ignore these actions, but they're actually what keep society running day to day. These efforts are closely related to emotion, place, and shared responsibility and are not included in official city plans (WIEGO, 2023). Truly valuing them requires rethinking what counts as useful work, not just money-driven output, but also connection-based effort that holds communities together.

Estrato socioeconomico.

(2019)

This map illustrates the socioeconomic stratification of Bogotá in relation to access to public transportation services. Color-coded zones represent different income levels across neighborhoods, highlighting disparities in urban infrastructure and mobility coverage. Areas such as “Cerros Orientales” and “Bo. Rodríguez” show distinct topographical challenges, while the presence of a river and contour lines suggests how geography influences transit accessibility.

TransMilenio S.A. (2019). Plan Marco del SITP 2019. [Publicación oficial]

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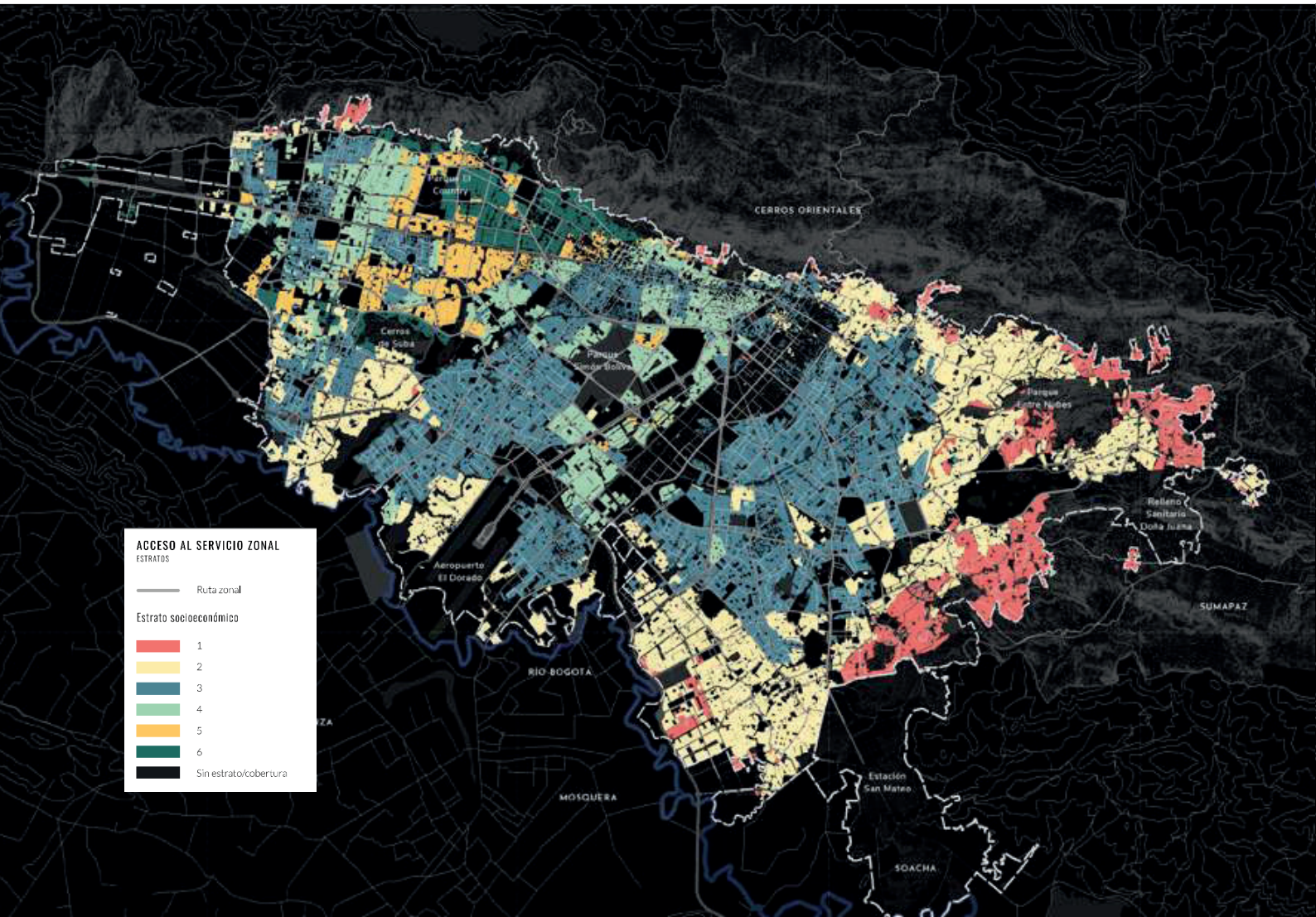

Monthly Income.

(2019)

This map visualizes household income distribution across Bogotá using a hexagonal grid overlay. Red-toned areas indicate neighborhoods where households earn significantly less, while green-toned zones represent regions with higher income levels. The spatial pattern reveals stark economic disparities, often aligned with topographical and infrastructural features. Pathways and elevation contours suggest how geography and urban planning intersect with income inequality.

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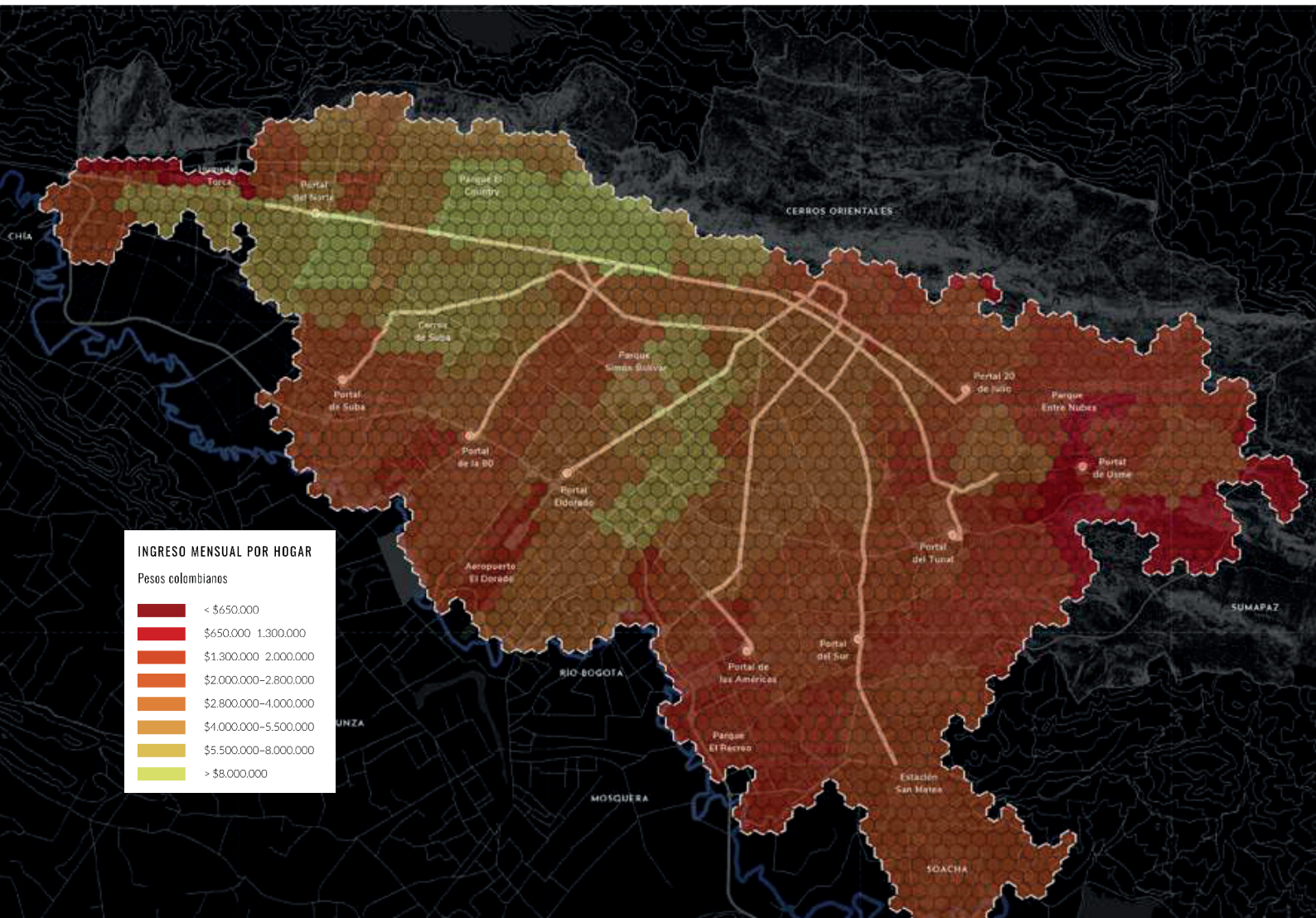

Urban Economy.

Pain Points.

1. Formal and Informal Commerce
In Bogotá, registered shops coexist daily with street vendors. Although street vending supports countless households, it is not legally recognized, leaving vendors vulnerable to sudden removal and unstable working conditions. Rules intended to clean up city areas often force street vendors out without offering viable solutions, increasing their difficulties and financial struggles.

2. Entrepreneurship and the Digital Economy
The city's startup culture and digital job market are growing quickly, particularly among young people. However, this boom is mostly in wealthy, central districts. Peripheral neighborhoods face challenges such as unreliable internet, limited opportunities for skill development, and a lack of spaces for creative collaboration, which prevents many people from taking advantage of new opportunities.

3. Economic Hubs
Bogotá's economic engine mainly runs on the central districts of Chapinero and other industrial zones, areas where jobs, capital, and support systems are concentrated. Because activity is concentrated in these areas, people living on the periphery face difficult, costly journeys to work while their neighborhoods remain ignored, creating deeper gaps in both city layout and access to opportunities.

4. Employment and Income Policies
Public programs created to help people find jobs often fail to address the reasons why people can't find work. Many at-risk communities still can't achieve consistent employment, and skill-building efforts usually don't align with what employers want, so people end up in temporary jobs instead of achieving financial stability.

5. Popular, Solidarity, and Care Economies
People trading goods locally, whether growing food or helping neighbors, keep communities going. Yet, governments rarely include them in reports or plans. Without loans, stable resources, or recognition, these everyday systems keep things together, quietly supporting lives despite unstable conditions.


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Culture & Identity.

Space shapes opportunity & access.

The vibrant city of Bogotá benefits from a rich cultural atmosphere, largely cultivated by its libraries. However, museums often play a more discrete role. These institutions collaborate with the community to promote connection, learning, and creative expression. However, the distribution of these spaces is uneven: certain neighborhoods have good facilities with plenty of events, while areas farther south barely receive basic cultural services and don't have essential resources (Ajuriaguerra Escudero & Di Guglielmo, 2025). This gap limits opportunities to learn through fun activities, creating invisible lines across town and making culture feel out of reach for many residents.

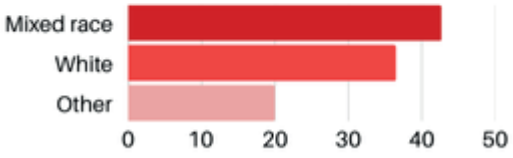
Attending school, from early childhood education through college, opens doors for people. However, there's a significant difference in the quality of schools and university admissions between the city's north and south (Junta Rodríguez, n.d.; Astorquiza Bustos & Mejía Arango, 2021). Where you live shapes how much learning you experience, maintaining poor conditions across generations. What children learn reveals exactly where leaders choose to spend money and which parts of town they pay attention to.

Street parties, like local fairs, murals, dance groups, and unplanned performances, breathe new energy into shared spaces. They turn sidewalks and plazas into arenas of cultural pushback. Though usually operating outside official channels, these activities enable marginalized neighborhoods to share their histories and redefine belonging while challenging the definition of city life (Bucheli, 2020; Mu-

Ethnography

3,061,931

Families Etnography



Health

22 Public hospitals

100+ Health centers

50 Private hospitals

1200+ IPS/ Private

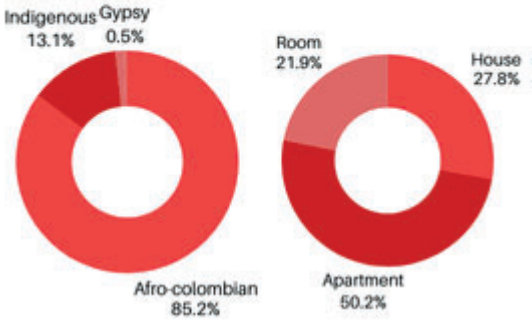
Culture

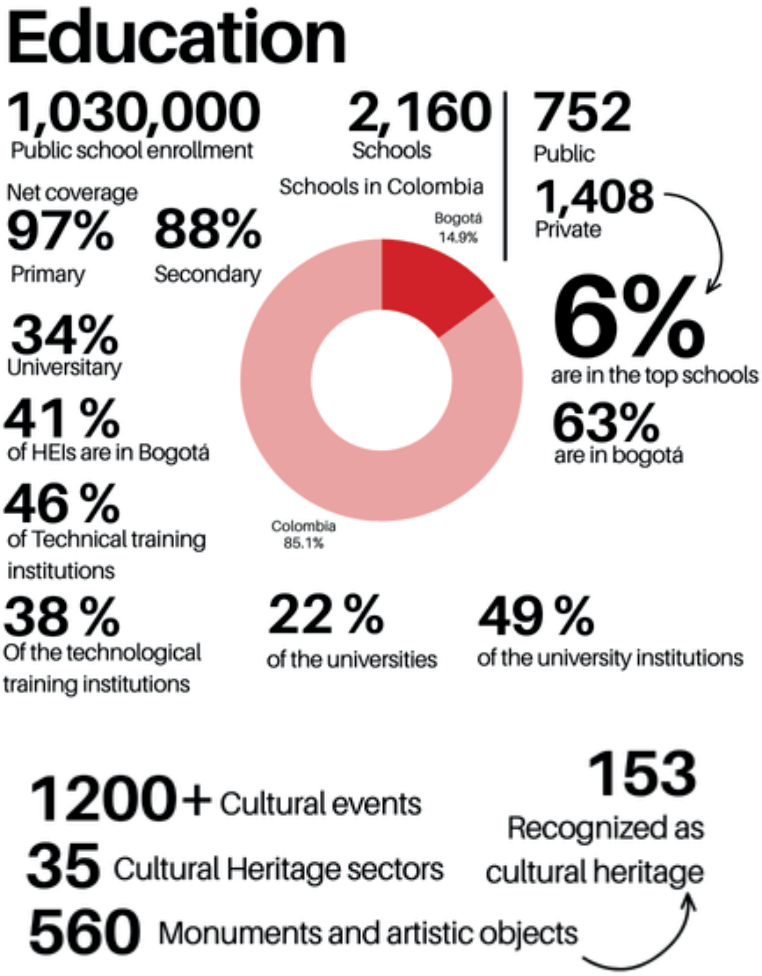
7,199 Buildings of cultural interest

63% Colombia's cultural economy

600,000 Visitors to book faire

Bogotá's cultural life thrives in libraries, schools, and grassroots activities, but access and quality vary greatly across neighborhoods.





sicco-Nombela, Fernández Hernández, & Cozar Castañeda, 2025). In Bogotá, painted walls and grassroots celebrations don't just add color; they speak out, honor roots, and shift perspectives.

The city's tangible heritage, manifested in its physical locations and living traditions, extends from the historic heart of the city to its distinctive architectural structures, communal narratives, and the cultural practices that are embedded in the daily lives of its people. Preserving these elements builds stronger community ties and group identity, but it requires careful approaches that acknowledge both grand landmarks and ordinary moments. Often, memories tied to working-class zones are overlooked by official tools, which slows efforts toward creating a city narrative open to everyone (Toth et al., 2019).

Lastly, Bogotá benefits from its diverse cultures, languages, and age groups. People of different backgrounds live here, including Afro-descendants, natives, migrants, the young, and the elderly. Each group adds unique insights, speech patterns, and lifestyles.

However, city planning rarely reflects this diversity, often treating everyone the same while ignoring their distinct needs (Ramos, Duque, & Nieto, 2020). Recognizing this rich blend as a resource requires rethinking how areas are developed, how resources are shared, and how public spaces are designed.

Culture & Identity.

Pain points.

1. Cultural Spaces and Facilities
Libraries, museums, and theaters, as well as other cultural spots, keep the city's energy alive. However, they are not distributed evenly in Bogotá. Many areas, particularly peripheral zones, lack proper facilities and events, making culture harder to access and increasing the gap in available creative opportunities.

2. Formal Education
Schools and colleges share knowledge and opportunities, but many students are unable to participate because of differences in the quality of facilities and supplies. This creates a gap that feeds inequality and slows social mobility.

3. Popular Expressions and Festivals
Carnivals, graffiti and music, along with other creative acts, breathe life, character and courage into shared spaces. However, these forms often encounter disapproval, are ignored by the authorities or face rigid rules, which weakens their ability to stimulate cultural life and strengthen neighbourhoods.

4. Material and Immaterial Heritage
Bogotá's past stretches from old city streets to local icons, forming a real connection to who the city is today. However, preserving these elements is uneven, some places and traditions are ignored or squeezed out by new construction, gradually causing shared roots and common stories to fade.

5. Ethnic, Linguistic and Generational Diversity
Bogotá grows stronger when people from all different backgrounds come together, regardless of their age or the language they speak, but city plans rarely reflect this diversity. When efforts to include everyone fall short, certain neighbourhoods are excluded from key decisions; their voices do not influence progress even though they help to build it.

Social fabric & Security.

Fear grows where light fails.

Bogotá's social life mostly holds together thanks to local groups working where they live. When official support disappears, residents form community associations, organise shared meals or group initiatives called mingas, demonstrating unity among citizens. Although city planners rarely pay attention, such actions quietly address food security, provide mutual support, and solve daily problems (Astudillo Rodas & García García, 2021). Their importance lies not only in their output, but also in their meaning: urban strength born from teamwork and resilience.

Bogotá's cities face serious disorder and a lack of safety. Small-scale clashes, such as thefts, verbal fights, or intimidation, happen constantly across many southern and western edges. However, people's perceptions of crime do not always align with the statistics (Romero, 2014). In certain neighbourhoods, fear grows due to inadequate street lighting, poorly maintained parks, and police presence only infrequently. This highlights that security is not just about data; it is also tied to emotions and how people perceive their environment (Moser & McIlwaine, 2000).

Getting everyone included fairly is still difficult here. Unequal access to schooling, employment and opportunities for recreation reveals a divided city, where some areas benefit while others are left behind.

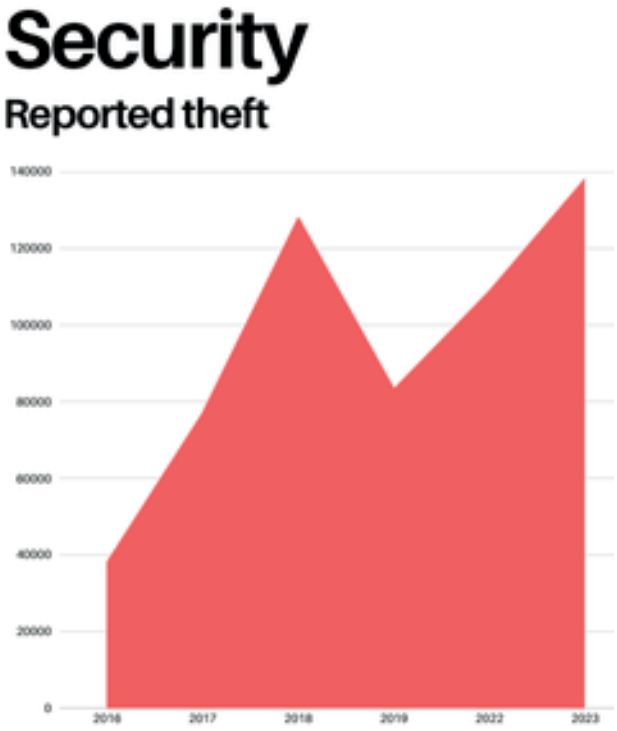
Social fabric

500+ Community care organizations

30 billion COP

Invested to strenghten local cultural solidarity networks

Bogotá's social cohesion relies on local community initiatives, yet unequal access to services and safety challenges reveal deep divides across the city.



18.5 %
Homicide increase in the first quarter of 2025

64 %
Extortion increase between 2023 and 2024

69%
Security insatisfaction

This divide not only prevents personal growth, but has a negative impact on community spirit too. When parts of the city don't share resources equally, Bogotá cannot work as one unit and is held back by old, unfair practices.

The delivery of social services, including healthcare, child support, disability aid and welfare, relies heavily on local infrastructure, yet access to these services varies significantly from one region to another. While some communities enjoy nearby resources, others have to deal with extended travel times, long waiting periods and instability. This unequal access to basic services has a significant impact on people's everyday lives, highlighting the need for better adaptation of planning to local conditions (Houghton, Bascolo & del Riego, 2020; Bautista-Gómez & van Niekerk, 2022).

People don't really trust big organisations these days broken, commitments and red tape having worn things thin. Because of this, neighbourhoods are finding their own ways to cope. When official help falls short, local leaders step in, neighbours support one another, and people find ways to keep things running themselves. To support these efforts effectively, power should grow outward from the ground up, rooted in the places where people live.

Social fabric & Security.

Pain points.

1. Community Networks and Territorial Solidarity
People organizing locally through neighborhood associations, shared meals, or community workdays keep their neighborhoods together by helping each other and dealing with issues directly. However, these efforts often lack proper support from decision-makers or resources, so organizers rely on volunteers, which can lead to exhaustion or burnout.

2. Violence and Perception of Insecurity
In certain areas, everyday routines are disrupted by small-scale violence, demands for money, or conflicts over territory. Meanwhile, in other areas, the fear of becoming a victim far exceeds the actual crime rate. This gap between how people feel and the statistics makes keeping communities safe more difficult and reduces confidence in authorities and shared environments.

3. Social Inclusion and Equity
In Bogotá, opportunities for quality education, decent employment, and safe recreational spaces are not distributed equitably, reflecting the city's social divisions. Neighborhoods on the periphery face significant challenges that restrict mobility and promote isolation.

4. Social Services
Health care, programs for children, assistance for people with disabilities, and welfare services all depend on public facilities, which differ greatly from one area to another in terms of access and effectiveness. Outlying areas or poorer neighborhoods usually face gaps in care, long delays, and inadequate facilities.

5. Institutional Trust and Community Resilience
In some areas, trust between people and authorities breaks down due to broken agreements, long waits, and feeling ignored. When that happens, locals usually step in to fill the gap, creating strength through community efforts. Yet, they rarely receive the necessary support or credit to sustain their efforts over time.


REPUBLICA

Environment & Sustainability.

Invisible networks sustain urban life.

The city is dealing with a quiet mess regarding trash management. Every day, Bogotá produces massive amounts of garbage, yet even with official pickup services, recycling relies heavily on informal workers. These people are often forgotten, but they play a crucial role in the city's ecology by extracting, organizing, and returning materials to the production cycle (Bermúdez, Montoya-Ruiz & Saldarriaga, 2019; Pardo Martínez & Piña, 2017). Still, they operate under precarious circumstances, lacking proper status or job protections, which shows a gap between proclaimed green goals and continuous marginalization.

Bogotá's air quality is crucial when discussing long-term quality of life. Instead of just cars, there are mostly personal vehicles and cargo trucks pumping out nasty fumes (Cuéllar-Álvarez et al., 2023). The neighborhoods hit hardest, such as those in the southwest or near industrial zones, usually experience heavier smog, which affects people's breathing (Almentero et al., 2024). This uneven effect shows that pollution does not spread uniformly; it accumulates where poor communities already struggle.

Green spaces and urban wildlife are important for people's health, mood, and the local climate. However, parks, yards, and natural links between them are lacking and are distributed unevenly across neighborhoods. While some areas have many well-maintained green spaces, others have few (Tzortzi, Lux & Pardo Delgado, 2024).

Sustainability

8300 Tons Produced of solid waste

12,000 Families depend on informal recycling

2 trillion In reusable material are wasted

Bogotá faces environmental challenges—from waste management and air pollution to uneven green spaces and water stress—while local initiatives strive to promote sustainability amid systemic

18% only recycled by informal recyclers

2,320
Premature deaths linked to pollution

62% Of particulate emissions are from public transport

Without these spaces, a city's ability to cool itself down, protect local animals, and have places for people to gather is weakened.
Water in Bogotá is under pressure from several directions. As cities spread out, wetlands, river zones, and supply areas are hit badly, natural rhythms shift and water systems weaken. Although some organizations attempt to protect important areas such as the northern and southern wetland areas, construction demands and ineffective collaboration continue to endanger these areas (Gómez & Velásquez, 2018). The long-term health of water depends on land use plans that recognize water as ecologically vital and culturally meaningful.

Ultimately, fostering an understanding of nature and cultivating eco-awareness are key to reshaping how people relate to their surroundings. Across Bogotá, classrooms, local groups, and community networks run hands-on initiatives that promote green habits, such as recycling, protecting city animals, and restoring parks.

However, these initiatives often lack unity or clear connections to government plans. Building lasting eco-values requires valuing local wisdom and sparking community involvement while shaping a common path toward livable cities (Henao-Rodríguez, Lis-Gutiérrez, & Guzmán-Sierra, 2024).

Environment & Sustainability.

Pain points.

1. Solid Waste Management and Recycling
Bogotá produces tons of trash daily, yet much of it never makes it to landfills because informal recyclers collect it, though they rarely receive credit or support for their work. Poor facilities, inconsistent sorting by residents, and minimal official inclusion of these workers all reduce the city's ability to manage waste responsibly.

2. Air Quality and Emissions
Transportation is still the main source of dirty air in the city, while busy roads and industrial areas contribute large amounts of harmful particles. The places that are already struggling, usually poor districts, are hit hardest by the bad air. They deal with worse health problems and growing unfairness when it comes to pollution.

3. Green Areas and Urban Biodiversity
Parks, ecological corridors, and green spaces are rare and unevenly distributed, many neighborhoods lack access to nature entirely. This deficit weakens health, both physical and mental, and reduces climate adaptability while accelerating species decline in urban areas where habitats are already fragmented.

4. Water Management
Wetlands, watersheds, and the city's water supply are under pressure from urban expansion, contamination, and weak safeguards. Moving into these areas not only damages wildlife, but also increases flood risk and weakens Bogotá's access to clean water in the future.


IO·PEDRO·A·

Mobility & Connectivity.

Mobility issues define city access.

Bogotá's transportation system relies mainly on large public transit systems such as TransMilenio and SITP. Although these systems aim to provide coverage across the city, they still struggle with overcrowding and poor maintenance. Some zones are poorly served (Echeverry, Ibáñez, & Hillón, 2005; Hidalgo, Pereira, Estupiñán, & Jiménez, 2012). During times of heavy traffic, buses are overcrowded, stops are filled with people, and the service feels worn down (Echeverry et al., 2005). Also, peripheral neighborhoods often don't have reliable connections, which deepens access differences and reduces opportunities for equitable mobility (Bocarejo, Portilla & Pérez, 2012).

Walking or biking is considered eco-friendly and good for health. However, the paths people use tend to be broken or feel risky at times. Research indicates that users identify clear obstacles related to the city's layout, traffic dangers, and road construction (De Zubeldia, Montes, & Rueda, 2006), based on studies conducted in Bogotá. Although the city has promoted biking more recently, the plans of officials often don't align with how riders actually get around (ITDP, 2023).

The ability to easily get from place to place is important for everyone to be able to move freely. Using different modes of transportation together; such as walking, then hopping on a bus, or biking before catching a large transit line. Helps more people reach their destinations, regardless of their situation.

Bogotá's transportation system faces challenges of overcrowding, poor infrastructure, and unequal access, while walking, biking, and digital tools offer opportunities that remain unevenly distributed.

However, when systems are not linked physically, in pricing, or through technology, things slow down. Broken ramps, unconnected stations, and confusing signs make switching between options difficult, especially for people with disabilities or limited mobility (Echeverry et al., 2005).

Road networks, including streets, bridges, and signs, affect how cities function and influence travel experiences. In Bogotá, many roads are worn out, holed, and poorly maintained, with unclear signage. This not only compromises safety, but also slows traffic, adding extra expenses for drivers. Decisions about road repairs are often influenced by politics rather than technical needs, which deepens uneven access to infrastructure funding (Torrico, Boonsiriphatthanajaroen, Garg, & Lodi, 2024).

Mobile apps, digital signs, and GPS tools have made it easier to get around in some city areas. However, these services don't extend far into peripheral areas, where internet access is limited and device ownership varies greatly. Without reliable technology, people can't plan trips effectively, receive live updates, or manage their travel. Currently, smart transportation does not serve everyone equally (Lutz, Heroy, Kaufmann, & O'Clery, 2025).

Trip origin.

(2019)

This map visualizes Bogotá's urban mobility patterns through a heatmap overlay, where the brightest points indicate the areas that generate the highest volume of trips across the city. Key transportation hubs such as TransMilenio portals, major parks, and central neighborhoods stand out as dense nodes of activity

TransMilenio S.A. (2019). Plan Marco del SITP 2019. [Publicación oficial]

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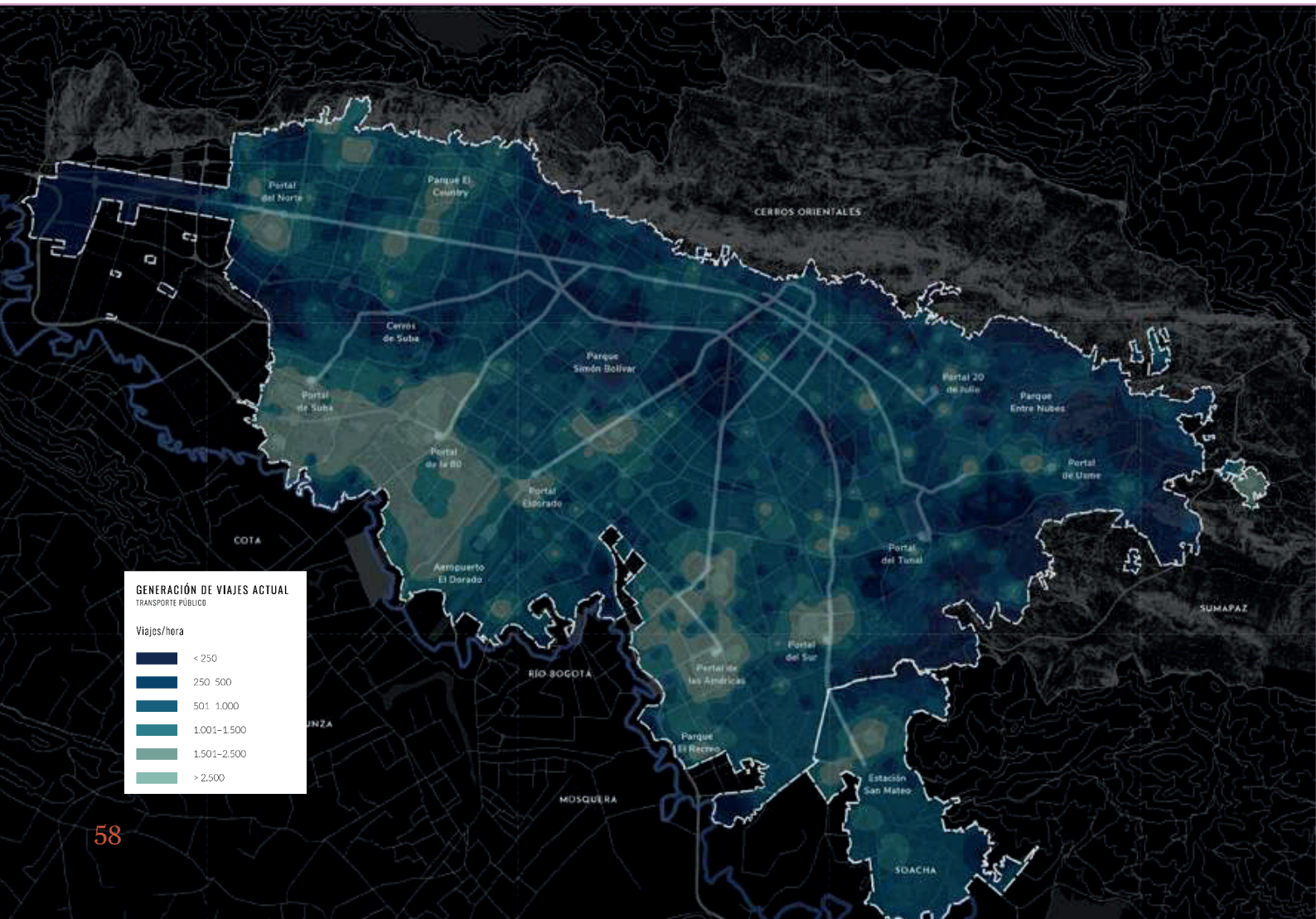

Trip destination.

(2019)

This heat map illustrates Bogotá's main trip destinations, with the highlighted areas indicating where most journeys across the city conclude. The color gradient—from blue to yellow—reflects increasing density, with yellow zones representing the highest concentration of arrivals. Key destinations include major transit hubs like Portal del Norte, Portal de las Américas, and Portal El Dorado, as well as central urban areas such as La Candelaria, Chapinero, and Parque Simón Bolívar.

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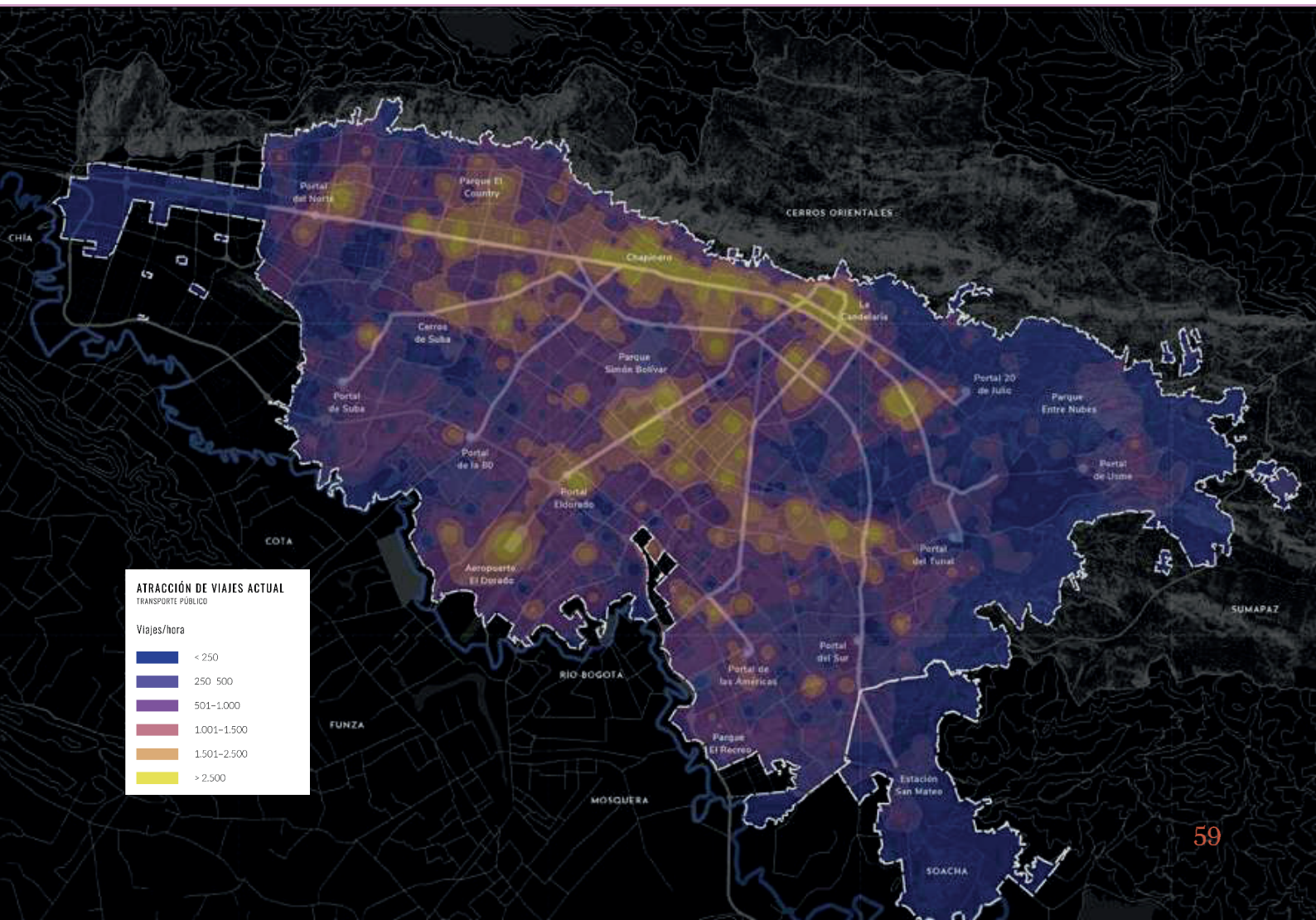

Time spent.

(2019)

This map visualizes average travel times across different zones in Bogotá, where darker areas represent longer durations and lighter areas indicate shorter times to reach final destinations. It reveals spatial inequalities in urban mobility, with peripheral zones facing significantly higher travel burdens compared to more central or well-connected areas. The gradient highlights how proximity to major transit hubs and infrastructure directly influences accessibility, underscoring the need for targeted improvements in underserved regions to promote more equitable and efficient transportation across the city.

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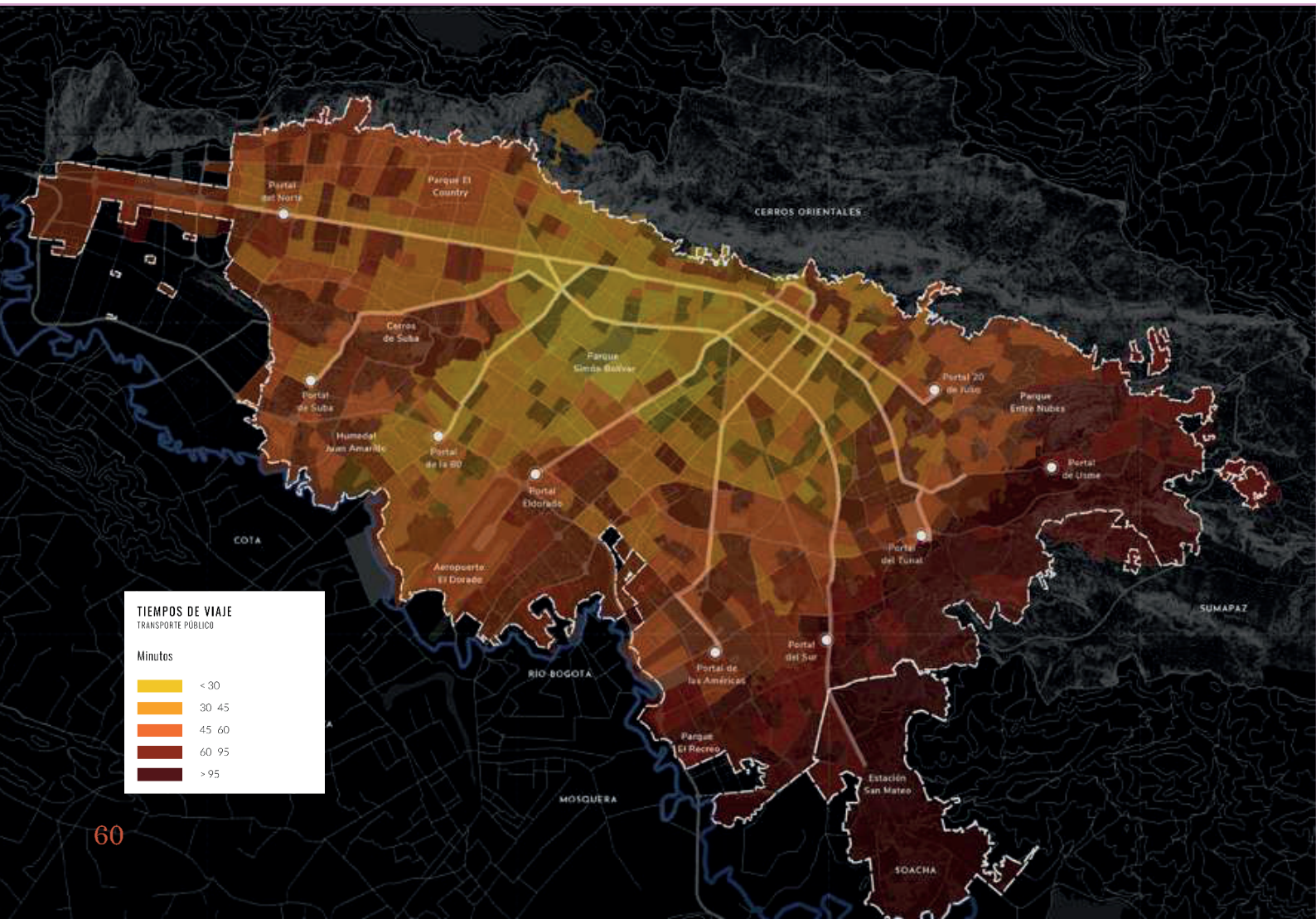

Area of Service.

(2019)

This map illustrates the zonal service coverage of Bogotá's public transport system, specifically highlighting all areas reached by the SITP (Sistema Integrado de Transporte Público). The blue-shaded zones represent locations within a 500-meter radius of a bus stop, indicating accessible walking distances for most users. Remarkably, 91% of the urban area is covered by some form of public transport service, showcasing Bogotá's unique opportunity to enhance mobility equity and optimize transit accessibility. This extensive coverage positions the city to strengthen last-mile connectivity and improve user experience across its diverse neighborhoods.

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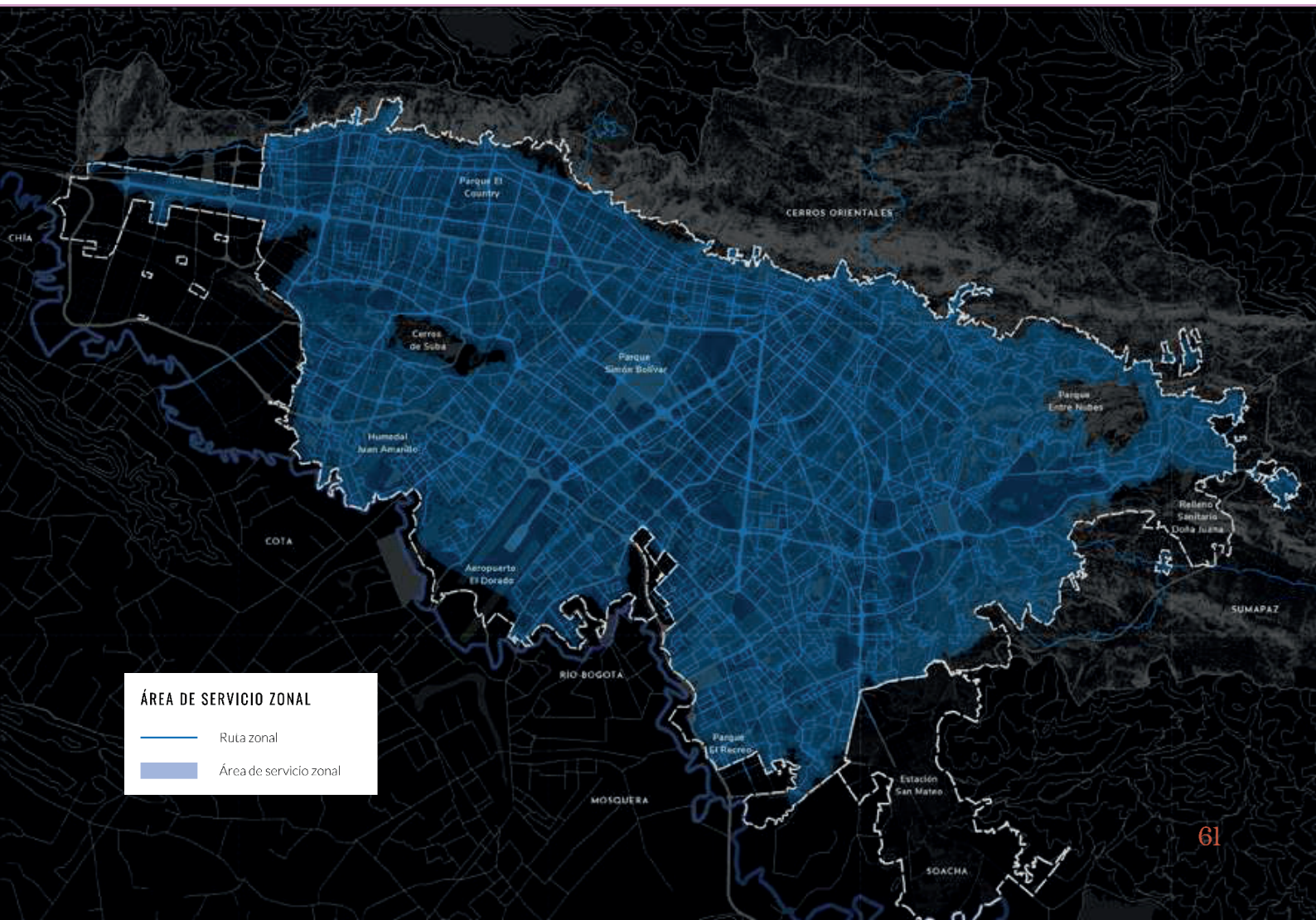


Mobility & Connectivity.

Pain points.

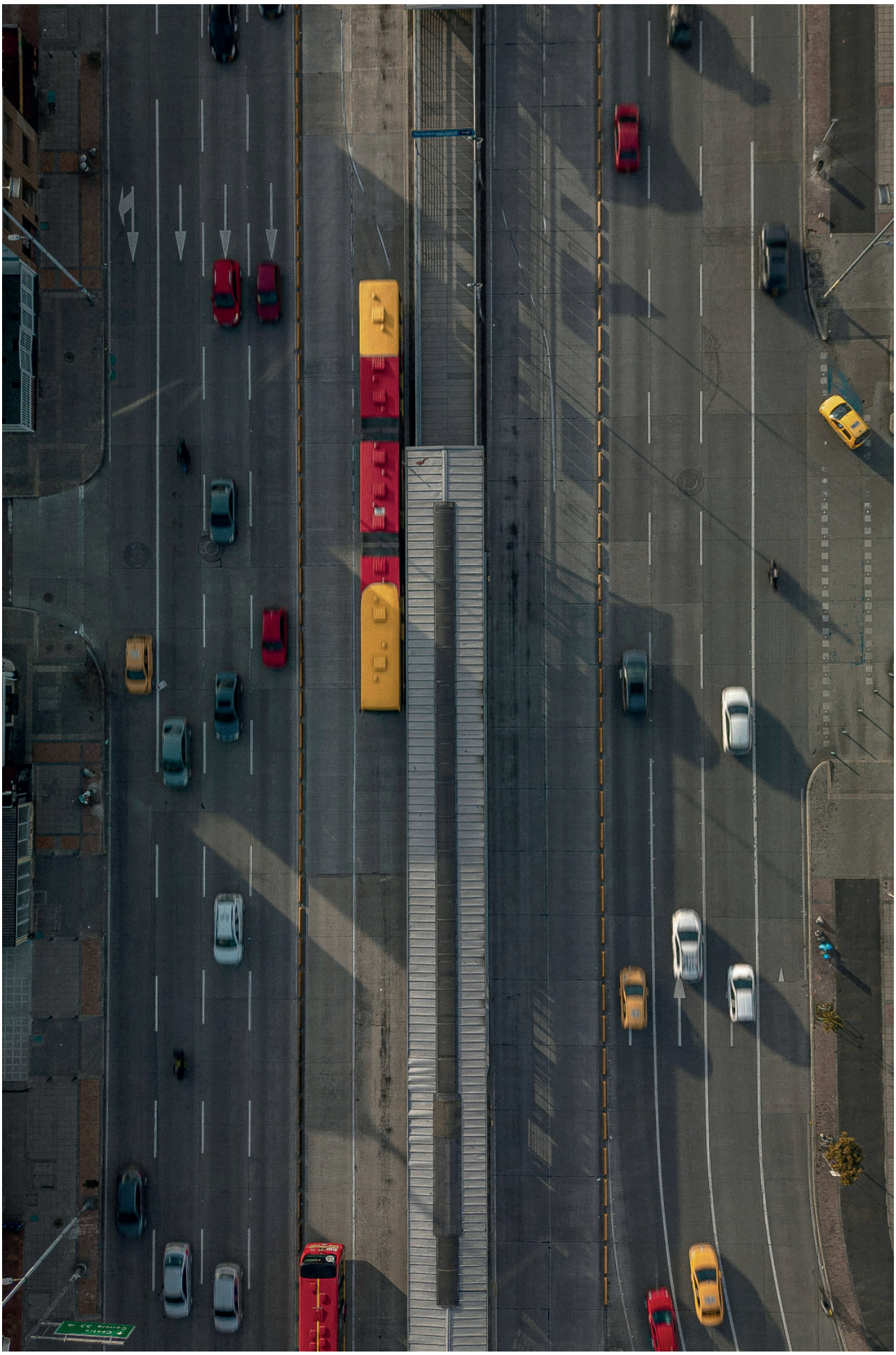
1. Mass Transit
Bogotá's public transportation system is supported by TransMilenio and the SITP, but challenges such as limited coverage, frequent overcrowding, and outdated infrastructure negatively impact their effectiveness. Many peripheral areas remain underserved. This forces residents into long journeys. These journeys are expensive and uncomfortable.

2. Active Mobility
Walking and biking are important for the environment, but the places for these activities are often not safe, are not connected, or are not taken care of. Discontinuous sidewalks, missing bike lane connections, and inadequate lighting prevent people from using them and limit their potential as everyday transportation options.

3. Intermodality and Accessibility
In order to create an inclusive and efficient system, it is necessary to have the ability to combine buses, cycling, walking, and other modes seamlessly. However, infrastructure deficiencies, station design issues, and limited universal accessibility complicate transfers, particularly for people with disabilities or those traveling from the periphery.

4. Road Infrastructure and Maintenance
Streets, bridges, and street signs are critical to urban mobility, yet many roads have deteriorated due to holes and outdated infrastructure. Maintenance is usually reactive instead of strategic, resulting in uneven quality and bottlenecks that reduce mobility throughout the city.

5. User Technologies and Information
Digital tools such as apps, GPS tracking, and real-time information signs can improve the travel experience significantly, but coverage is not consistent. Peripheral neighborhoods often lack reliable access to these services, which deepens the existing gap in information and convenience between central and peripheral areas.



Why focusing on Public Transportation?

If we take a step back, it's obvious that public transportation in Bogotá is more than just a "mobility" issue. It's the central thread that ties together almost every pain point we've been mapping so far.

It's the physical and symbolic link between people, opportunities, and the city.

Why bogota has one of the worst traffics in the world?

The city of Bogotá, consistently ranks among the world's top cities in terms of traffic congestion. According to TomTom's 2024 traffic index, the Bogotá metropolitan area ranked 40th in the world, with an average congestion level of 45% and an average time to travel 10 km of 29 minutes and 23 seconds, significantly higher than in 2023 (TomTom, 2024). Previous studies indicate that in 2019, Bogotá drivers lost approximately 191 hours per year stuck in traffic, placing the city at the top of the global INRIX ranking (INRIX, 2020).

Structural factors that explain this reality include, first and foremost, rapid urban growth and the diffuse expansion of the city. Rapid urbanisation in Bogotá has not been accompanied by adequate road infrastructure, generating extensive commuting and constant congestion (OECD, 2022). According to the Inter-American Development Bank (IDB, 2019), congestion delays in Bogotá accounted for about 1 % of local GDP and more than 335 million hours of lost time in 2019.

Second, the road and transport infrastructure has significant issues. For example, although the TransMilenio bus rapid transit system is innovative, it suffers from congestion, incomplete lines, and low average speeds. Between 2002 and 2011, the average speed of public transportation decreased from 27 km/h to approximately 19.3 km/h (De Zubeldia, Montes, & Rueda, 2006). Urban planning has also not efficiently integrated land use, transportation, and roads, resulting in an uneven distribution of road infrastructure (Bocarejo, Portilla, & Pérez, 2012).

A third factor is high motorization and low transportation integration. Although Bogotá has approximately 250 cars for every 1,000 people of driving age, congestion is caused by a lack of efficient roads, high-capacity lanes, and jammed intersections. The "Pico y Placa" vehicle restriction strategy temporarily reduced congestion but also increased the complementary vehicle fleet (Walsh, 2014; Polaridad Cofinanciamiento, 2021).

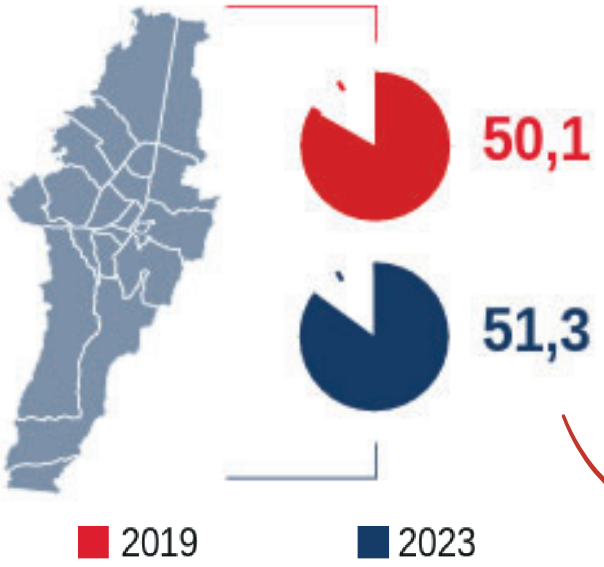
In addition, both drivers and users of public transport are affected by limited public mobility and long travel times. Travel times have increased significantly over the last decade, as the average speed of buses and other public transport modes has decreased. Public transport users, particularly those from lower socioeconomic backgrounds, spend between 22% and 40% more time travelling than those from higher socioeconomic backgrounds, with daily journeys exceeding two hours (MDPI, 2018).

Territorial inequality in investment and transport also contributes to congestion. The city's peripheries, particularly in the south and west, have limited access to high-capacity roads and quality transport. This leads to longer peak travel times and lower average speeds (OECD, 2022). Demand is high on certain corridors, which causes major roads to become overcrowded while other arteries are not used to their full capacity.

Overall, traffic congestion in Bogotá is the result of multiple interconnected factors: rapid urban expansion without commensurate infrastructure; deficiencies in road infrastructure; public transport saturation; high rates of vehicle ownership; long travel times; and a lack of territorial integration. These factors combine to give Bogotá some of the worst traffic levels in the world, significantly impacting quality of life, productivity, and environmental sustainability (IDB, 2019; TomTom, 2024; Bocarejo et al., 2012).

Overcoming this challenge requires comprehensive strategies that include expanding and modernising public transport, coordinating urban planning and promoting sustainable and equitable transport modes.

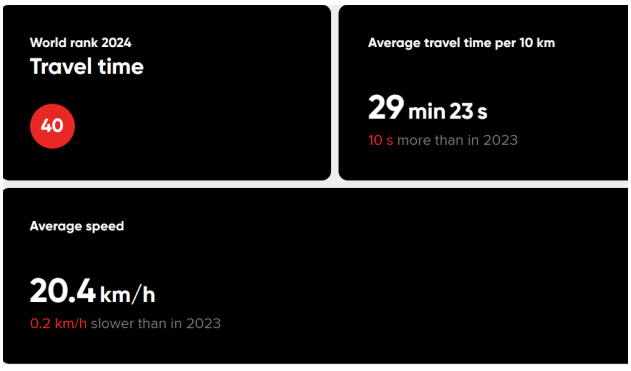
Average Time people spent from home to work in 2019 versus 2023

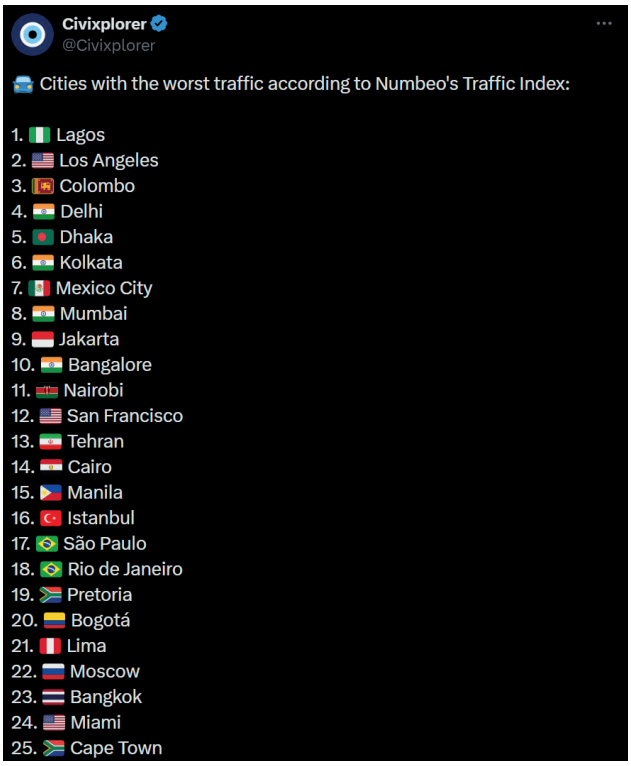


51 minutes.

Was the average time it took a person in Bogotá to get to work in 2023. This means that, on a daily basis, citizens spend a considerable portion of their time on commuting alone, Almost 200% of the average time at a national level

By: ANIF
Data retrieved: DANE (2023)





Public transport in Bogota.

Understanding the current challenges facing Bogotá's public transport system requires looking back and recognizing the historical path that has shaped its present functioning. Over the last few decades, the city has undergone various stages of institutional, technical, and operational transformation that have shaped the provision of collective mobility. The decisions made at each of these moments—from the way traditional transportation was organized to the implementation of strategic projects such as TransMilenio, SITP, and, more recently, TransMiCable—left deep marks that still condition the quality of service, modal integration, and the daily experience of users.

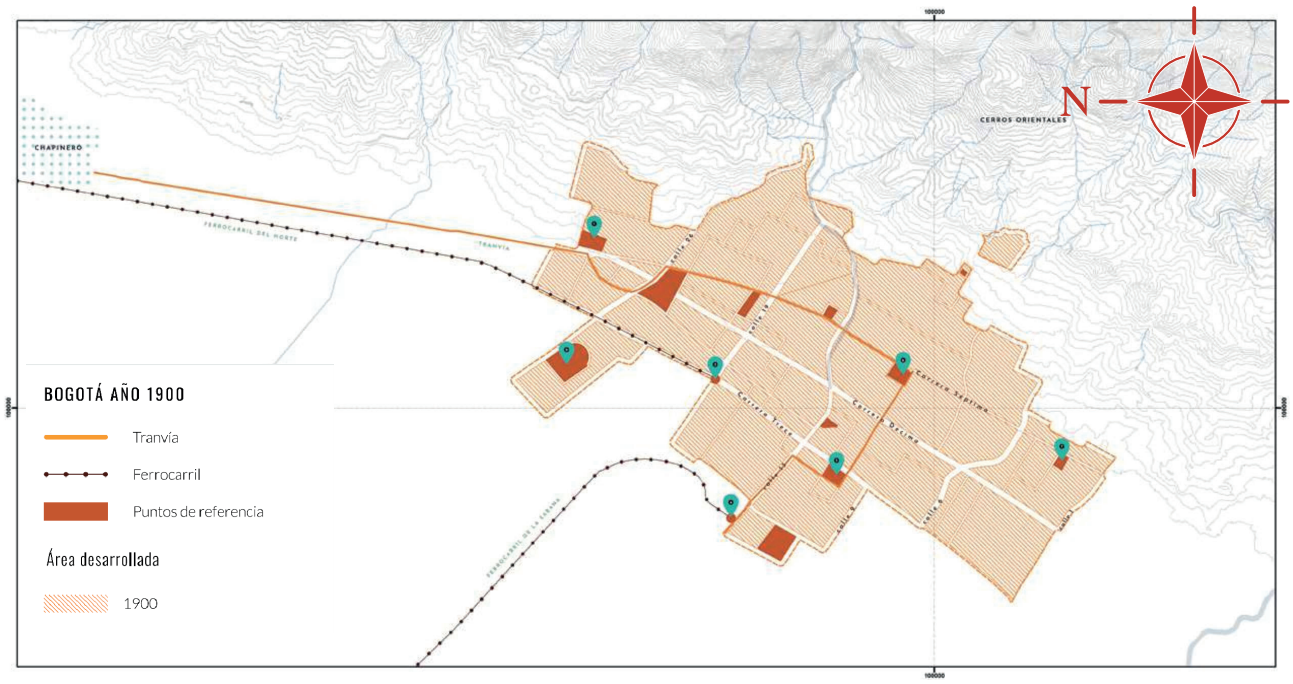
This section takes a look at this evolution, identifying the key milestones and models that took shape during different periods. It then analyzes in detail the three main components of the current public system in order to understand not only their structure and operation, but also the inherited tensions and challenges that remain. By reviewing the past and the decisions made, we seek to offer an interpretive framework that allows for a better understanding of contemporary issues and opportunities for improvement towards a more efficient, accessible, and integrated system.

[1800-1900]

Slow pace of urban movement.

In the early 19th century, Colombian cities like Bogotá were small and centered around political and economic hubs. Bogotá expanded from the Plaza de Bolívar toward Chapinero, establishing its first suburban neighborhood.

Animal-drawn vehicles appeared by 1846, and Bogotá launched a collective public transportation system using carriages that could hold up to ten passengers by 1851. Population growth created the need for organized transportation.



PUNTOS DE INTÉRES

01. Panóptico
02. Cementerio Central
03. Estación del Norte
04. Estación de la Sabana
05. Plaza de los Mártires
06. Plaza de Bolívar
07. Plaza de Armas
08. Parque Jiménez de Quesada
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30. Parque Simón Bolívar
31. Parque Distrital El Tunal

TransMilenio S.A. (2019). Plan Marco del SITP 2019. [Publicación oficial]

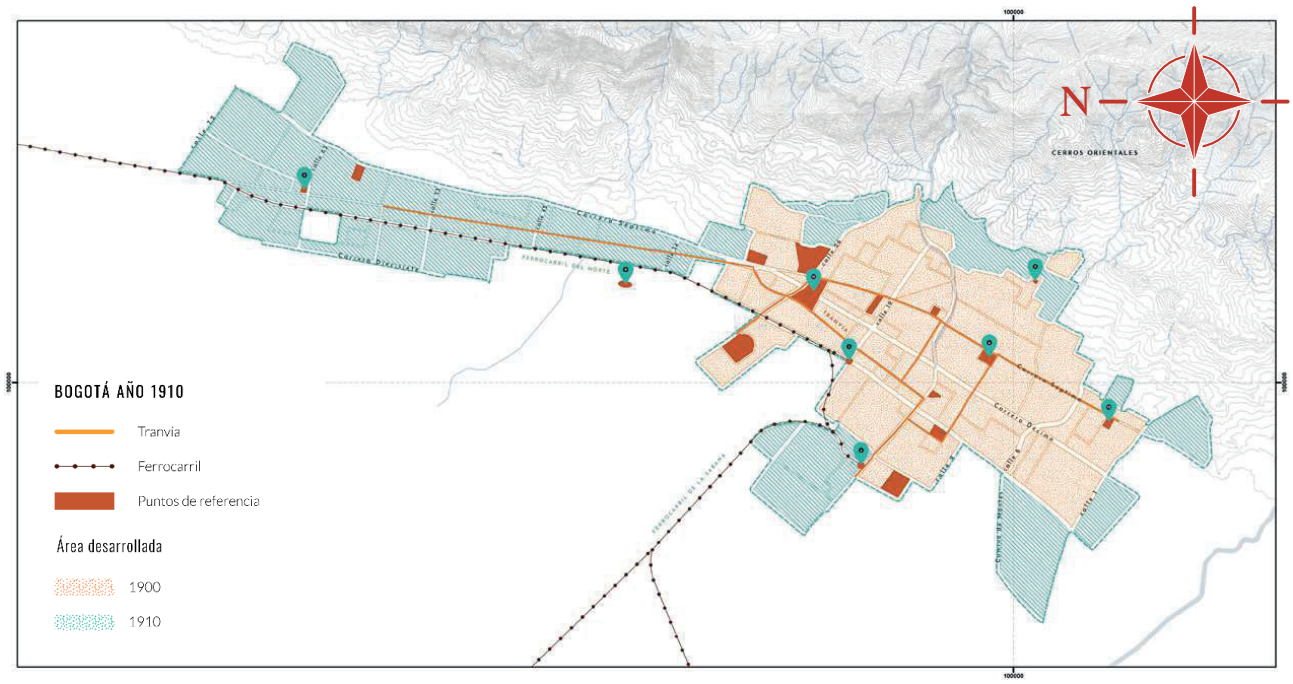
[1900-1910]

Tram network started connecting people.

In 1895, the start of construction of the Southern Railway was initiated for the purpose of establishing a connection between Bogotá and Soacha. By 1903, the railway had reached Sibaté, and by 1905, it was connected to the Sabana Railway in Bogotá.

Meanwhile, Chapinero's growth as an urban area depended on access to the tramway and railway. However, the tram service faced several issues: poor maintenance, frequent delays, irregular schedules, and unhygienic conditions. Despite the much higher cost, wealthier residents preferred private carriages. In 1904, the city government signed a contract with the Bogotá City Railway Company to improve the service.

Unfortunately, by 1908, conditions had not gotten any better. In 1910, the municipality finally bought the company and inherited a deteriorated system consisting of four lines, outdated equipment, and only 12 kilometers of tracks, just two of which were electrified.



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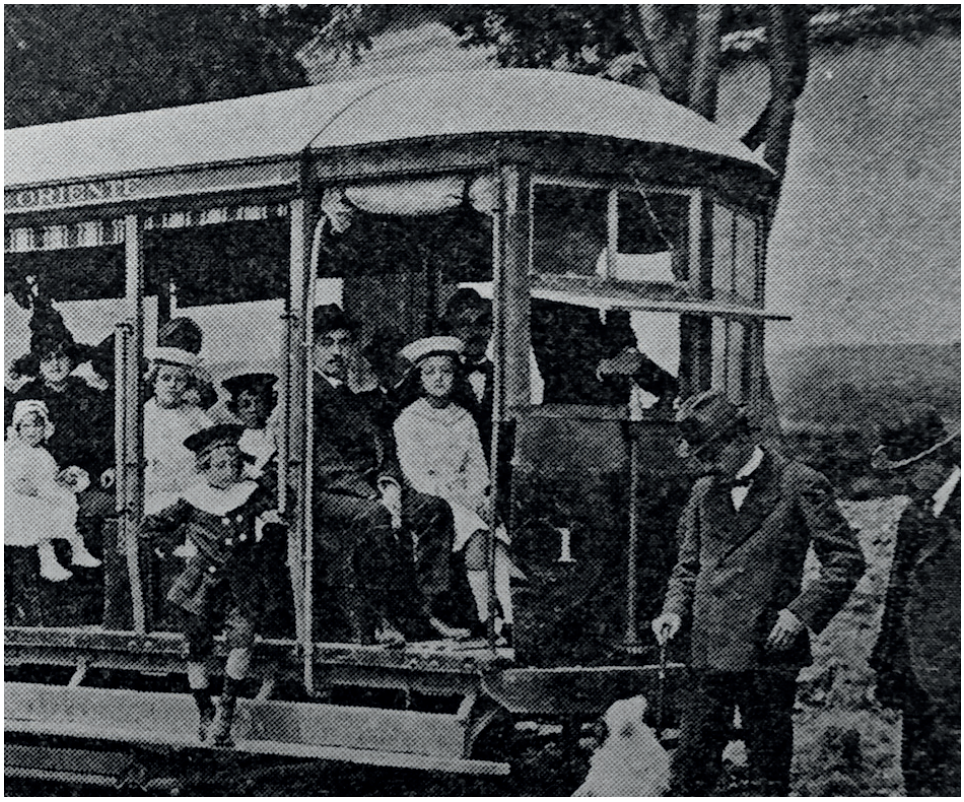
TransMilenio S.A. (2019). Plan Marco del SITP 2019. [Publicación oficial]



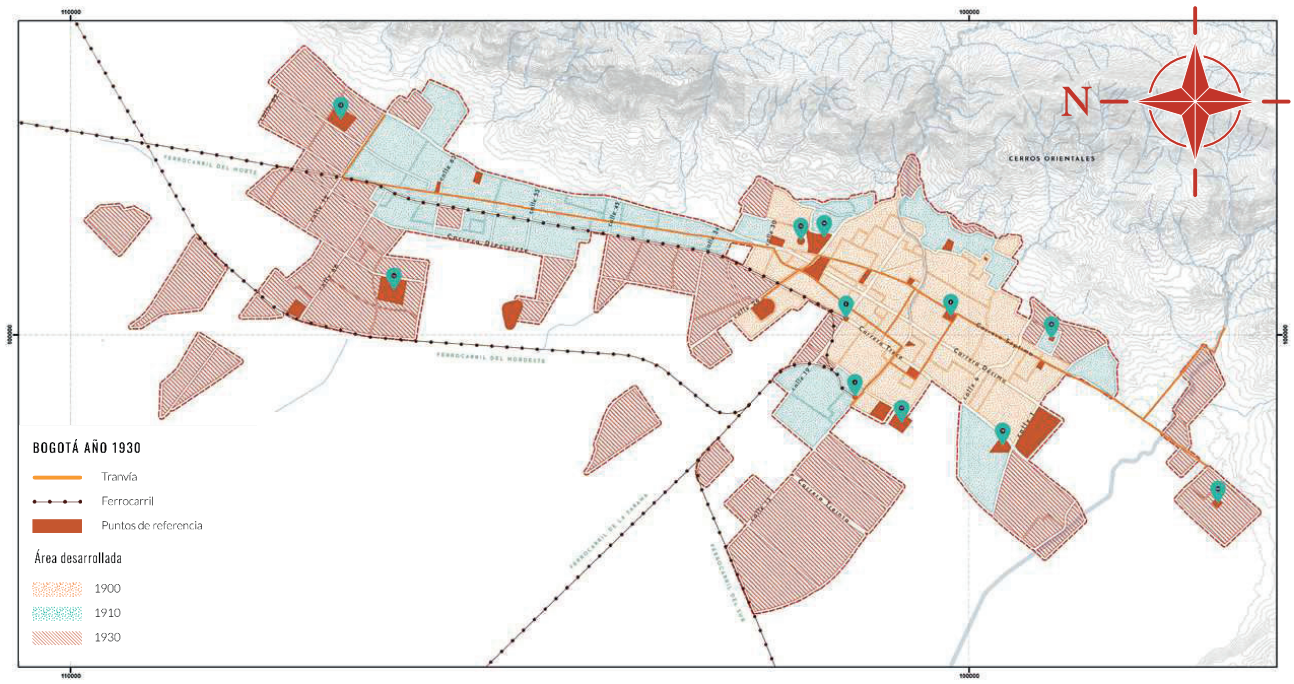
[1910-1930]

Tranvía era city's main artery.

The Bogotá Municipal Tramway operated from 1910 to 1929. During this period, the system slowly expanded. It introduced electrification and mixed use for passengers and cargo. Due to poor planning and lack of integration with urban growth, it failed to reach a lot of working-class neighborhoods.

The year 1921 marked the end of mules as urban transportation, with the introduction of the first trams to expand the network to 30.6 km. But the city's bad service and lack of efficiency made some people start their own buses, especially for workers. The Tramway administration tried to ban or limit the buses but failed.

By 1925, the Tramway administration had even started buying private buses. Nevertheless, many informal operators adapted truck bodies into improvised buses and created informal routes. In 1917, the Neoclassical Sabana Station, designed by British engineer William Lidstone, opened as the hub of the national railway. Construction began on the Northeast Railway in 1925



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30. Parque Simón Bolívar
31. Parque Distrital El Tunal

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
[Publicación oficial]

[1930-1950]

Buses took over city routes.

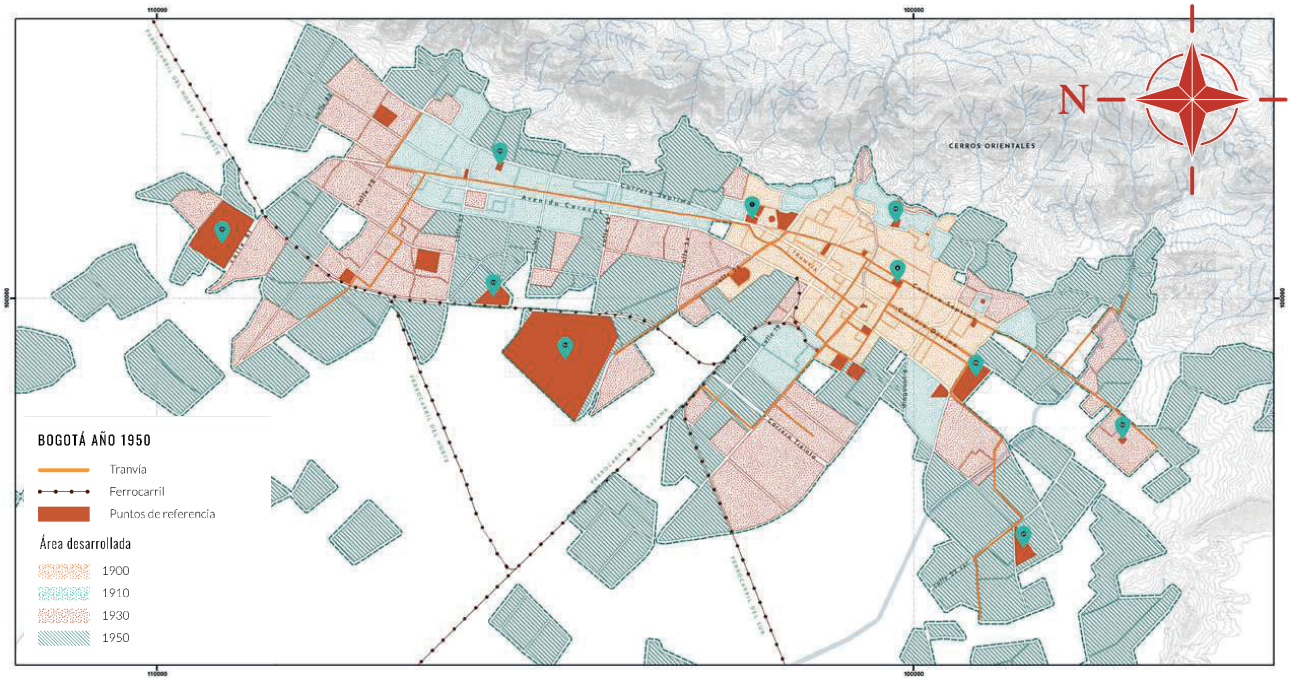
From 1933, the Northern Railway was dismantled and replaced by Avenida Caracas. A second connection between the Northeast and Southern railways was also created.

In 1929, due to financial pressures and bus competition, the City Council placed the tramway and aqueduct under the control of creditor banks through a system called "Delegated Administration," which lasted until the tram's closure in 1951.

Although tram lines expanded in the 1930s, buses steadily captured more passengers. In 1936, new streamlined trams were introduced, and a color-coded route system was adopted to address high illiteracy. However, Mayor Jorge Eliécer Gaitán restricted tram routes in 1938, giving more space to buses.

In 1942, with Bogotá's population at 380,000, the first proposal for a metro system was made but rejected. Later, in 1946, the city tried modernizing transport by incorporating trolleys and buses, which gained popularity thanks to better labor conditions and owner-operated models.

By 1948, bus cooperatives strengthened their influence, accelerating the tram's decline. Finally, in 1951, Bogotá's tramway ceased operations, overtaken by the growing bus sector.



PUNTOS DE INTÉRES

01. Museo Nacional
02. Cementerio Central
03. Estación del Norte
04. Estación de la Sabana
05. Parque de los Mártires
06. Plaza de Bolívar
07. Parque de Las Cruces
08. Iglesia Nuestra Sra. de Lourdes
09. Hipódromo
10. Parque del Centenario
11. Plaza de Egipto
12. Plaza de Armas
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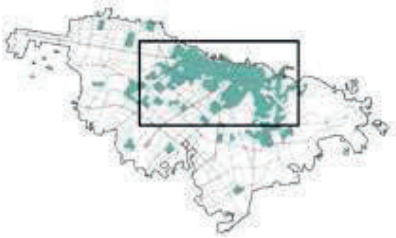
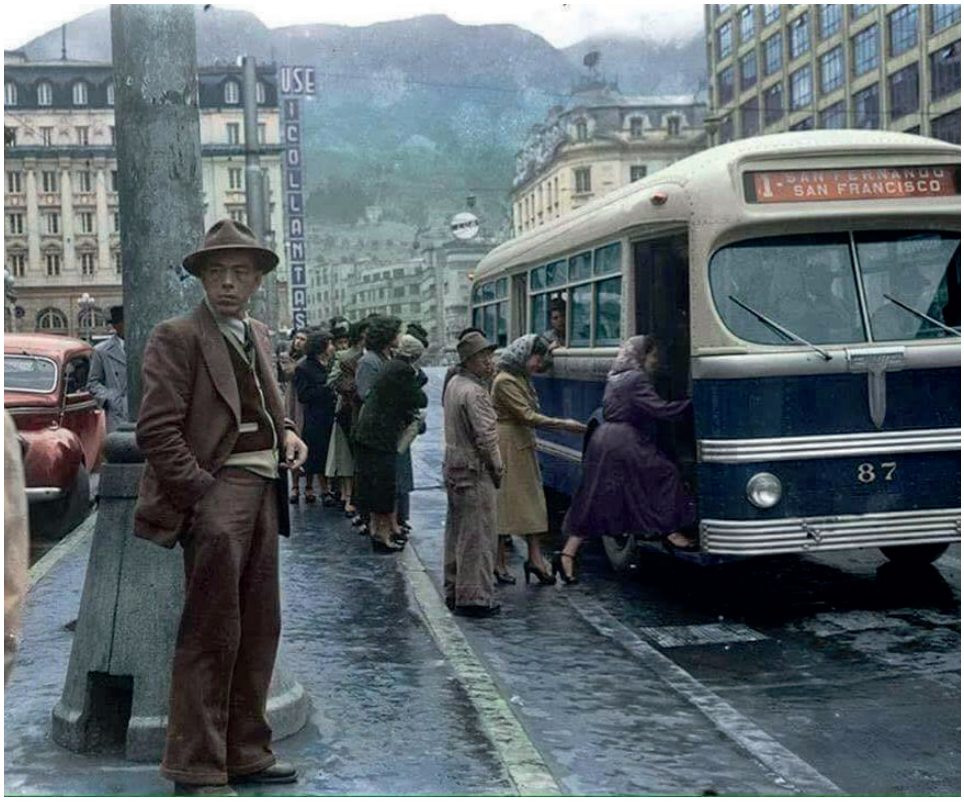




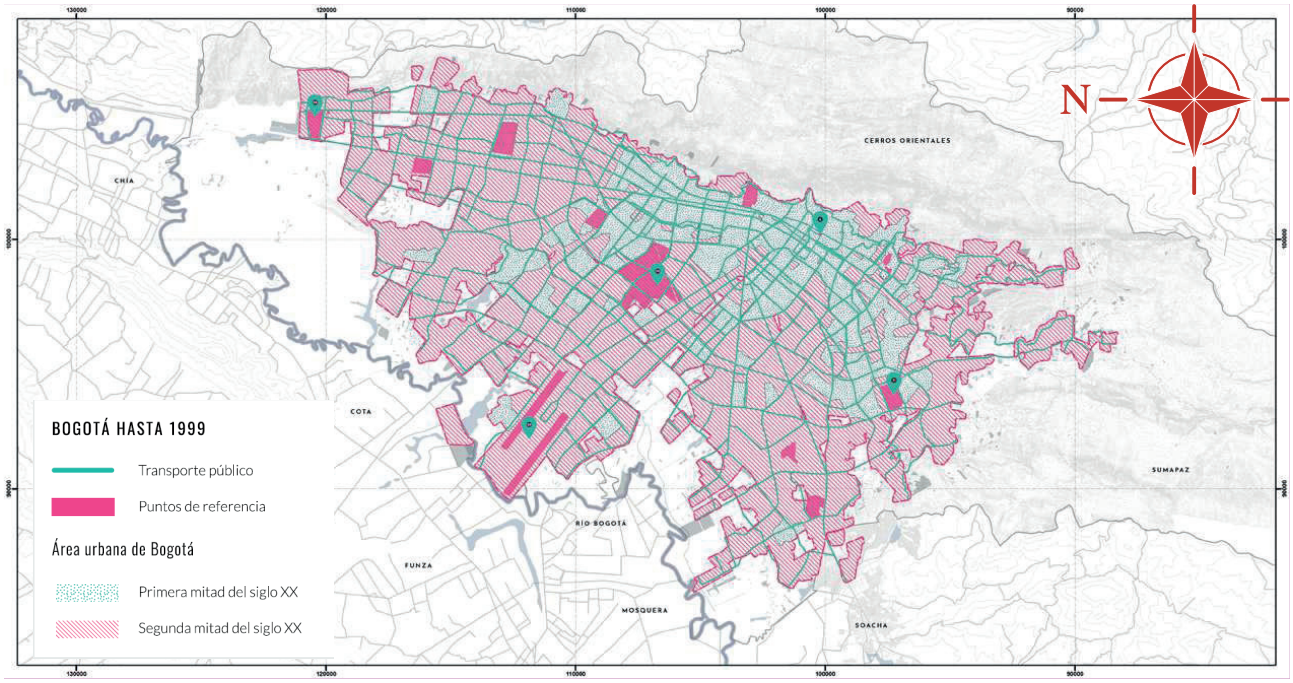
[1950-2000]

Bus chaos defined city travel.

On June 30, 1951, service was last provided by the eight trams that ran on the routes serving the neighborhoods of Pensilvania and 20 de Julio. Two years later, the final railway lines in Bogotá and its savanna were constructed, influencing the city's future development. Following the tram's closure, bus service continued to be the main form of municipal transportation until the creation of the Bogotá District Bus Company in 1958. This company was soon replaced by the Urban Transport District Company (EDTU) in 1959. By 1962, the EDTU was operating 87 diesel buses and 25 trolley cars. Even so, its limited routes left much of the growing southeastern area to private operators.

Non-public transit vehicles took over and led to unplanned, low-density city growth across more than 50% of Bogotá's land. From the 1960s onward, private companies and cooperatives continued to expand; meanwhile, problems emerged with route distribution, service schedules, vehicle maintenance, and safety. The authorities at the national and district levels share responsibilities, leading to a situation where regulations overlap and compete with one another.

By the late 1980s, there were new proposals for a Bogotá metro, but they were rejected due to technical and financial limitations. Instead, the focus shifted toward the development of exclusive bus corridors, establishing the foundation for future mass transit solutions. Meanwhile, the national rail company was liquidated in 1988, and Ferrovías was established in 1992 to administer railway infrastructure.


BOGOTÁ HASTA 1999
Transporte público
Puntos de referencia
Área urbana de Bogotá
Primera mitad del siglo XX
Segunda mitad del siglo XX
N
CERROS ORIENTALES
CHÍA
COTA
SUMAPAZ
RIO BOGOTA
FUNZA
MOSQUERA
SOACHA


BONANZA

[Present.]

Mass transit redefined Bogotá's streets.

Bogotá's public transport systems are mainly structured around TransMilenio and the Integrated Public Transport System (SITP), which seek to address the city's mobility through a hierarchical model of routes and services. TransMilenio operates as a BRT (Bus Rapid Transit) system on exclusive corridors, connecting the most densely populated areas and the main arteries of the city through high-flow stations and articulated and bi-articulated buses. This system prioritises speed and efficiency in circulation, using exclusive lanes and electronic fleet control, thus reducing travel times compared to traditional buses. TransMilenio's expansion has included trunk and feeder corridors, integrating peripheral sectors into the centralised network (Cervero, 2013).

The SITP operates as a secondary system that integrates urban and zonal routes not included in the TransMilenio network, private companies regulated and supervised by the District operate the system, ensuring coverage in less densely populated areas. The SITP lets users combine services to reach TransMilenio stations, promoting a more efficient transportation system. Although SITP buses are typically smaller and operate on more flexible routes, they are also required to meet the same safety and quality control standards as TransMilenio buses (Vasquez et al., 2020). In terms of pricing, both systems use an integrated payment system with the "TuLlave" card. This card allows for one payment per trip and free transfers within the system, as long as it is within the limits set by district regulations. Currently, the TransMilenio ticket price for main routes is approximately 3,200 Colombian pesos, with the option to make multiple transfers depending on the destination and trip length (Secretaría Distrital de Movilidad, 2024). This integrated pricing model makes public transportation more affordable and encourages its use over private vehicles.

At the operational level, both systems face challenges related to overcrowding in major routes and hubs, service quality, and vehicle modernization. To improve efficiency, they are implementing real-time monitoring tools, demand analysis, and expansion plans, including bus electrification and corridor expansion. The coordination between TransMilenio and SITP reflects an effort to consolidate a sustainable and resilient urban transportation system that optimizes mobility and reduces polluting emissions in the Colombian capital (Rojas, 2022).

This map presents the complete public transportation network of Bogotá, Colombia, highlighting two key systems. The red lines represent the TransMilenio trunk network, a Bus Rapid Transit (BRT) system operating along major corridors with dedicated lanes and large stations known as “portals.” The blue lines depict the SITP zonal network, composed of smaller buses that circulate through local streets, connecting neighborhoods to the trunk system. Together, these networks form an integrated grid that spans the city The map also features topographic contours and the Eastern Hills, offering geographic context to Bogotá’s complex urban mobility landscape.

(2019)

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
[Publicación oficial]

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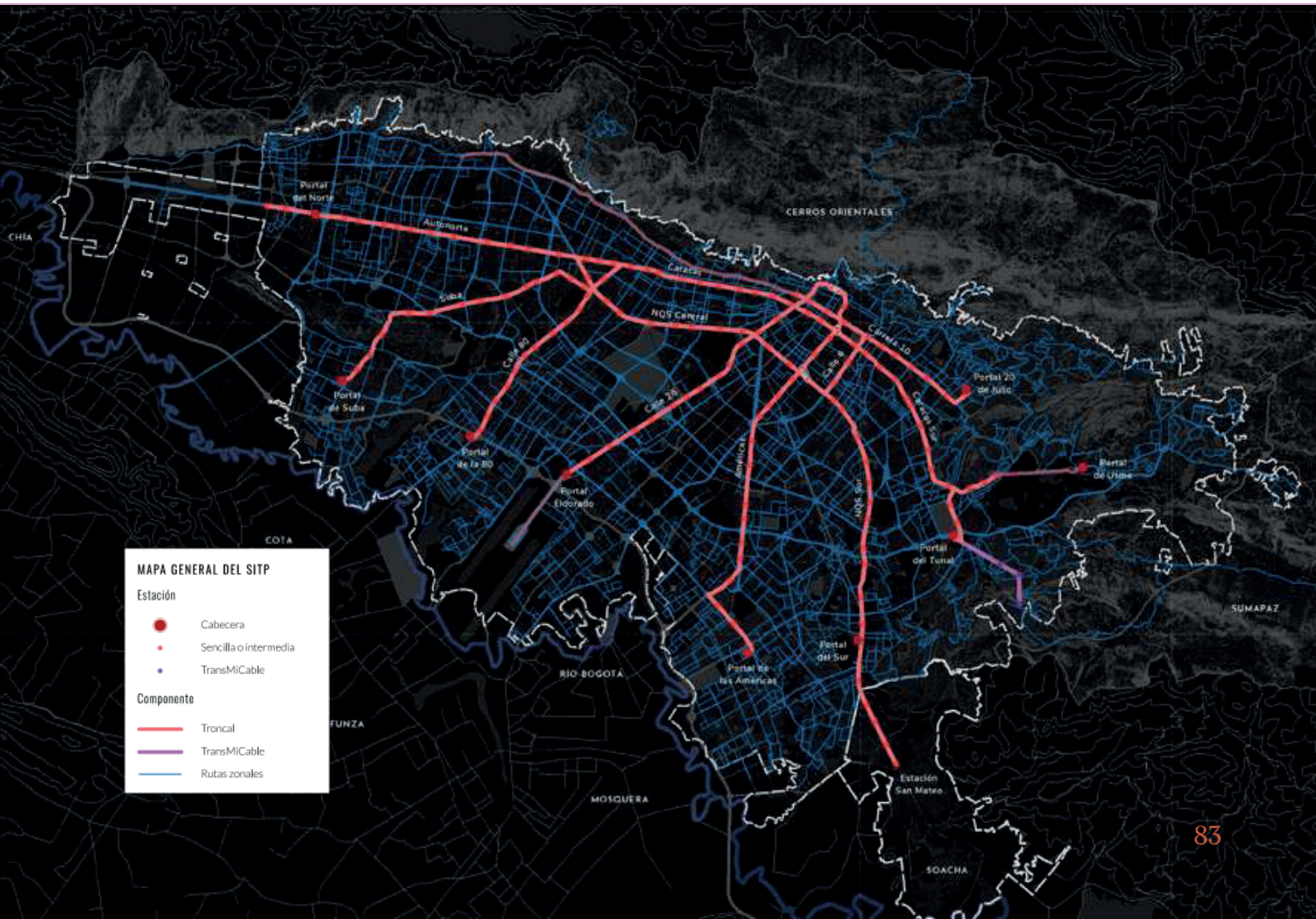

Transmilenio.

High-impact system connected the city.

TransMilenio is Bogotá's articulated bus mass transit system, inaugurated at the end of 2000 as a response to the crisis of traditional public transport, characterised by informal routes, oversupply of vehicles and poor service quality (Echeverry, Ibáñez & Hillón, 2005). The system operates through exclusive lanes for articulated buses and metro-type stations, integrating private fleets with public infrastructure. Its design seeks to improve efficiency, reduce travel times, and offer high-capacity transport to a large part of the urban population, with a public-private operating model and regulatory control by the Capital District (Sandoval & Hidalgo, 2004).

Since its implementation, TransMilenio has improved Bogotá's mobility. It transports millions of passengers daily, reduces average travel times, and improves road safety (Hidalgo, Pereira, Estupiñán, & Jiménez, 2012). However, TransMilenio faces challenges such as reaching maximum capacity during peak hours, station and bus infrastructure deterioration, and unequal coverage of peripheral areas. Studies indicate that TransMilenio has been a key tool for connecting the city and establishing the basis for an integrated, high-capacity public transportation system, considering its limitations (Echeverry et al., 2005; Hidalgo et al., 2012).

TransMilenio was born in the late 1990s when Bogotá's public transportation system was highly inefficient, had too many routes, and provided poor service. According to Echeverry, Ibáñez, and Hillón (2005), "a large number of obsolete buses provided public transportation; the average commute was one hour and ten minutes; and traffic-generated pollution accounted for approximately 70% of total urban emissions" (p. 152). This critical situation led the district and national governments to look for a high-impact solution to get people around.

They adopted the idea of a BRT (Bus Rapid Transit) system as part of a broader mobility strategy. In 1999, the administration of Enrique Peñalosa proposed the creation of a system of dedicated bus lanes inspired by foreign models, such as Curitiba, Brazil (Sandoval & Hidalgo, 2004). According to Metropolis (2015), "In 1999, Bogotá's mayor proposed a plan for a BRT system called TransMilenio that would improve the efficiency and safety of public transportation, reduce pollution, and lay the groundwork for comprehensive urban development" (p. 2). The system adopted a public-private model in which the state was responsible for the infrastructure and the private sector was responsible for operation, which ensured an accelerated deployment.

TransMilenio started operating in December 2000 with the first part of the system, which included the Avenida Caracas trunk line, metro-type stations, and a fleet of articulated buses. By April 2002, approximately 650,000 passengers per day were using the system, thanks to 38 km of exclusive lanes, 62 stations, and about 470 articulated buses, as well as 300 feeder buses covering 125 km of routes (Sandoval & Hidalgo, 2004, p. 39).

According to Echeverry et al. (2004), the system officially began in January 2001 in direct response to the previous transportation crisis. Its hybrid design combined public planning, private route selection, and regulatory control (p. 7).

The organizational and regulatory structure of the system was also innovative. Echeverry et al. (2005) explain that TransMilenio was configured as "a hybrid model that combines public planning of the network structure, route bidding, regulation, and supervision, along with private operation of revenue collection and transport service" (p. 154). This approach solved some problems of the previous system but created challenges associated with capacity, maintenance, and expansion. An ex-post evaluation by Hidalgo, Pereira, Estupiñán, and Jiménez (2012) concluded that, although the impacts on travel time, road safety, and air quality were positive, there was still a need for service improvements and criticism regarding user perceptions (p. 135).

Transmilenio.

(2019)

This map provides a detailed view of Bogotá's TransMilenio mass transit system, highlighting its trunk routes and key stations. The colored lines represent the different corridors that cross the city, connecting peripheral areas with the urban center. The main portals—located at the ends of the system. serve as transfer hubs between feeder and trunk routes. Intermediate and terminal stations are also shown along the corridors, facilitating access to neighborhoods and nearby municipalities.

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
[Publicación oficial]

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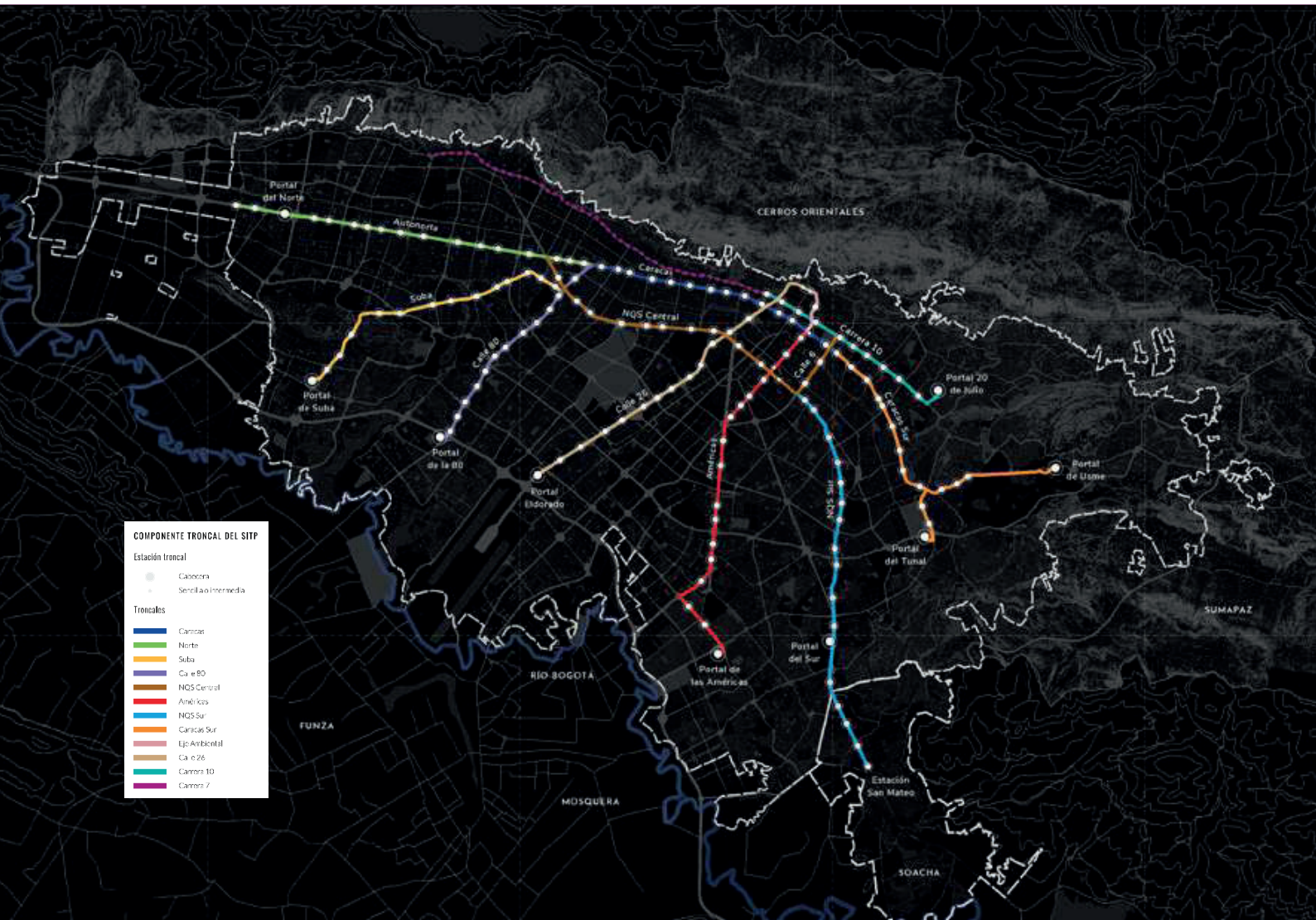

This map of Bogotá illustrates the city's TransMilenio bus rapid transit system, highlighting its structural hierarchy through color-coded stations. Pink dots represent the terminal stations, which serve as key endpoints for various routes and facilitate transfers between trunk lines. Green dots indicate the main stations or "portales," strategically located at the city's periphery to connect outlying neighborhoods with central corridors. Orange dots mark the smaller intermediate stations that provide access to local areas along the transit lines. Together, these stations form a network that converges toward the city center.

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
[Publicación oficial]

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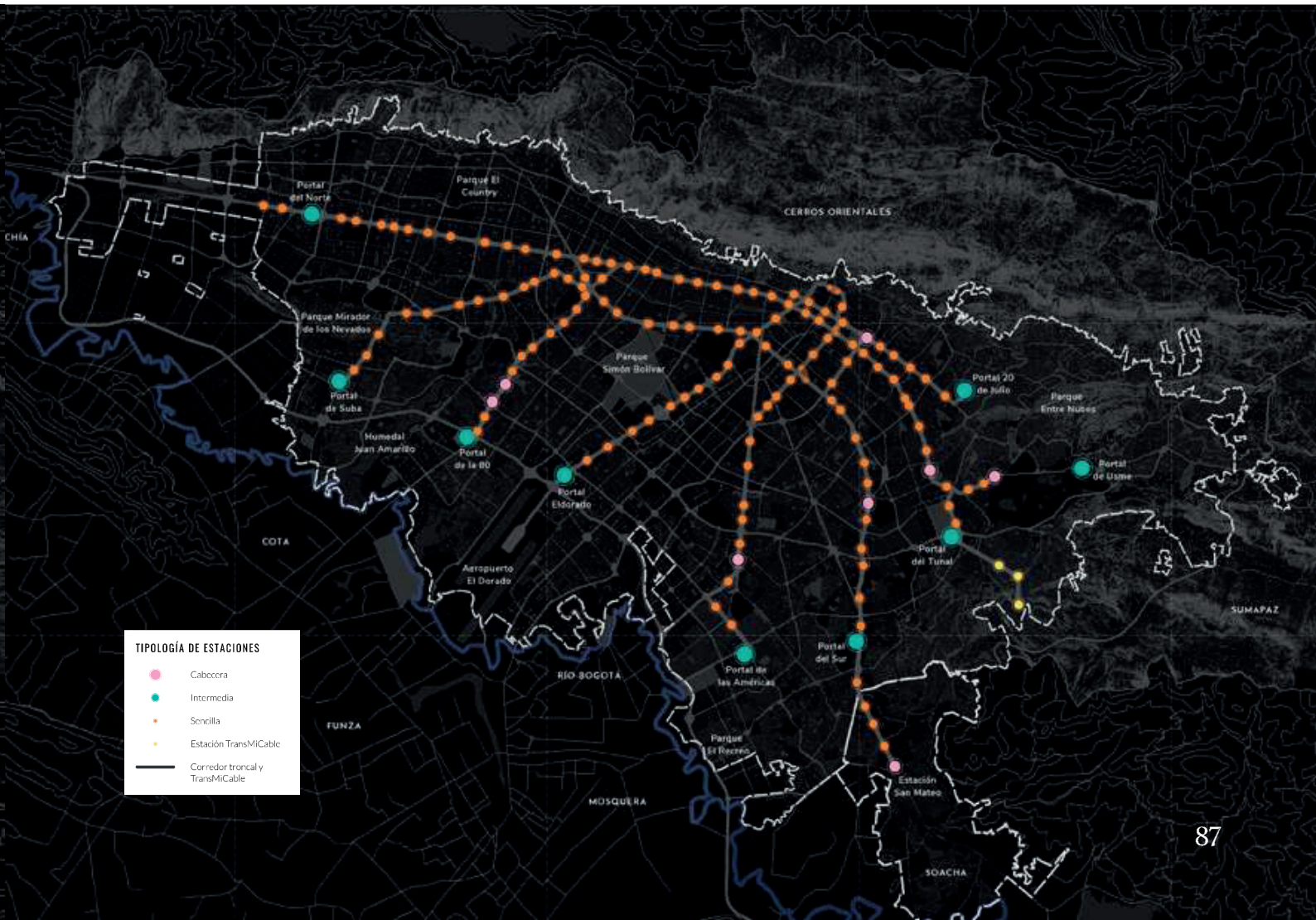


SITP.

Feeder buses expanded TransMilenio reach.

Bogotá's Integrated Public Transport System (SITP) is a regulated system that organises and coordinates buses that are not part of the TransMilenio mass transit system, with the objective of expanding public transport coverage to peripheral neighbourhoods and localities. The SITP operates through feeder and zone routes that connect neighbourhoods with TransMilenio stations or with other routes in the system, using a single prepaid card scheme to facilitate fare integration (Duarte Vega, 2015). This integration seeks to reduce urban transport fragmentation and reduce reliance on informal or illegal buses, improving mobility and user safety (Aspilla Lara & Rey Gutiérrez, 2012).

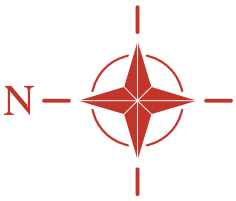
Despite its advantages, SITP faces significant challenges in terms of coverage, operational efficiency and service quality, especially in peripheral areas where bus frequency and maintenance are still limited (Cabrera-Moya & Prieto-Rodríguez, 2022). However, it is recognised as a key component for building a comprehensive and sustainable public transport system in Bogotá, complementing the capacity of TransMilenio and contributing to the social and urban inclusion of historically marginalised sectors (Duarte Vega, 2015).
Bogotá's Integrated Public Transport System (SITP) emerged as a response to the chaos of traditional public transport in the city, characterised by informal routes, lack of consistent coverage, and high institutional fragmentation. According to Duarte Vega (2015) "the root cause of the chaos in mobility is not only transport, but multiple actors related to service provision and infrastructure" (p. 71). This need for organisation led the district authorities to seek a new model that would integrate zonal, trunk and feeder routes under a more coordinated operation scheme.

The SITP's formulation was part of a sustainable mobility and territorial planning strategy that connected the TransMilenio mass transit system with feeder and zonal bus routes. According to Aspilla Lara and Rey Gutiérrez (2012), "the implementation of the SITP should counteract the increased use of private vehicles and favor collective modes of transportation that offer coverage, comfort, equity, and safety" (p. 5). So, the SITP was designed as a multimodal system to extend mass transit service to peripheral neighborhoods, reducing the need for external services and improving accessibility.

The SITP initiative involved a complex institutional and technical structure. For example, in 2009, the Inter-American Development Bank (IDB) approved a loan to support the SITP's institutional development. The loan's purpose was to "coherently articulate and make viable the projects that make up the SITP with its different subcomponents" (IDB, 2009). (IDB, 2009).

Meanwhile, Cabrera-Moya and Prieto-Rodríguez (2022) argue that, despite the complexity of public transportation systems, few studies demonstrate how to structure an integrated system like the SITP using a viable system approach (p. 442). These data show just how much institutional planning is needed to run the SITP.

Even so, implementing the SITP has presented significant challenges. Aspilla Lara and Rey Gutiérrez (2012) warn that the short-, medium-, and long-term challenges of the SITP in Bogotá are enormous, given the expansion of the vehicle supply and the limited coverage of public transportation (p. 7). Furthermore, a study by the University of Quindío notes that, despite progress, the SITP still requires further articulation, adaptation, and viability as a system (Cabrera-Moya & Prieto-Rodríguez, 2022). In summary, the SITP is an attempt to integrate and improve Bogotá's public transportation system, but its success depends on overcoming issues of coverage, efficiency, and governance.



(2019)

TransMilenio S.A. (2019). Plan Marco del SITP 2019. [Publicación oficial]

This map illustrates the full zonal network of Bogotá's Integrated Public Transport System (SITP), showcasing how different service types are distributed across the city. The blue lines represent the main SITP routes, which connect a wide range of neighborhoods and urban sectors, forming the backbone of daily mobility. These routes are designed to ensure coverage and accessibility across Bogotá's diverse topography and urban density.

SITP.

(2019)

Complementing the main network, green lines indicate feeder services that link peripheral areas to major transit hubs, while orange lines show additional feeder routes that reinforce local connections. Purple lines represent complementary services that fill coverage gaps and improve access in underserved zones. Together, these layers create a comprehensive and adaptive transport web that supports inclusive urban mobility and integrates Bogotá's surrounding municipalities into the city's transit system.

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
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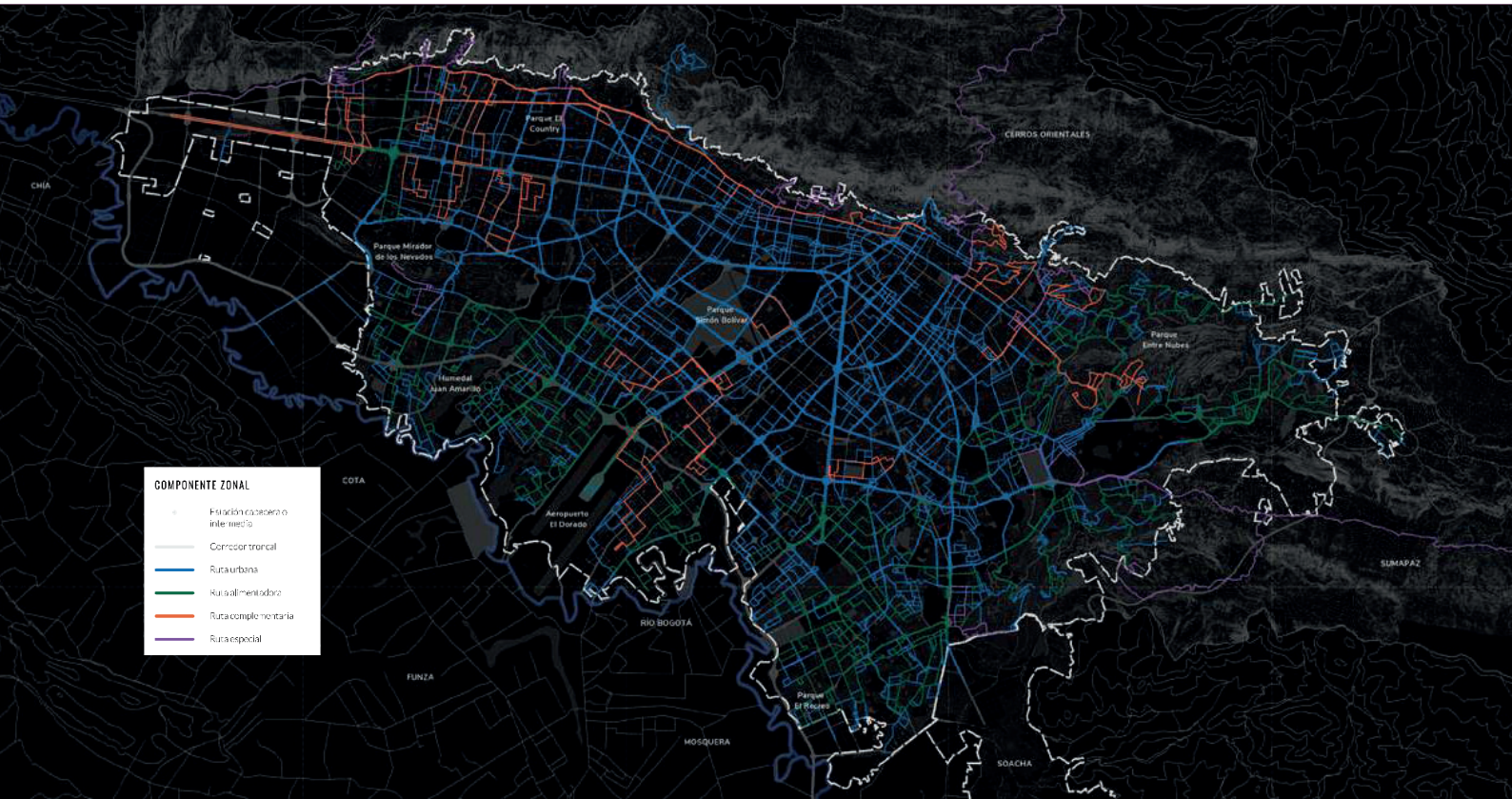

Routes.

(2019)

This map displays the hourly distribution of users at each bus stop across Bogotá's public transport system. Each dot represents a paradero, with its brightness and density indicating the volume of passengers per hour.

The visualization reveals mobility patterns throughout the city, highlighting areas of intense transit activity and helping identify key zones for service optimization and infrastructure planning.

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
[Publicación oficial]

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Users.

(2019)

This map visualizes the number of passengers at each bus stop across Bogotá's public transport network. Each dot represents a paradero (bus stop), with its color and size indicating passenger volume—revealing patterns of high and low demand throughout the city.

The distribution highlights key transit corridors and densely populated areas, offering valuable insights for mobility planning, service optimization, and infrastructure investment.

N

TransmiCable.

Aerial solution improves urban inclusion.

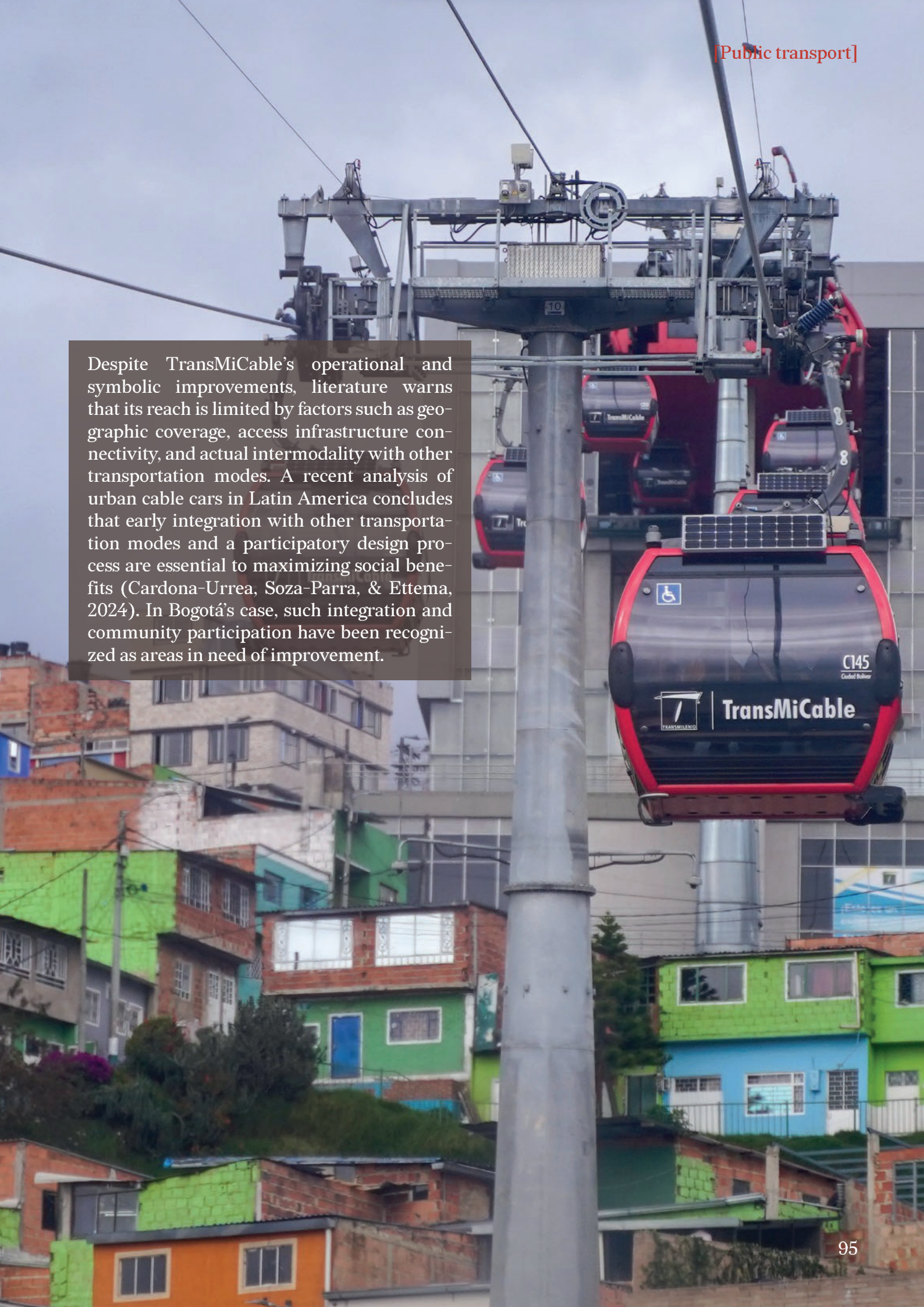
TransMiCable is a cable car public transport system implemented in Bogotá, mainly in Ciudad Bolívar, with the objective of connecting hard-to-reach hillside neighbourhoods to the trunk mass transport network, including TransMilenio. It was conceived as an innovative solution to improve accessibility, reduce travel times and foster urban inclusion of historically marginalised sectors (Padilla, 2020; Sarmiento et al., 2020). The cabins run on a continuous cable between elevated stations, integrating with bus routes and offering peripheral inhabitants more efficient access to employment, education and urban services.

In addition to its transport function, TransMiCable has shown positive impacts on quality of life and urban mobility. Studies indicate that it reduces travel times, increases inhabitants' physical activity, and reduces exposure to pollutant emissions compared to other traditional transport modes (Baldovino-Chiquillo et al., 2023; Villar-Uribe, 2021). However, challenges remain in terms of geographical coverage, intermodality, fare integration and informal transport management. Thus, the system represents an innovative and sustainable mobility strategy, but requires continuous improvement to maximise its social and urban impact.

The TransMiCable system was born as a concrete response to the mobility challenge faced by the hillside neighbourhoods in the southern periphery of Bogotá, especially in the locality of Ciudad Bolívar. According to a study assessing users' expectations and perceptions, the aerial cable was introduced because traditional modes of transport did not adequately cover these steeply sloping and difficult-to-access territories (Lutz, Heroy, Kaufmann & O'Clery, 2025). The decision to implement this technology is also framed within the urban inclusion and sustainable mobility policies of the capital district.

The TransMiCable structure was made to work with Bogotá's other public transportation, making a connection between areas that are hard to reach and the main transit lines. A study by Transportación (2022) evaluated the results of a panel survey, showing that users valued reduced travel time, improved comfort, and onboard safety. However, the study also reports that pollution reduction benefits were lower than expected (Peñalosa et al., 2022). This dichotomy between achievements and limitations characterizes TransMiCable's reality.

TransMiCable's impact extends beyond transportation to include urban accessibility, quality of life, and perceptions of belonging. A research project on health and urban transformation (TrUST) found that, after implementing the system, the average travel time for forced journeys in Ciudad Bolívar decreased and that exposure to certain pollutants was lower in cable cabins than in other modes of transportation (Sarmiento et al., 2023). However, the study also highlights challenges in terms of spatial equity, emphasizing that the system alone cannot address all integration barriers.



Despite TransMiCable's operational and symbolic improvements, literature warns that its reach is limited by factors such as geographic coverage, access infrastructure connectivity, and actual intermodality with other transportation modes. A recent analysis of urban cable cars in Latin America concludes that early integration with other transportation modes and a participatory design process are essential to maximizing social benefits (Cardona-Urrea, Soza-Parra, & Ettema, 2024). In Bogotá's case, such integration and community participation have been recognized as areas in need of improvement.

TransmiCable.

(2019)

This map shows the TransMiCable line in Bogotá, a cable car system designed to serve hillside neighborhoods that are not reached by the traditional TransMilenio network. The purple route connects areas like Lucero, San Francisco, and Jerusalén to the Portal del Tunal, acting as a vital feeder line that improves accessibility and mobility in underserved zones of the city.

TransMilenio S.A. (2019).
Plan Marco del SITP 2019.
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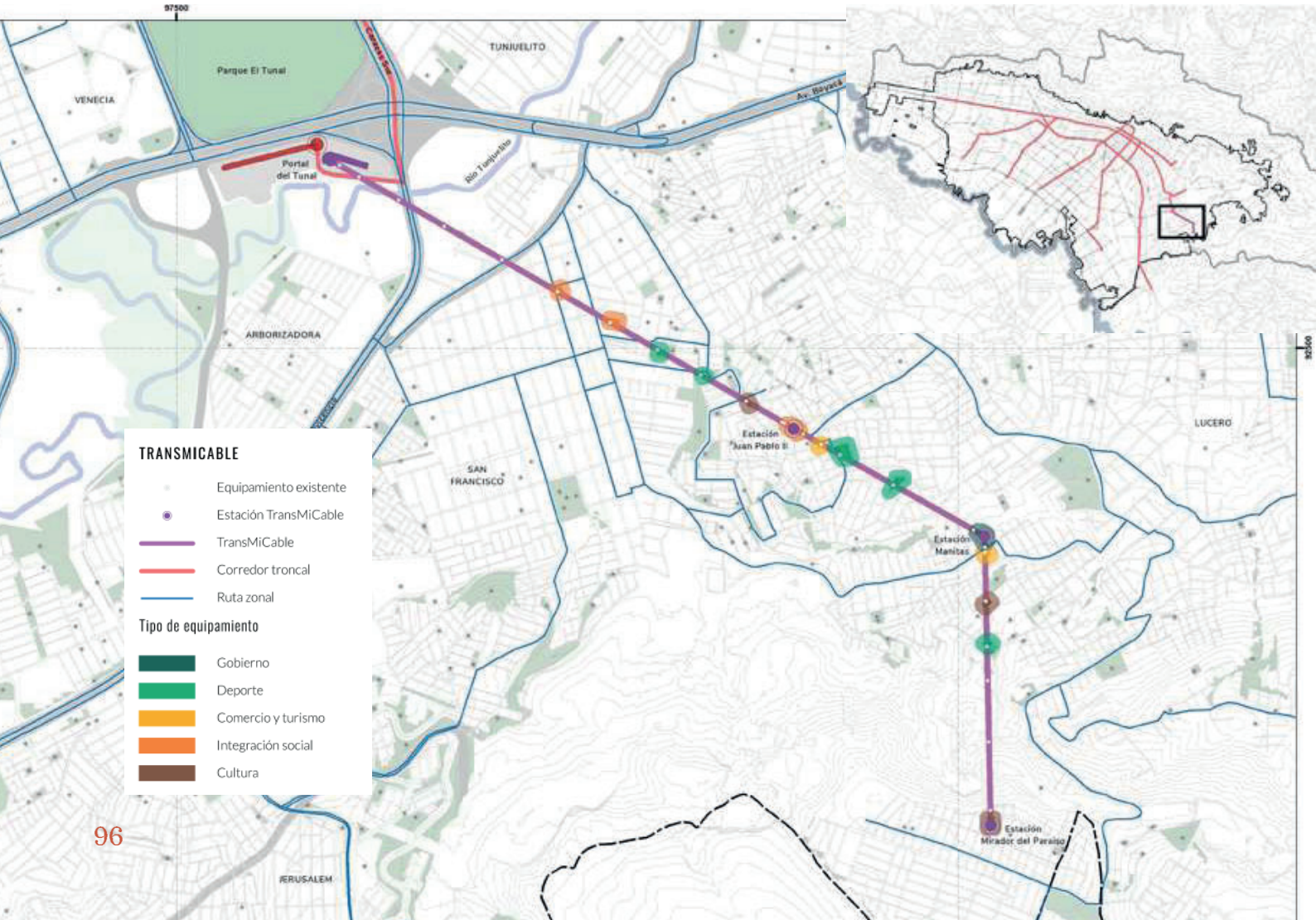
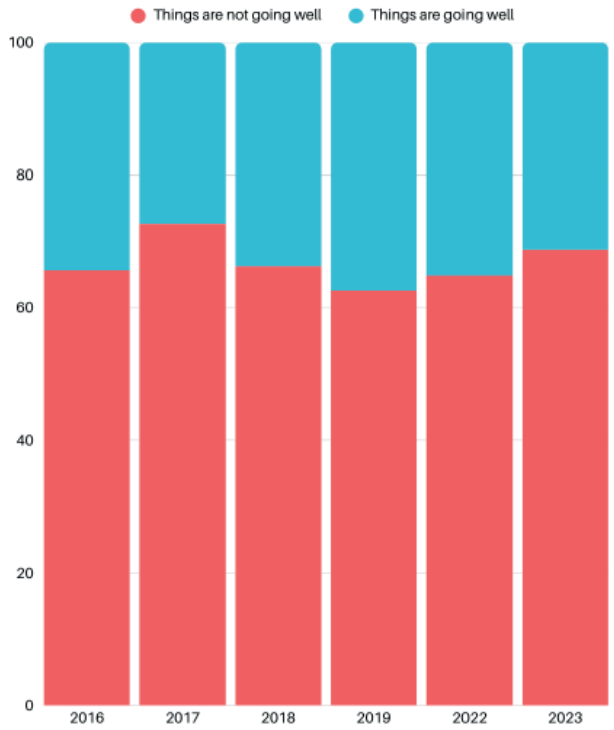


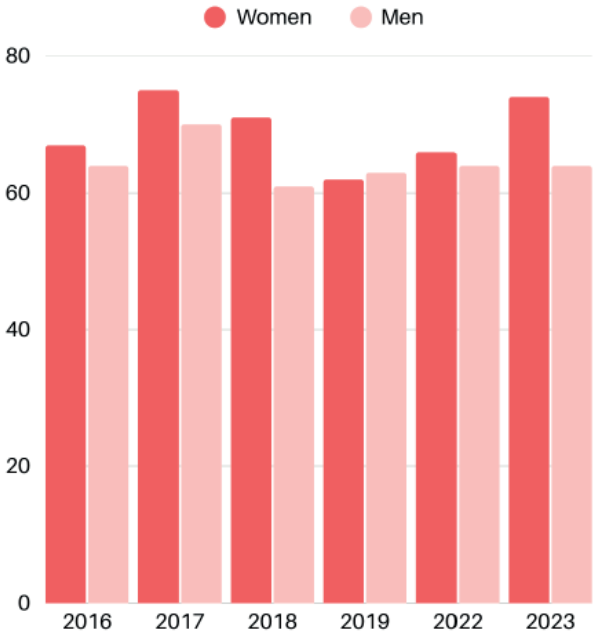
General perception and the transportation issue.

The Citizen Perception Survey 2023 is an instrument developed to analyse how Bogotá residents perceive key aspects of their quality of life, including mobility, safety, public space, institutional management and citizen coexistence.

General Perception of the city by year (2023)

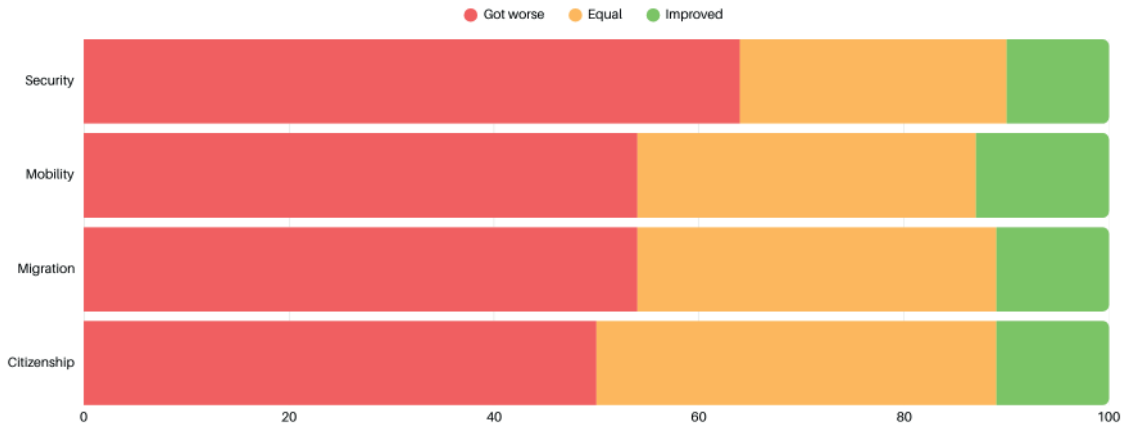
The survey made shows that throughout the years the general perception about the city has a rate of 60% or more of dissaproval stating that the city is always getting worse





Concern percentages about the city (gender)

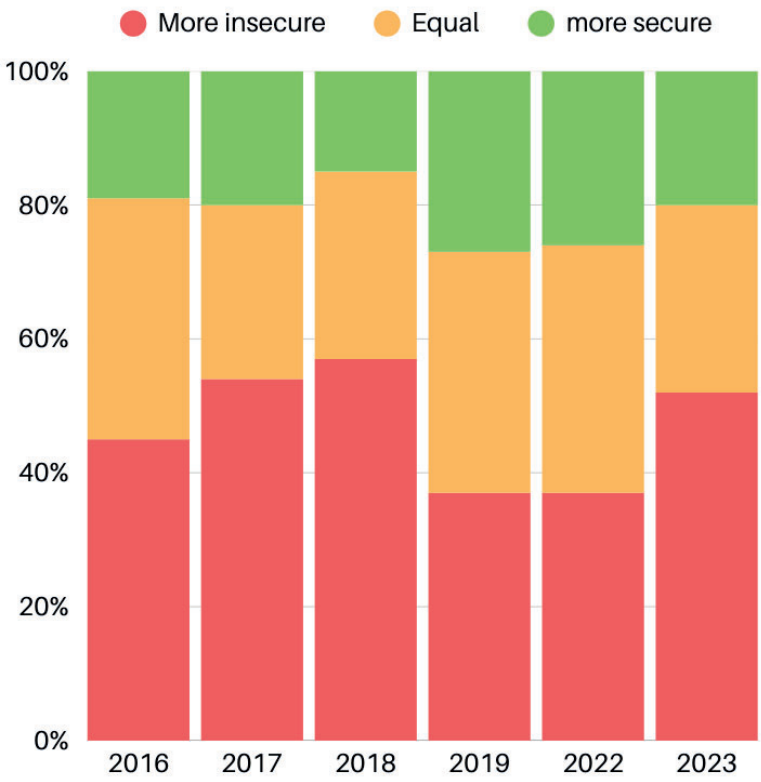
Highest concerns aboutthe city in percentages

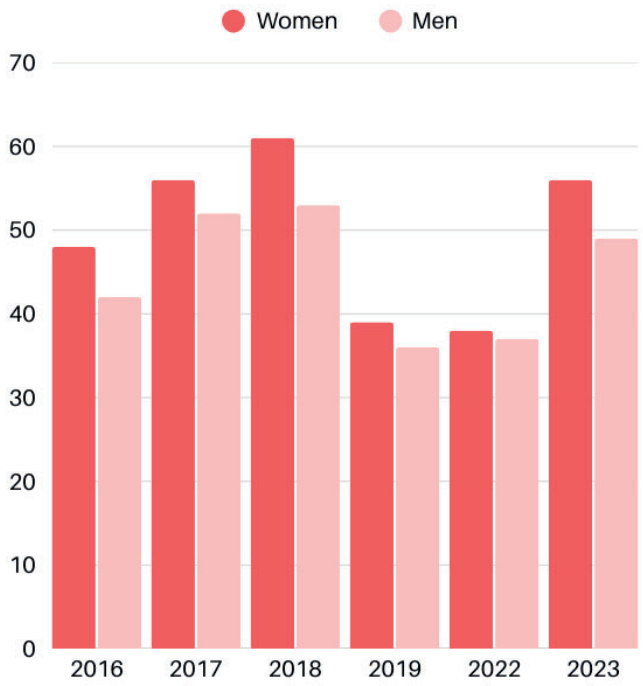


Security.

Security Perception.

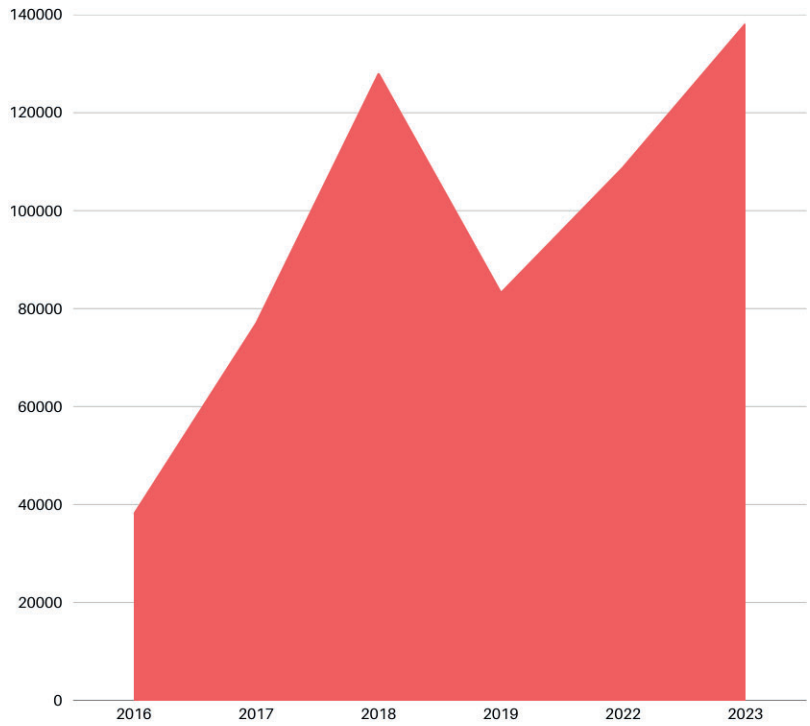
Bogotá, reveals that security perception remains a major concern in the city, with the majority of participants consistently viewing the city as insecure across the years. Although there are slight shifts in sentiment—particularly a modest rise in the "More secure" category in recent years—the dominant perception throughout 2016 to 2023 is one of persistent insecurity, as reflected by the prevalence of the red segment in each bar. This trend underscores the enduring public anxiety around safety and the challenges faced in improving urban security.



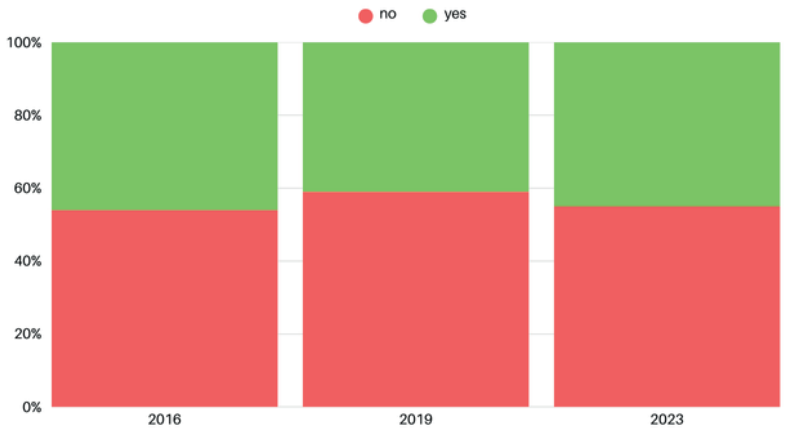


Women Have the lowest perception of security

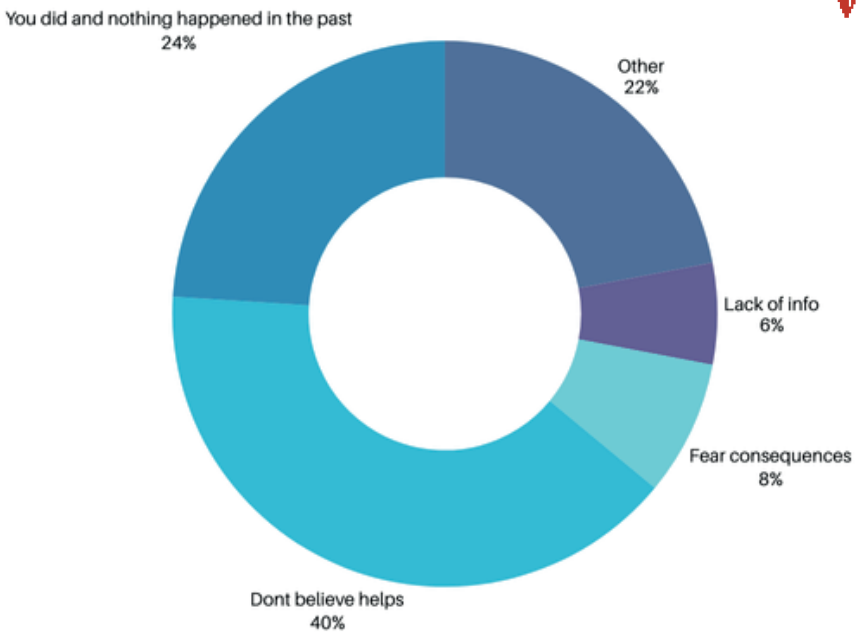
Reported Theft.



Did you report the last Theft they comitted to you?



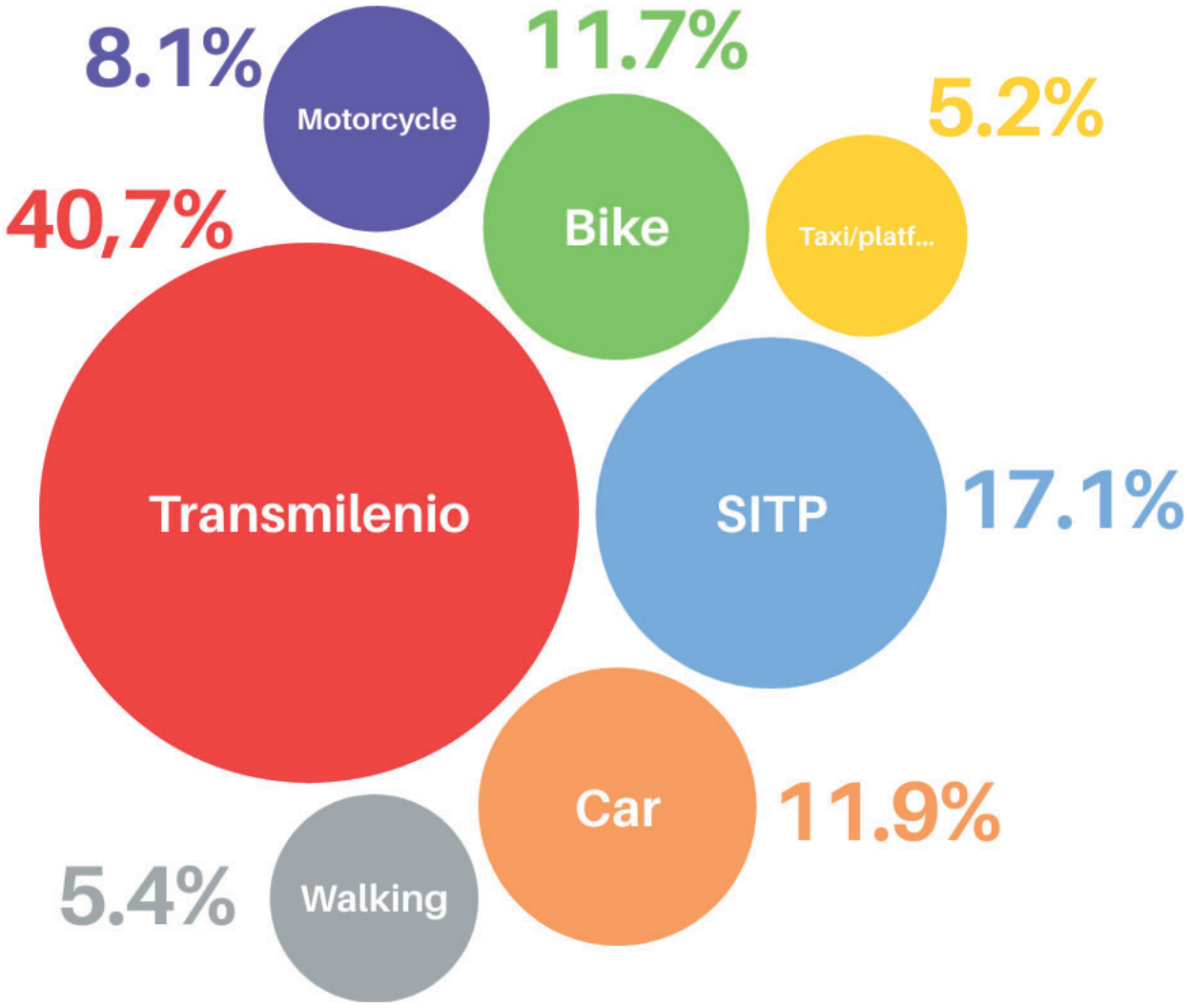
Why Not?



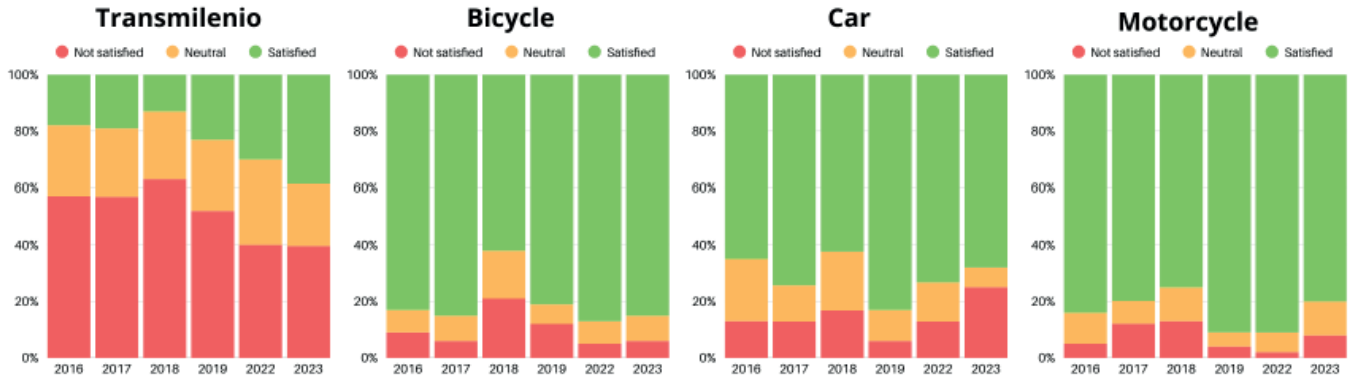
Transport.

Daily Transportation.

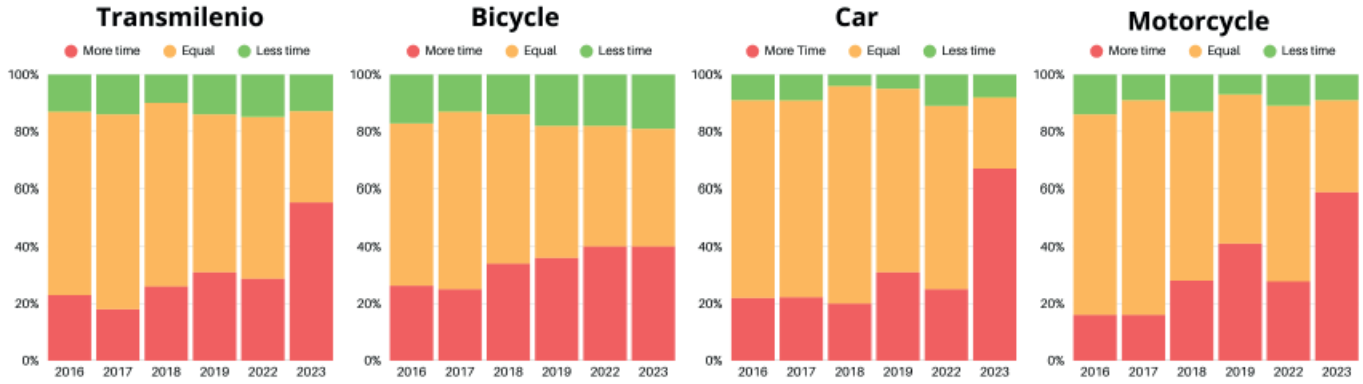
In Bogotá, more than 50% of the population relies on public transport to get around on a daily basis. This makes public transport the city's main transport system, reflecting not only its importance in the daily lives of millions of people, but also the need to strengthen and optimise it to respond to high demand.



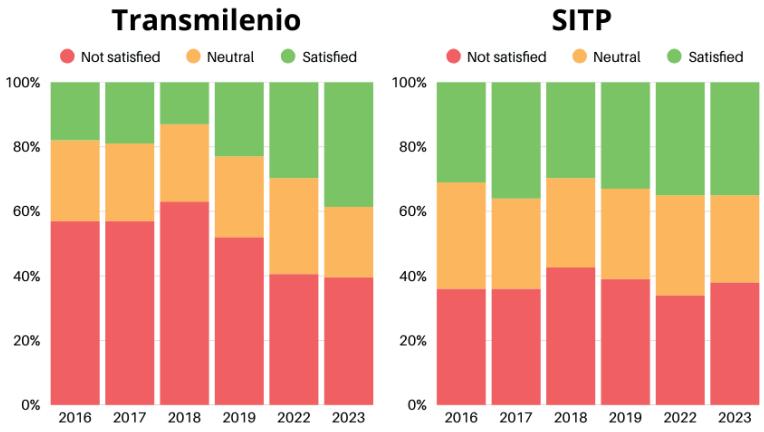
User Satisfaction.

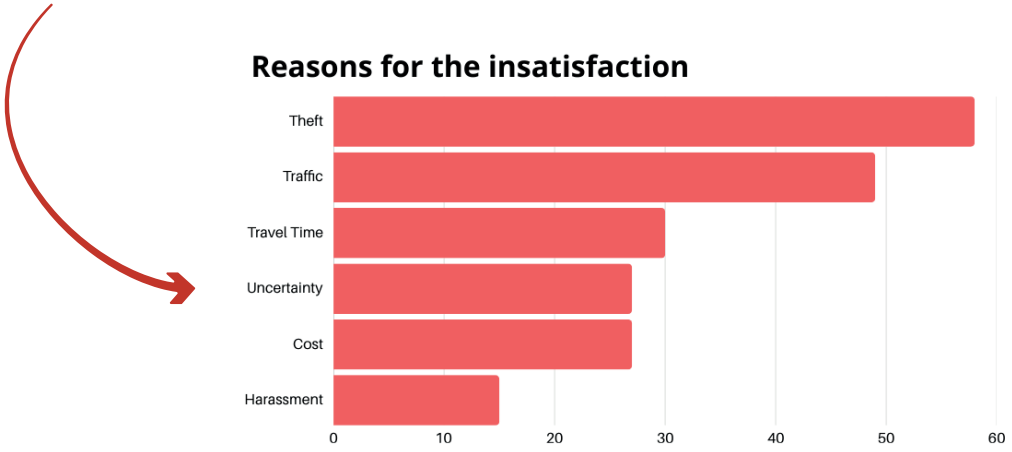


Time change in rides.



Satisfaction with public transport.





Conclusions.

The results show that the general perception of the city is moderately negative, with an increase in concerns related to urban safety, inefficient public transport and territorial inequality.

Among the most relevant findings, it is evident that citizens distrust the institutions in charge of security and mobility; furthermore, public transport continues to be a determining factor in daily dissatisfaction. The survey concludes that the quality of urban life depends directly on improvements in mobility, safety and local governance (Bogotá Cómo Vamos, 2023).

The survey results show that insecurity is the public's greatest concern. The data show a high perception of risk on the streets, at stations, and on buses, particularly regarding street theft and armed robbery. The population has low confidence in the authorities and believes that the institutional response to crime is too weak. In the survey, high levels of fear were reported when traveling at night or in peripheral areas.

Several authors have noted that insecurity in Bogotá is related to structural factors of urban inequality, an ineffective institutional presence, and poor coordination between security and mobility (Gutiérrez et al., 2021). This implies that transportation and security are interconnected because of the flaws in the public system that expose users to risky situations during their travels.

Insecurity

Transport

According to the survey, transport in Bogotá is considered to be one of the most important issues for citizens.

The main problems identified are:

·The system is slow and not working well. According to responses, travel times are excessive due to high demand and inadequate road infrastructure.
·Deficiency in SITP and TransMilenio coverage. Gaps persist in the connection between peripheral neighborhoods and the urban center, forcing users to combine several modes of transportation.
·Insecurity on buses and in stations: Public transportation is perceived as one of the most dangerous places in the city, primarily due to theft and harassment.
·Lack of institutional trust: Most people feel that there have been no substantial improvements to the service in recent years.

Academic studies, such as those by Bocarejo and Oviedo (2019), argue that Bogotá's transportation system suffers from a structural crisis of planning and equity. Lower-income populations face longer travel times and more precarious conditions. Therefore, mobility in Bogotá is not only a transportation problem, but also a social and territorial one (Bocarejo et al., 2019).

Natalia Caro is a user of route T23, the bus that runs from Fontanar del Río (in Suba) to the city center. According to her, she has waited up to 45 minutes for service. TransMilenio Operations Center officials say that every eight minutes during rush hour, buses are dispatched on the 269 urban, complementary, and special routes that run every day in Bogotá and have 5,970 stops. All buses are controlled from an operations center with 40 workstations.

However, operators report problems that delay the journey: accidents, stranded cars, or protests. It is very difficult to meet this interval time in Bogotá, they say. Currently, 1,520,000 people use the SITP daily, and for most of them, it has become part of their routine to leave an hour and a half early: about 30 minutes to wait for the bus and an hour to reach their destination. Among the buses that take the longest are those on routes that run through the neighborhoods of Cortijo, Zarazota, Germania, Ciudad Kennedy, Mazurén, Casablanca, and Calle 222.

(*El Tiempo, 2018*)

Survey

In 2022, an exploratory survey was conducted to learn about users' perceptions of and experiences with the city's public transportation system. The sample had about 60 participants, and they were chosen at different locations in the zonal system. This approach ensured that the respondents were regular bus users in the context of actually waiting for a bus, which made the responses more valid.

During the fieldwork, certain difficulties associated with public mistrust became obvious. A considerable number of the approached people declined to take part in the survey, citing concerns about potential safety issues. This reaction is a reflection of a common event in urban public spaces, where high crime rates and the perception of risk condition everyday interactions between strangers.

Despite these limitations, the collected data proved valuable for understanding the daily experience of local public transportation users. The responses made it possible to identify aspects related to bus frequency, perceived safety at bus stops, waiting times, and the strategies individuals develop to cope with the system's shortcomings.

What type of service do you use?

54.6% of respondents primarily use SITP urban buses (blue), which highlights their central role in everyday mobility in Bogotá. Informal buses and TransMilenio follow closely behind with 13.6% each, illustrating the existence of both formal systems and unregulated alternatives that fill connectivity gaps. Complementary services account for 9.1%, while shuttle buses and traditional buses account for 4.5% each. Overall, the results illustrate the significant dependency on the zonal system and the ongoing importance of informal transportation as a necessary addition to the official system.

How often do you use this service?

64.3% of participants use public transportation daily, illustrating their high dependence on the system for daily mobility. Meanwhile, 28.6% of participants said they use it sporadically, and only 7.1% said they use it two to four days a week. These results show that public transportation is the main means of travel for most users and plays a key role in their daily lives. However, a smaller proportion of users maintain occasional or complementary use, which may be linked to specific journeys or used in combination with other modes of transportation.

What are your mobility alternatives?

The survey results show that, given the shortcomings or limitations of the public transport system, the most common and interesting responses from users point to various mobility alternatives to complement or replace their usual journeys. Among the most frequently mentioned options are taxis and transport apps, which are perceived as faster and safer solutions, even at a higher cost. A significant number of respondents use informal buses, valued for their flexibility and availability in areas where the formal system has limited coverage. Finally, private cars and motorcycles appear as individual alternatives that offer greater autonomy.

How would you rate the service you are using? (From 1 to 5)

When it comes to rating public transport services on a scale of 1 to 5, the results show that most people gave an average rating. Fifty percent of respondents gave a rating of 3, indicating moderate satisfaction. 14.3% rated the service with a 2, reflecting a certain degree of dissatisfaction, while another 14.3% gave the highest rating of 5, indicating high satisfaction. The rest of the participants rated the service with a 4, showing positive but not uniform opinions. These results showed that, in general, people were satisfied with the service not so much because of its intrinsic quality, but because it represents the only affordable transportation alternative at a reasonable price. This suggests that the perception of satisfaction is more linked to the availability and affordability of the system than to the experience of using it.

In terms of recommendations for improving public transportation service, they touch on a few key points related to frequency, availability, and cost. Some of the suggestions that have been put forward include increasing the number of TransMilenio buses, ensuring that vehicles run more regularly, and reducing the price of the service. It seems that users perceive adjustments that improve the accessibility and efficiency of the system as priorities, aspects that are directly linked to the daily mobility experience in Bogotá.

What has been your best experience with the service?

When asked about their best public transportation experience, people shared some really interesting stories, even if they didn't have many to choose from. Most respondents said they hadn't had a particularly positive experience, or could not remember one. One person said that the most important thing for them was just having a way to get around without having to walk to work. Other experiences that were considered acceptable were linked to specific service conditions, like traveling on an empty bus without traffic or taking a quicker route that avoided traffic jams, which let them get to work on time. It's interesting to see how the things that make a positive experience happen are more influenced by things like efficiency and comfort than by the overall quality of the system.

How long are your trips?

Regarding public transportation, it seems that users may experience waiting times ranging from 10 minutes to 1 hour and 30 minutes, depending on the route and time of day, as indicated by the survey data. However, we have received feedback from participants indicating that, on occasion, two buses on the same route arrive back-to-back, which can result in notable variations in perceived waiting times. It is important to note that these results reflect the irregularity of service frequency, an aspect that directly influences the travel experience and users' travel planning.

How long do you wait for the bus?

Regarding public transportation, it seems that users may experience waiting times ranging from 10 minutes to 1 hour and 30 minutes, depending on the route and time of day, as indicated by the survey data. However, we have received feedback from participants indicating that, on occasion, two buses on the same route arrive, which can result in notable variations in perceived waiting times.

What has been your worst experience with the service?

When we asked about the worst experience with public transportation, the responses we got were really interesting. A lot of people talked about problems with how the system is run and how safe it is. Many respondents mentioned that the SITP could be more regular, pointing out that the buses are sometimes a bit late or not very frequent. We also saw some common problems with drivers, like not knowing the route, closing the door before passengers can get off, or driving recklessly on streets with potholes. Safety was also a concern, with reports of passengers feeling threatened by individuals in an agitated state. Finally, users mentioned the inconvenience of having to take multiple buses to complete a journey, as well as the inconveniences caused by protests that force passengers to leave vehicles without a refund or to make additional transfers. It's clear that these responses are pointing to some areas that could be improved. It seems that there might be a link between negative experiences and how well the service is operating, as well as how safe and reliable it seems.

Flow Map.

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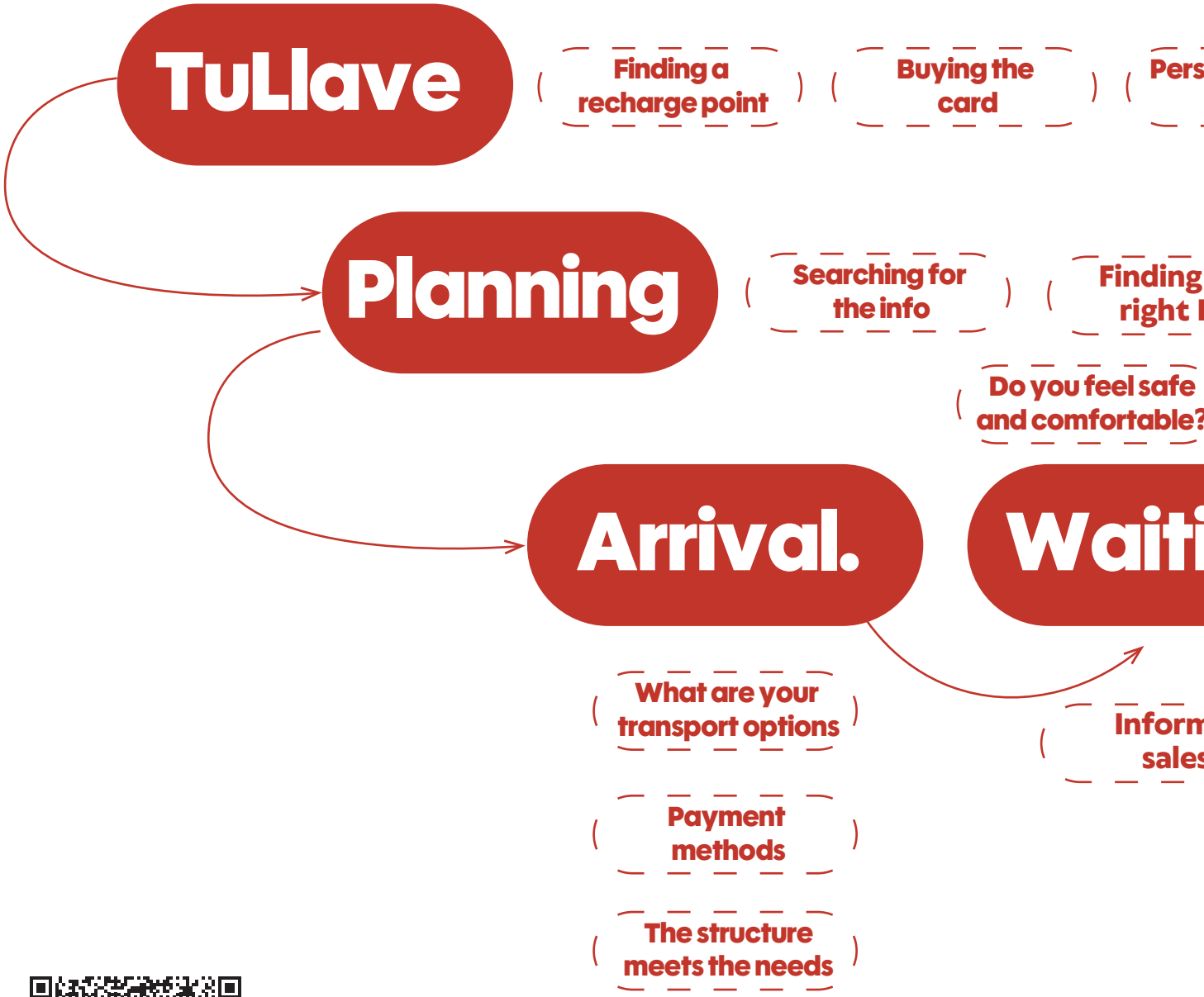

Scan to see the full flow map.

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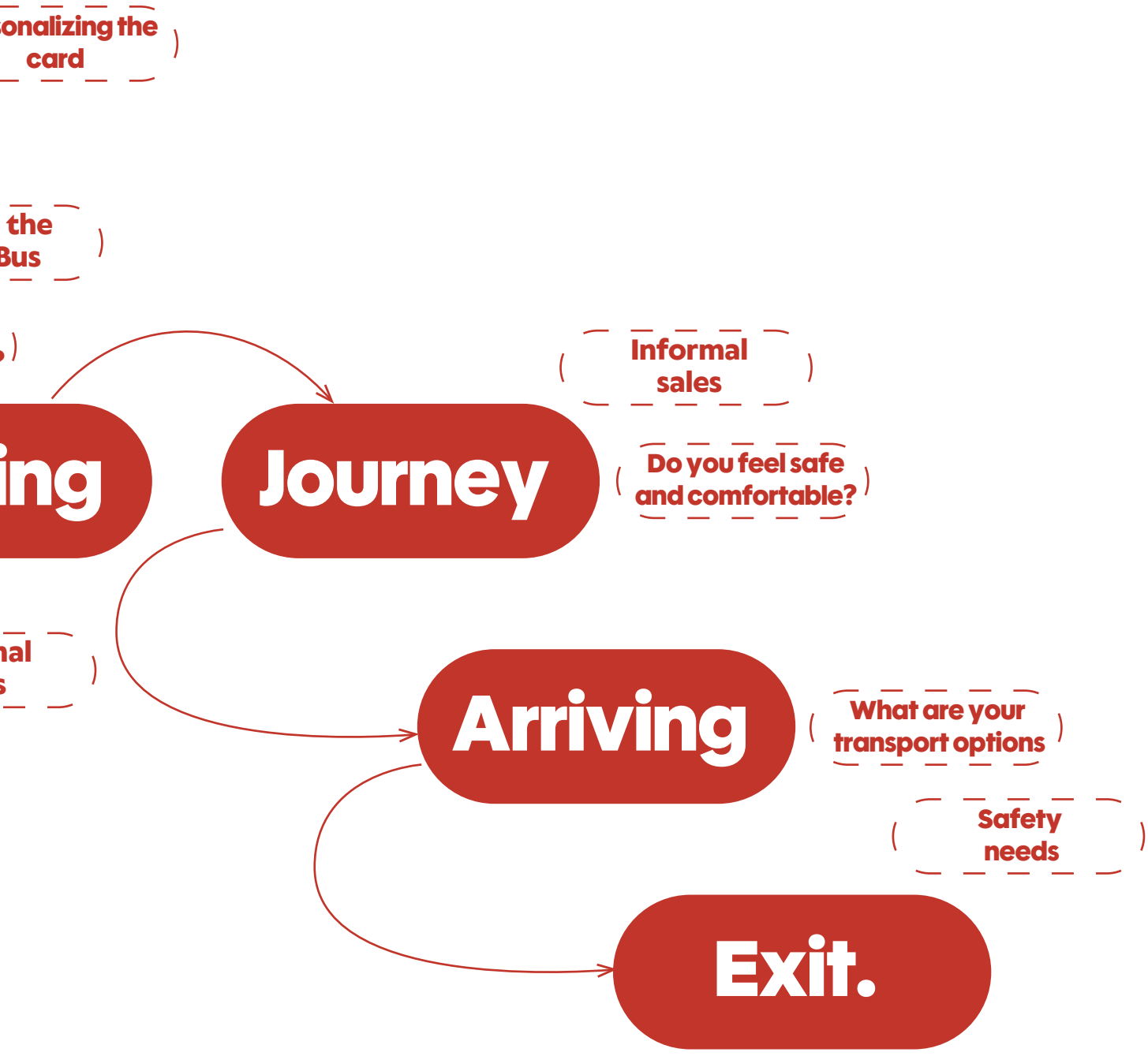
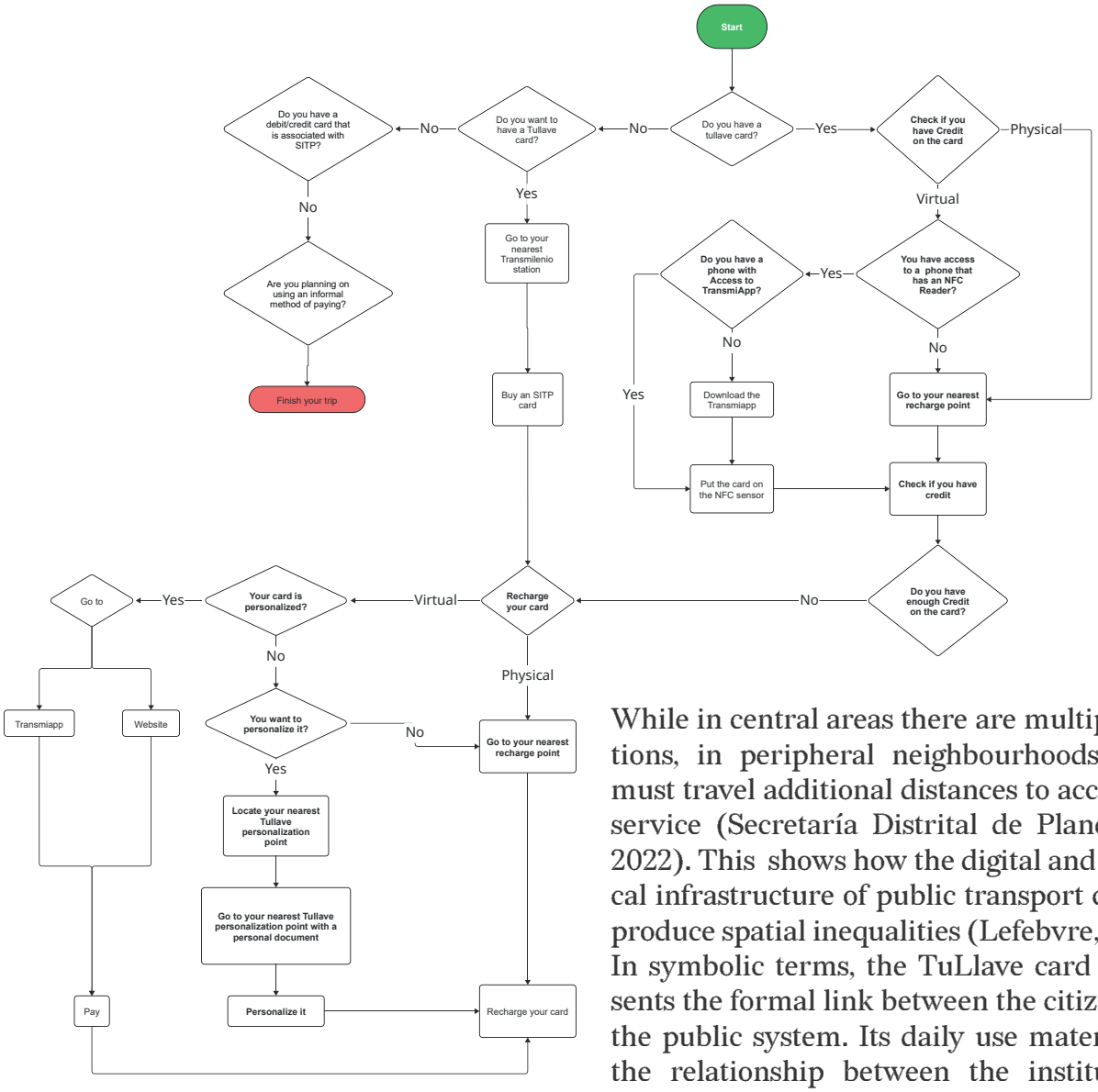


Method / TuLlave.

Access to the mass transit system is mediated by the TuLlave card, an instrument that concentrates the functions of payment, control and traceability of the user. This process, although brief, constitutes a key interaction between the citizen and the technological infrastructure of the system. According to Norman (2013), everyday interaction systems should minimise the cognitive and emotional burden on the user; however, the need to top up or search for functional outlets generates frequent friction in Bogotá. The location and availability of top-up points reflect territorial inequalities.



While in central areas there are multiple options, in peripheral neighbourhoods users must travel additional distances to access the service (Secretaría Distrital de Planeación, 2022). This shows how the digital and physical infrastructure of public transport can reproduce spatial inequalities (Lefebvre, 1974). In symbolic terms, the TuLlave card represents the formal link between the citizen and the public system. Its daily use materialises the relationship between the institutional promise of mobility and the concrete experience of the urban inhabitant (López & Ramírez, 2020).

Friction points

1. Limited Availability and Distribution
TuLlave cards are important for using public transportation in Bogotá, but they're not always easy to find. Many neighborhoods don't have reliable sales points, forcing users to travel long distances just to get one. Even in busy areas, kiosks might not have the cards you need or they might only sell anonymous cards, which limits who can use them.

2. Confusing Card Types and Benefits
TuLlave offers different types of cards: basic, personalized, and special. However, the company does not clearly explain the differences between these types of cards. Riders often don't realize that only personalized cards allow access to free transfers, credit rides, and balance protection. This confusion causes many people to miss out on important benefits or use the system in the least efficient way.

3. Problems with Personalization
To personalize a TuLlave card, you need to visit one of the few service points, which are often full of people. The process can be slow and complicated, with long lines and limited staff. For people who don't have a formal ID or know how to use technology, the step where you personalize your account can be a problem when trying to access all the transit benefits.

4. Cost and Recharge Friction
The card's initial cost might be a challenge for users with low incomes. There are not many recharge stations, especially in rural areas, this makes it hard to keep a good balance. There are digital recharge options, but people don't use them much because they don't know about them and they don't trust online systems.

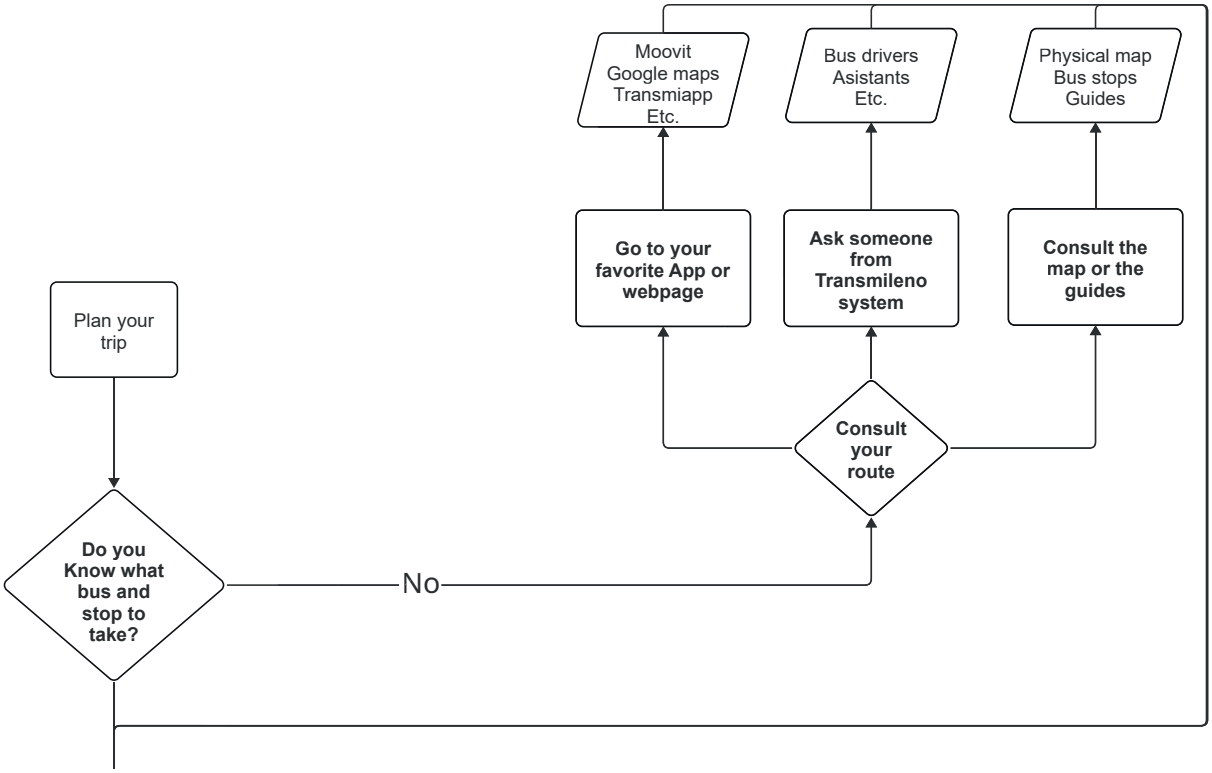
5. Lack of Integration: Digital Platforms
Apps and websites designed to help TuLlave users often don't work well or don't always work as expected. Many riders have trouble checking their balances, recharging online, or linking their card to digital services. Problems like errors, a bad user experience, and lack of notifications make things even harder, especially for people who don't know how to use digital tools.

Planning.

Trip planning is the user's first interaction with the transport system and determines the expectations and decisions that will guide the subsequent trip. In Bogotá, this process involves selecting the best combination of modes - SITP, TransMilenio, zonal or alternative transport - based on time, cost, and perceived comfort (Secretaría de Movilidad de Bogotá, 2023). Planning is mainly supported by mobile applications such as TransMiApp, Moovit, and Google Maps, which allow for real-time consultation of routes, schedules, and occupancy levels. From a user experience perspective, this phase corresponds to the cognitive moment of the journey: the individual mentally organises his or her journey before executing it.

According to Norman (2013), effective interaction with digital tools depends on usability, immediate feedback and trust. However, in the Bogotá context, the fragmentation of platforms and the lack of full integration between transport modes limit the efficiency of the process (Vega & González, 2021).

When it comes to public policy, planning depends on how developed the technology is for getting around. The ability to provide information that is reliable, and easy to get is important for how much control users have and how they feel about their experience (UITP, 2019). Adequate planning reduces uncertainty and stress, which are essential elements for sustainable and inclusive mobility.



Friction points

1. Fragmented Information Sources
Users have to look at different platforms; apps, websites, and station maps, to plan one trip. There isn't one system that combines real-time data, route maps, and fare information for all types of transportation. This fragmentation causes confusion, especially for people who are not familiar with the system or for people without access to smartphones.

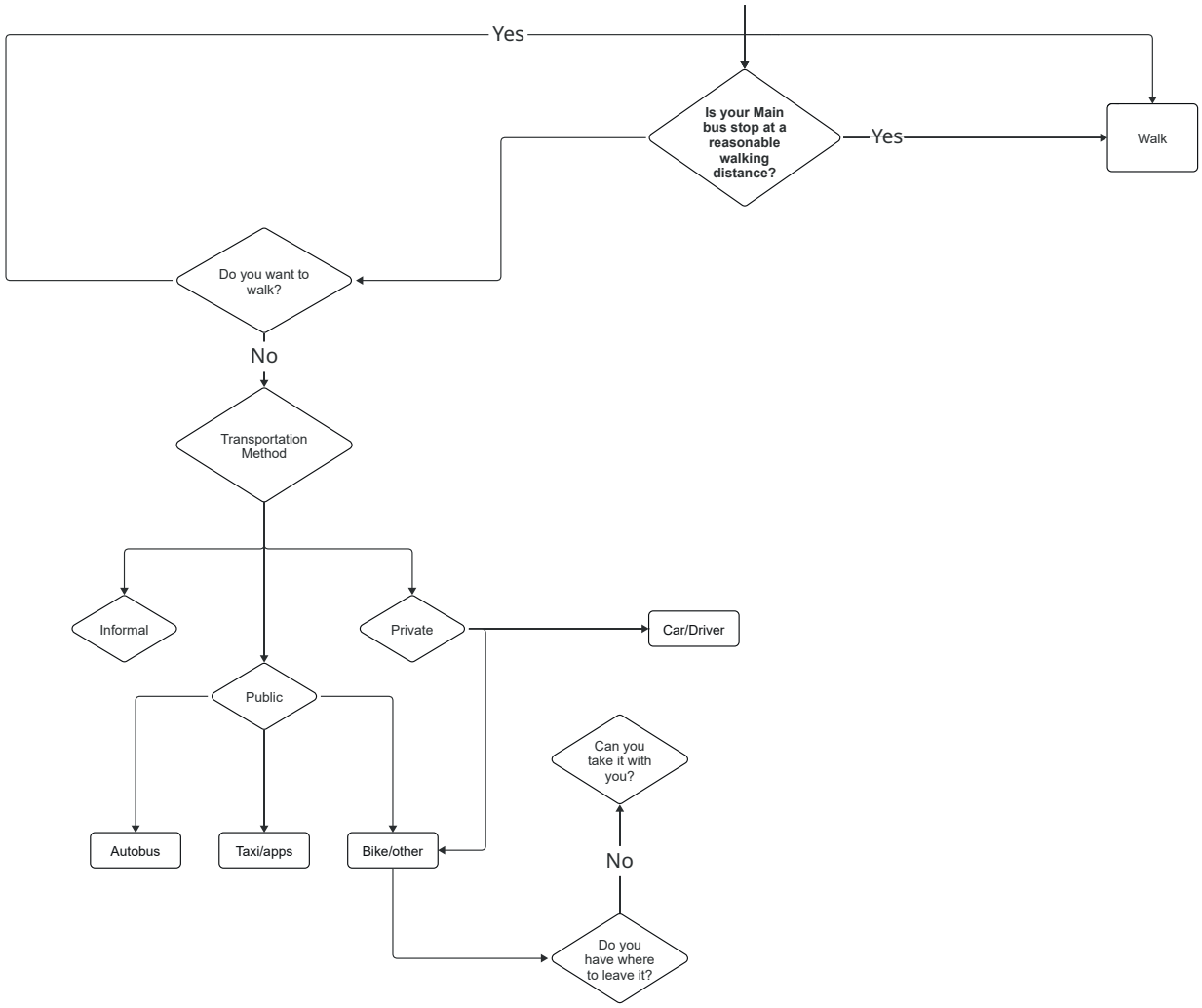
2. Inconsistent Real-Time Data
Apps often show the wrong arrival times or don't update delays and changes to routes. During busy times or when there are problems with the service, people may arrive at the bus station expecting a bus that has been sent to a different route or canceled. This makes people distrust digital tools and rely on guesswork or word-of-mouth.

3. Complex Route Structures
TransMilenio's trunk lines and SITP's zonal routes use alphanumeric lines connect, where to transfer, and how to reach peripheral destinations requires prior knowledge or trial and error. This makes it hard for new users.

4. Limited Predictability of Transfers
Even when a route seems good on paper, transfer points can be chaotic. Stations may be overcrowded, signs may be unclear, or feeder buses may be delayed. Planning a trip with multiple transfers can be risky, especially when there is not much time or when the destinations are far apart.

Arrival.

The so-called first mile constitutes the initial stage of urban travel and corresponds to the route between the point of origin and the first connection with the transport system (Méndez, 2019). In Bogotá, this stage is usually done on foot and is conditioned by the quality of public space. Discontinuous sidewalks, informal occupation of the pavement, and perceived insecurity are recurring factors that affect the user experience (Bogotá Mobility Secretariat, 2023). The first mile shows the connection between mobility and the territorial structure. According to Gehl (2010), the way pedestrian spaces are designed affects how safe and comfortable people feel. In Bogotá, the lack of continuous infrastructure and high traffic density create tensions between pedestrians, cyclists, and private vehicles. In this sense, the first mile acts as a filter to decide who can participate. When public spaces lack the necessary conditions, users find mobility to be a physical and emotional challenge. This means that the first experience affects how the whole trip is remembered (Vega & González, 2021).



Friction points

1. Poor Last-Mile Infrastructure
Sidewalks that lead to stations or bus stops are often in bad condition. They are cracked, narrow, or blocked by things like street vendors and parked cars. In neighborhoods on the periphery, there may be no sidewalks. This forces users to walk along roadsides or through unsafe areas just to reach the system.

2. Inadequate Signage and Wayfinding
Many users have a hard time finding the nearest SITP stop or TransMilenio entrance because there is a lack of clear, consistent signs. In busy or informal areas, stops may be hidden, unmarked, or moved without warning, causing confusion and wasting time.

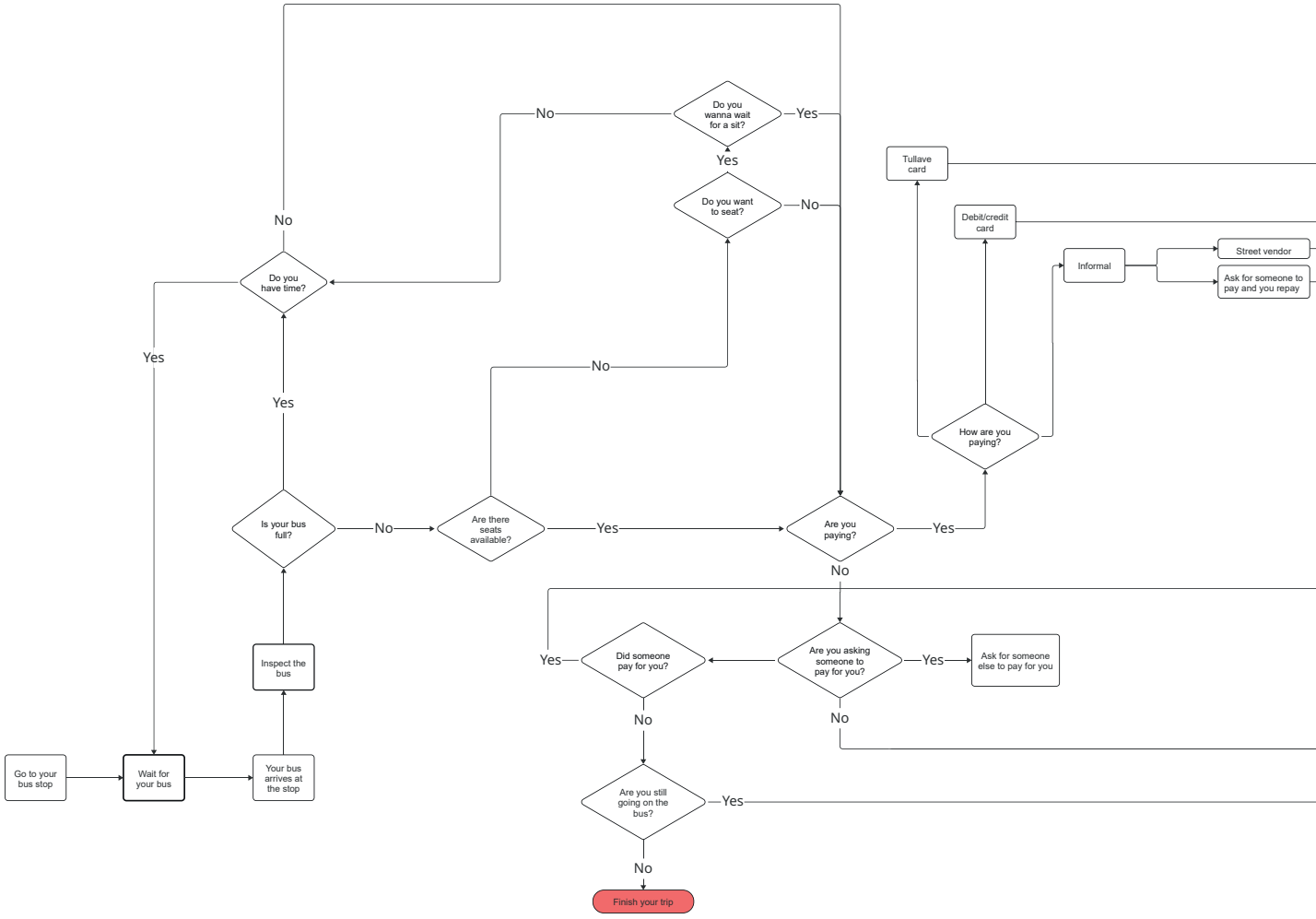
3. Exposure to unsafe conditions
Going to the system often means walking in the dark on streets with few lights, at lonely corners, or in dangerous places. Women, older adults, and young people are especially at risk during early morning or late evening commutes, when there is less traffic and fewer people are around.

4. Limited Modal Integration
It's often hard to get from walking, biking, to taking public transit. There aren't enough bike storage options, and the routes that connect to sidewalks and streets might not be easy to navigate. This makes it less likely that people will use more than one way to travel, and more likely that they will use informal or unsafe options.

5. Environmental Discomfort
Rain, heat, and pollution can make it hard to get to the system. Many stops don't have shelters, shade, or seating, so people have to wait or walk in the sun or rain. This is especially hard on children, older adults, and people with disabilities.

Entering the system.

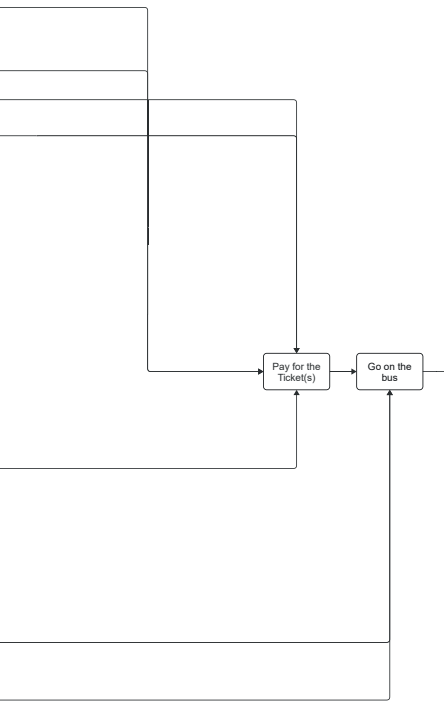
Entering the system—through turnstiles or validators—symbolizes the transition from an open public space to a controlled environment. This act embodies the user's transition to a logic of collective and regulated mobility (Sheller & Urry, 2006). At TransMilenio stations, the high density of users generates physical contact and spatial stress, especially during peak hours. Studies by CAF (2022) show that overcrowding and disorder are among the main things that make users unhappy. However, passengers can also work together to move around, showing that people can adapt to traffic problems. According to Lefebvre (1974), this space is a social creation, a living network that expresses both order and conflict. When someone enters the system, there is a negotiation between the rules of the system and the user's daily practices.



Friction points

1. Station and Stop Accessibility
Many TransMilenio stations are on elevated structures or are located across high-traffic roads through bridges or tunnels. This can be challenging for older adults, people with disabilities, or those with children. SITP stops often have problems. They don't have signs, lighting, or shelters. This makes them hard to find and uncomfortable to wait at. This is especially true in the outer zones.

2. Turnstile and Card Reader Failures
TransMilenio has malfunctioning turnstiles and card readers. This happens a lot during peak hours. People may tap their TuLlave card more than once without success, which causes delays and frustration. Sometimes, SITP buses don't register cards, which leads to disputes or people having to pay cash.



3. Overcrowding at Entry Points
During rush hour, the entrances to the station get very crowded. There are long lines to get in and the platforms are packed. In SITP, buses sometimes arrive at full capacity and skip stops, leaving passengers behind.

4. Lack of Clear Signage and Wayfinding
TransMilenio stations can be confusing for people using them for the first time. Directional signs are often faded, inconsistent, or blocked by crowds. In SITP, many stops don't have route maps or real-time arrival information, which makes it hard to know if you're getting on the right bus.

5. Safety and Exposure
Entering the system often means walking through areas with poor lighting, crossing bridges where people can see you, or getting off a bus at a remote stop. These conditions can make people feel insecure, especially women, young people, and older adults.

Waiting Time.

Waiting at the bus stop or at the gate is one of the most important stages in the perception of service quality (UITP, 2019). In the case of Bogotá, waiting times are perceived as excessive due to the variability in bus frequency and the limited accuracy of digital tools (TransMiApp, Moovit). Waiting is a time when you are not moving, but you are still moving from one place to another. Augé (1992) describes it as a moment that is paused within the "non-places" of modern mobility. In this section, users develop adaptive strategies, such as using a mobile phone, having occasional chats, or simply observing their surroundings. People don't like having to wait at bus stops in bad weather like rain or cold. This makes them like the bus system even less. The quality of furniture, coverage, and lighting are all important in making the waiting area more comfortable and safe (Gehl, 2010).

Friction points

1. Exposure to weather and pollution
Most waiting areas don't have enough shelter, shade, or seating. Passengers are exposed to rain, intense sun, and street-level pollution, especially at busy city streets or outdoor train stations. This discomfort is worse for older adults, children, and people with health conditions.

2. Insecurity and Vulnerability
Waiting areas, especially in less busy areas, are often poorly lit, separated from other areas, or located near areas with a lot of crime. There are no security guards or cameras, so there is more risk of theft, harassment, and violence, especially in the early morning or late evening.

3. Lack of Real-Time Information
Many bus stops and train stations don't show the right arrival times or service updates. Screens may be broken or missing, and mobile apps often don't show delays or changes in route. This uncertainty forces users to wait without knowing what's going on, increasing their anxiety and reducing their trust in the system.

4. Overcrowding and Disorder
During the busiest times of day, the platforms and stops are very crowded, with not much space to stand or move. Lines are often informal or ignored, which leads to pushing, jumping the line, and tension among passengers. This chaotic environment can be very stressful, especially for those who are most vulnerable among us.

5. Informal Vendors and Obstructions
Street vendors make things convenient, but they also block the way for people walking by. Sometimes, this causes problems between passengers and the people selling things. It also makes things look messy and makes it hard for people to move around.

The trip.

"Travel phase" refers to the actual journey through the transportation system. On this trip, people can enjoy the comfort, safety, cleanliness, and speed that are part of the service. In Bogotá, using TransMilenio or SITP is seen as having mixed feelings. While it covers a lot of territory and is relatively cheap, it has problems like overcrowding, irregular schedules, and people feeling unsafe (López & Ramírez, 2020). This phase is the most emotionally intense because the person is constantly interacting with other passengers and the physical environment of the vehicle. According to Bissell (2018), traveling with a group is also a way for people to socialize and learn about the city. But poor ergonomics, traffic, and noise can make it hard to enjoy your trip. The quality of the trip affects how people think about the system and whether they want to use it in the future. A smooth, comfortable, and predictable journey makes users feel confident and encourages them to use transportation in a way that can be maintained in the long term (CAF, 2022).

Friction points

1. Overcrowding and Physical Discomfort
TransMilenio buses are often very crowded, especially during the busiest times of day, standing for long periods in tightly packed conditions can cause physical strain, limited mobility, and higher stress. SITP buses can also get crowded, especially on popular routes where buses don't come often.

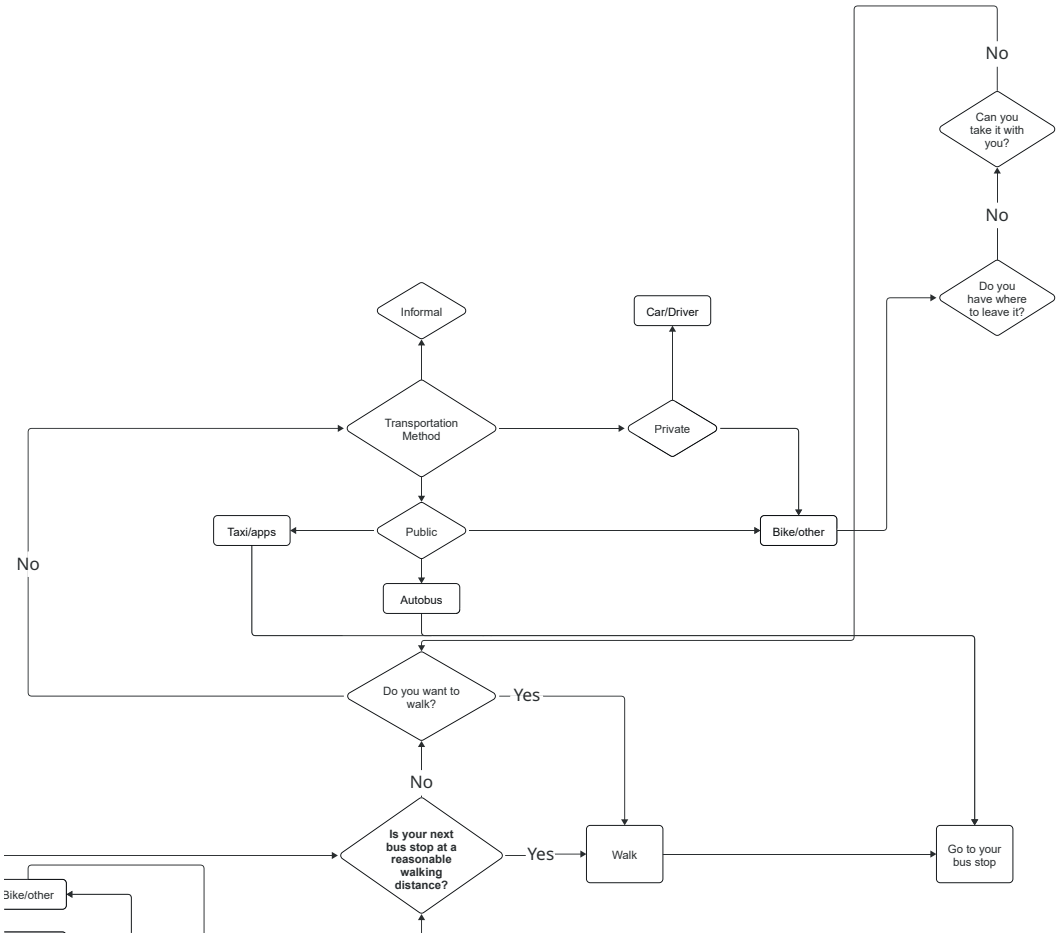
2. Unpredictable Travel Times
Even though buses have fixed routes, they often experience delays for various reasons, like traffic congestion, mechanical issues, or operational delays. TransMilenio's special lanes help, but buses and SITP vehicles still have to share the road with other vehicles, so they're often late. This unpredictability makes it hard to plan and can cause stress for people who need to travel at certain times.

3. Safety and Security Concerns
Pickpockets and harassers often target crowded buses and stations. The lack of security guards and fast emergency response systems makes passengers feel unsafe. This is especially true for women, young people, and older adults. Poor lighting and cameras in certain areas make these risks worse.

4. Lack of Real-Time Information During Transit
Once on the bus, passengers rarely receive updates about delays, changes to the route, or disruptions to the service. There aren't many screens or announcements on the bus, and mobile apps often have poor signal or don't update. This makes riders unsure about how to get where they're going.

The transfer.

The transfer phase is defined as the period during which users transition from one mode or vehicle to another within the transport network. This phase is considered a pivotal point in the journey, as it serves as a crucial link between different stages of the trip. In the context of Bogotá, this phase frequently occurs when passengers transition from the SITP feeder to the TransMilenio trunk lines, or between formal and informal modes of transportation such as vans, bicycle taxis, or walking (Parada Celis & Villamizar Ropero, 2023). Despite its transitional nature, this phase exerts a significant influence on users' perceptions of the system's efficiency, comfort, and continuity. Obstacles such as long walking distances, inadequate signage, and exposure to weather or insecurity have been identified as common challenges that increase travel time and reduce the perceived quality of the journey (CAF, 2022). For passengers, the transfer phase is especially important. They might notice changes in their surroundings, different ways to move through the airport, and sometimes a less reliable service. As Bissell (2018) explains, movement between spaces is important for both function and emotion. It helps travelers understand their place in the city. In Bogotá, many people describe transfers as moments of stress, confusion, and crowding, especially at busy stations like Portal Américas or Avenida Jiménez. These problems show that there are problems with how transportation infrastructure is designed and coordinated (López & Ramírez, 2020).



Friction points

1. Poor Synchronization Between Services
The timing of transfers is often not reliable. Bus schedules may be late or early, so passengers may have to wait a long time or miss their bus entirely. When the bus and feeder services don't work together, it can cause problems like delays and missed connections.

2. Inadequate Transfer Infrastructure
Many transfer points don't have the right signs, shelters, or lights. In TransMilenio, moving between platforms or stations can mean walking long distances, going up and down stairs, or going through crowded corridors. SITP transfers often happen at informal stops where it's not clear where to wait or which bus to expect.

3. Limited Real-Time Information
Passengers usually don't get real-time information about connecting buses. Apps may not show delays or changes in routes, and station screens, if there are any, are often old or not working. This makes it hard for users to know if their transfer is still possible or if they need to change their plan.

4. Physical and Safety Barriers
Going from one place to another can mean crossing dangerous streets, walking in dark areas, or going through busy areas. Older adults, people with disabilities, and women traveling alone are at particularly high risk during these transitions, especially in less populated areas.

5. Fare System Confusion
The TuLlave card lets you transfer within a 95-minute window, but many users don't know about this or miss the time limit because of delays. Some people mistakenly pay twice. Others lose benefits because their card isn't personalized or properly registered.

Exit.

Arrival at the partial or final destination of the system marks a change in spatial and emotional perception. The user leaves the closed environment of mass transport and rejoins the open urban space. This transition highlights the discontinuities between the transport system and its immediate surroundings: deteriorated access, lack of signage and lack of pedestrian connectivity (Secretaría Distrital de Planeación, 2022). According to Merleau-Ponty (1945), the experience of arrival is also a physical experience. After feeling limited, the body becomes independent again. When you reach your destination, you feel relieved, but you're also tired and your senses are overwhelmed. In terms of evaluation, the arrival is the highlight of the journey, if the environment is not safe or confusing when the user is leaving, the user will have a negative perception of the whole trip. So, the quality of the arrival is an indirect way to measure the success of the mobility system. The last mile represents the end of the journey and the user's return to their everyday environment. The final part of the route, which is usually for people walking or cycling, depends a lot on the quality of the city around it. Gehl (2010) says that the things that determine how liveable public spaces are include things like continuity, lighting, and safety. In Bogotá, the last mile of the journey is often the most dangerous. The streets are poorly lit, the sidewalks are broken, and there are a lot of cars. These conditions make people feel less safe and want to rely on cars and other motorized vehicles (Vega & González, 2021). From a public policy perspective, the last mile raises the need to integrate transport planning with proximity urbanism. A mobility system is only complete when users can reach their destination safely, comfortably, and easily (Lefebvre, 1974; UITP, 2019).

Friction points

1. Disorientation at Exit Points
Many TransMilenio stations have multiple exits, but they are often poorly marked or have unclear directional signs. If you don't know the layout, you might end up on the wrong side of a busy road or far from where you're going. With SITP, it can be hard to know exactly where to get off because informal or unmarked stops are common, especially in the outer zones.

2. Unsafe or Inaccessible Surroundings
Exiting the system often means walking in dark, broken streets or crossing busy streets. These conditions are dangerous for older adults, people with disabilities, and children. In some areas, there are no sidewalks. This means that people on bikes have to walk along the road or cross dangerous streets.

3. Lack of Last-Mile Connectivity
Once outside the system, users often have to walk long distances to reach their final destination. Some neighborhoods may not have bike lanes, safe places for people to walk, or other ways to get around like mototaxis or shared vans. This gap makes the transit system less efficient.

4. Exposure to Insecurity
It can feel unsafe to leave at night or in remote areas. Some stations and stops are located near areas with high crime rates. The lack of security or surveillance at these locations can make them more vulnerable. Riders may avoid certain exits altogether, even if they're closer to home.

5. No Feedback or Support Channels
If users experience problems, such as card errors, missed stops, or safety incidents, there is no way to report them or get assistance right away. Exit points don't usually include help desks, QR codes, or signs that direct users to support services. This means that users are disconnected from the system once they step out.

Informality as a solution.

In Colombia, transportation has always been designed around private cars, which has had a significant impact on how people get around and move through cities. Since the 1950s, cities have grown unchecked, with a lack of clear rules for getting around and more space given to roads for cars; all of which has created a system that leaves many people behind (Peña Rodríguez, 2020; Carmona Rojas, 2020). As a result, there is heavy traffic, polluted air, and difficult access to buses or public transportation, especially in remote or poor areas. Relying so heavily on cars not only reflects a social custom linked to luxury and convenience, but also reveals a lack of equity in how money is spent and how the territory is organized: it privileges traveling alone over traveling together (Peña Rodríguez, 2020).

Due to these trends, systems such as TransMilenio in Bogotá appeared late and in a limited form to address urban mobility problems. Although their idea was to speed up travel and reduce traffic jams, they fail to reach many places, have infrequent buses, and offer little integration, leaving many people dissatisfied. According to Peña Rodríguez (2020), there is a clear gap between what the authorities decide and what people really need when moving around the city: to be able to get around easily, have quick options, and feel safe. In response to this, unregulated transport is growing as a practical solution to the failures of the official system, operating alongside it but outside the established channels. Unregulated transportation in Colombia appears as a spontaneous response when there are not enough legal options. As Carmona Rojas (2020) mentions, this type of mobility does not occur by chance, but rather reflects problems in the organization of urban space and the government's failure to provide fair transportation for all. This has led to the emergence of motorized tricycles, unlicensed buses, private vans, organized groups, and alternative apps, all of which show how people find solutions where official services do not reach. This goes hand in hand with the chaotic growth of cities, as new residential areas spring up far from established routes, leaving some sectors cut off from the rest of the network. Thus, these informal forms end up playing a key role: they bring remote neighborhoods closer to the main transportation routes (Carmona Rojas, 2020; Fondo de Prevención Vial, 2013).

People often choose informal transportation not only because it reaches more places, but also because it is faster, changes according to needs, and adapts to the real environment. Far from the formal sector, which follows strict rules and set schedules, the unregulated sector reacts instantly when urban demand rises or falls. This ability to move around without rigid rules is very important where public management fails to handle how people travel every day.

According to Carmona Rojas (2020), this type of mobility appears precisely where the state is lacking, showing that access to transportation is not always guaranteed by rights, but depends on circumstances. So, although it reflects deep imbalances in society, it also reveals collective creativity and solutions created from the bottom up.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The Road Safety Fund (2013) adds another perspective, viewing informality not only as a result, but also as a flexible response to systemic shortcomings. From this point of view, traveling in unregulated vehicles not only solves transportation issues, but also opens up job opportunities for many people. Thanks to their low costs and quick adaptation to popular areas, they serve as a solution to unemployment or unstable jobs. Even so, this practical side brings road hazards, legal problems, and doubts about continuity, because several of these systems operate without clear rules or minimum coverage, leaving both drivers and passengers exposed.

Although many have tried to eliminate or legalize unregulated transportation, it remains present and growing in almost all of Colombia. This shows that this form of transportation is not just a violation of the rules, but something deeply rooted in how mobility works here (Peña Rodríguez, 2020; Carmona Rojas, 2020). Seeing it as useful and real forces us to rethink transportation decisions with a closer look and one that is adapted to the local context. We must aim for urban designs that include these clandestine routes within sustainable transit, using gradual processes to regulate them, talking with those who participate, and improving public management (Road Prevention Fund, 2013). In this way, the irregular could cease to be a sign of marginalization and become a tool for connecting areas.

Unregulated transportation in Colombia is not just chaos, but a clear result of government gaps, community pressures, and economic conditions. It arose because official services are either unavailable or dysfunctional; however, it continues to grow thanks to how it fits into everyday life in cities. Far from being a mistake, this form of transportation shows how people seek real solutions when there are no fair options for getting around (Peña Rodríguez, 2020; Carmona Rojas, 2020). Understanding this well means leaving punitive views behind and including, from the planning stage, all those means and people that really move the country forward.

Collective buses

In many suburbs of Bogotá, buses or vans don't follow official routes. Instead, they pick up and drop off passengers "on demand" or at informal stops. These vehicles emerged because regular buses and trains didn't offer enough routes, frequency, or connections in areas with few transport options. Before reforms to Bogotá's bus system, many buses competed for passengers, causing traffic, safety issues, and inefficiencies (Parada Celis & Villamizar Ropero, 2023).

Informal bus operators often belong to networks with little visibility or regulatory oversight. This makes it hard to manage cities and protect riders' rights (Heinrichs, Goletz & Lenz, 2017). These informal buses play a practical role by covering areas where formal transport is lacking. However, they also bypass rules on service quality and labor conditions. This creates tension between expanding access to mobility and ensuring good governance.

Mototaxis

The mototaxi service has grown a lot, especially in rural or hard-to-reach areas of the city and its suburbs. However, it is prohibited in the urban area of Bogotá. This type of transport is a fast, flexible, and low-cost option for trips that aren't well covered by formal transport. It's basically a part of how people get around, even if it's not always recognized (Behrens, Chalermpong & Oviedo, 2021).

From the point of view of employment, this informal way of getting around is also thought to be closely related to the workings of informal economies. People who can't find formal jobs often turn to driving motorcycle taxis. But being informal can be dangerous. You might not have insurance or follow the rules of the road. You might get into accidents, and the government might make it hard for you to do this activity (Heinrichs, Goletz & Lenz, 2017).

Bicycle taxis

Bicycle taxis (also called "bicitaxi" tricycles) are human-powered or assisted (in some cases electric) vehicles that don't have fixed routes. They're usually used for very short trips or as "feeder" services to the main transport system, especially in the working-class neighborhoods of Bogotá (CEMORE, n.d.). A study by the Bogotá Mobility Secretariat found that the number of bicycle taxis in the city increased by 52% between 2013 and 2019. The number went from about 3,054 to 4,646 vehicles (Parada Celis & Villamizar Ropero, 2023). They offer a useful alternative in some areas, helping people get around, but they also create challenges related to regulation, safety, employment, and planning (ITF/OECD, 2019).

Informal shared taxis

Informal shared taxis are private cars that pick up several passengers sharing a route. They often serve areas where the formal system does not have enough coverage, especially during rush hour. In Bogotá, these shared taxis are a way to meet the city's transportation needs when there aren't enough traditional options available (Behrens, Chalermpong & Oviedo, 2021). This type of service has two sides. On the one hand, it makes things more accessible and flexible. On the other hand, it affects regulation, competing with formal transport, user safety, and driver labor protection.

Informal vans

In the suburbs of Bogotá, such as Ciudad Bolívar or Usme, people often use SUVs or pickup trucks to transport passengers. These vehicles circulate in urban and rural zones, especially in areas where buses don't provide reliable service. They usually operate independently, without permits or formal oversight, and are part of the city's informal mobility landscape. For many residents, they offer a flexible and accessible alternative, filling critical gaps left by formal public transport systems. However, their informality raises concerns about safety, regulation, and long-term sustainability. (Parada Celis & Villamizar Ropero, 2023)

Groups on social media.

Finally, there is a new trend of WhatsApp groups or other social media groups that organize carpooling within neighborhoods or communities. People coordinate to share a vehicle, route, or journey, in some cases at a reduced or symbolic cost (ITF/OECD, 2019). This informal way of getting around is an example of how people and communities work together to meet their transportation needs when public transportation is not available.

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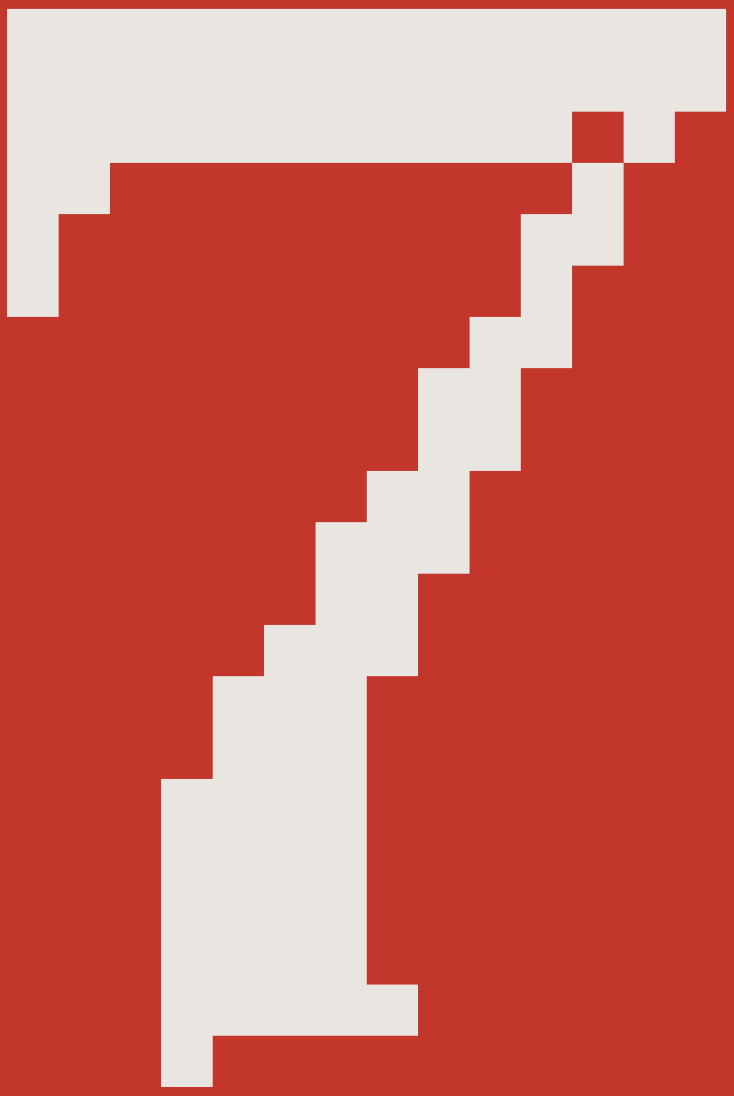


Territorial Challenges.

The analysis of the data above allowed us to create a map of the city of Bogotá. This map shows how the city's social, economic, environmental and cultural factors work together to create its urban structure. This approach showed how inequalities and different rates of growth have shaped a fragmented city, where opportunities, services and resources are distributed very unequally. By looking at information on mobility, informality, governance, culture and the environment, we were able to identify the main problems that affect the city's ability to change in a sustainable way.

There are six problems with the map that show the city's main structural problems. The most important problem is inequality, which makes it hard for people to access education, jobs, and services. Being informal can help deal with exclusion, but it also makes the city very vulnerable. Problems with mobility make things more difficult for people and the environment. Organizations tend to be weak and struggle with cooperation, which complicates effective planning. At the same time, the city's social and cultural resources are under pressure because they are not being recognized. The city is growing, which puts the ecosystems that keep the city going at risk.

All these problems are connected. The same problems are shown in how Bogotá is developed. If we understand this, we can see the city as a whole. Every part of the city affects the others, this means we can use this idea to help design the city, plan for the city, and create good public policies. We can do this in a way that is fair to everyone and does not hurt the environment.

Territorial Inequality as a Structural Driver.

The problem of unequal access to resources is made even worse when poor communities don't have access to good schools and other facilities, and when economic opportunities are focused in one central area. This spatial mismatch forces long trips to work, limits opportunities for people to move up in their careers, and makes it hard for people to get ahead.

Weak Governance & Fragmented Action.

The problem of unequal access to resources is made worse when poor communities don't have enough schools or other facilities, and when there are not many good jobs available. This spatial mismatch forces long commutes, limits upward mobility, and perpetuates cycles of exclusion.

Mobility Gaps & Transportation Issues.

Poor or non-existent public transportation makes it hard for people to get to jobs, schools, and other places. This also makes the air quality in these areas worse. This double impact makes social and environmental inequalities worse.

Informality as Both Survival & Exclusion.

Informality is very important for many people who live there. It provides housing, income, and support networks. But it is often not included in formal planning and regulation. This tension makes people feel like they could be forced to leave their homes or lose their jobs at any moment.

Cultural & Social Capital Being Pressured

Bogotá's cultural and social life – from local groups to art; is an important part of who people are and how they come together. But it is not given enough value, money, or attention. Sometimes, it is even stopped. This makes the community weaker and makes it harder for the city to change in a way that includes everyone.

Environmental Vulnerability & Urban Expansion.

The city of Bogotá is growing, and this is hurting its environment. There are more and more people living in Bogotá, and this is making it hard to protect the natural world around the city. There are also more people living in informal areas, which are not as well managed. This is making it hard to have enough water for everyone. The environment is being destroyed, and this is having a worse effect on poor communities.

System Challenges.

A detailed look at the Integrated Public Transport System (SITP) and TransMilenio in Bogotá showed some big problems that make it hard for people to use the system and make it not very efficient. Looking at data on how it is run, the infrastructure, how easy it is to get to bus stops and how people feel about it, we can see that there are problems with how well it works and how well it fits together. These problems make it hard for the system to be the main way people get around the city. Looking at this information, we can see that there are problems with the network that make it hard for people to use public transport every day.

Based on this information, we can see five big problems that make it hard for the transport system to work well. The problems with the user experience make the different parts of the system: the apps, signs, bus stops and vehicles. not work well together. This causes confusion, people to waste time and feel uncertain. On top of this, there are physical and infrastructural problems that make it hard for people to get on and off the bus, especially for people with reduced mobility, older people and people with children. The system is unreliable, with delays, cancellations and buses not coming at the right times. This makes people lose trust in the system and means it can't be relied on to help people move around the city.

There are two extra problems that make it harder for people to get around. On one hand, it is dangerous for people to travel to work or school. This is especially true for women, young people, and older adults. It also makes people feel less happy in the city. On the other hand, areas that are farther from the city center have fewer services, not all the buildings have the same infrastructure, and there are fewer government offices. This makes the city more unequal. Together, these problems show that Bogotá's transportation system needs to be improved in a way that makes it easier for people to trust it, and makes it easier for people to get around the city.

Fragmented System Experience Undermines Usability.

Bogotá's public transportation system is a mess. It's made up of different components, like apps, stations, buses, and signs, that don't work together. This fragmentation makes it hard for users to trust the system and use it.

Physical & Infrastructure Barriers.

Problems with infrastructure like sidewalks or station facilities, create physical obstacles that make the system harder, slower, and more dangerous to use. This is especially true for people with disabilities, older adults, or those traveling with children.

Peripheral & location Disadvantage.

Neighborhoods on the edge of the city have it worse. They have fewer stores and places to charge their card, less bus service, unsafe or incomplete infrastructure, and less help from city officials. This makes it harder for people to move around and limits opportunities for people to get ahead.

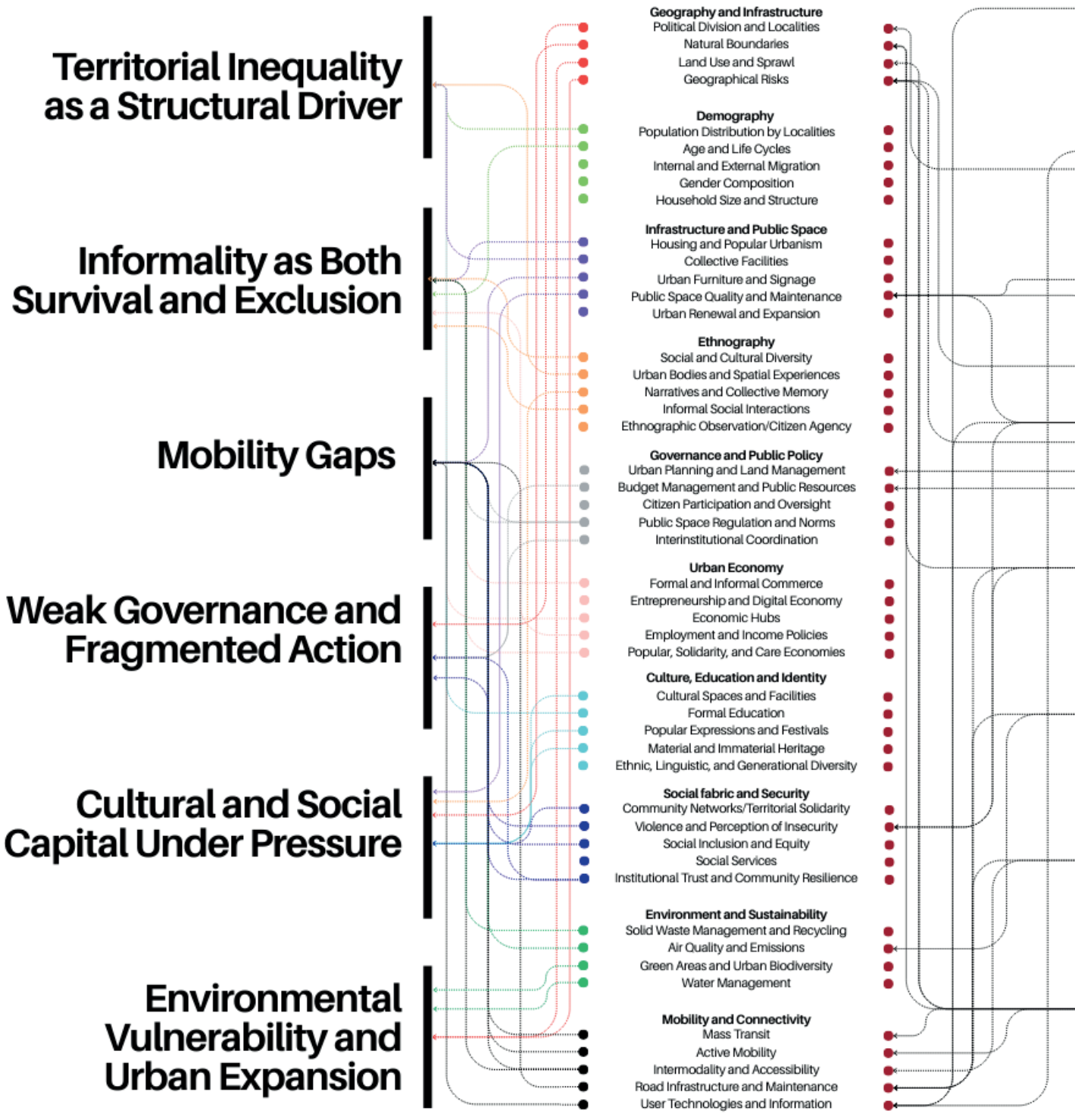
Operational Unreliability Disrupts Continuity.

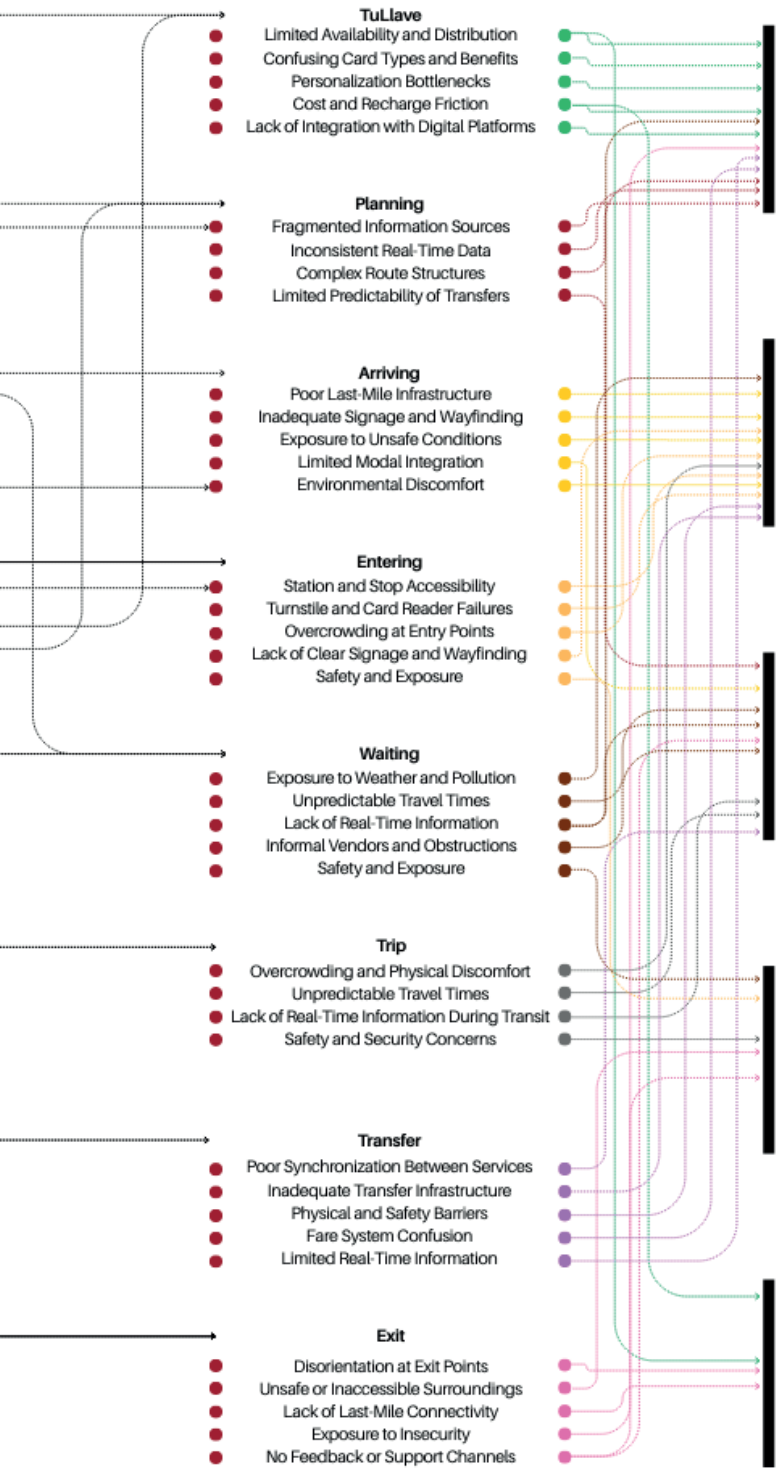
The problem of unequal access to resources is made worse when poor communities don't have enough schools or other facilities, and when there are not many good jobs available. This spatial mismatch forces long commutes, limits upward mobility, and perpetuates cycles of exclusion.

Vulnerability & Insecurity Are Built Into the Journey.

At almost every step; from walking to the station to waiting on the platform. People are more likely to be victims of crime, harassment, and bad conditions. These risks affect women, young people, and older adults more than other groups. This makes them less likely to use the internet and creates even greater inequality.

Challenges Map.





Fragmented System Experience Undermines Usability

Physical and Infrastructure Barriers

Operational Unreliability Disrupts Continuity

Vulnerability and Insecurity Are Built Into the Journey

Peripheral Disadvantage

Case Studies

This section presents a series of case studies that show how different actors, both institutional and informal, have addressed the challenges of public transport in various cities around the world. The selection is organized into six scenarios, each of which brings together a set of experiences that illustrate the tension and complementarity between solutions promoted by official frameworks and those that emerge from the daily practices of citizens.

Each scenario includes five cases of formal means, initiatives developed by public institutions, official operators, or regulated projects, along with five cases of informal means, which correspond to spontaneous, adaptive, or community responses that have emerged to fill gaps and improve urban mobility. This comparative structure allows us to identify patterns, contrasts, and lessons learned between both types of approaches, revealing how the interaction between the formal and the informal shapes new possibilities for the design of more inclusive and resilient transportation systems.

Beyond the description of each case, the purpose of this section is to analyze its relevance as input for systemic design and user experience in public mobility. By bringing these practices into dialogue, we seek to understand how formal solutions can benefit from the flexibility of the informal, and how community initiatives can inspire public policies that are more sensitive to the real needs of people.

Fragmented System Experience Undermines Usability

Nottingham, UK

Direct regulation of bus services

The city of Nottingham, located within the United Kingdom, has distinguished itself through the implementation of a distinctive public transport management model. This model is characterised by the direct regulation of bus services through the utilisation of innovative legal and institutional instruments. This approach emerged as a response to the challenges posed by the national deregulation of public transport that commenced in the 1980s. The repercussions of this deregulation, as evidenced by Rye (2010), included the fragmentation of services, a paucity of coordination, and a decline in the quality perceived by users. In the face of these challenges, Nottingham City Council adopted a range of strategies that sought to balance market efficiency with the necessity to ensure minimum standards of service, accessibility, and environmental sustainability.

A key program that was started in 2010 in the city of Nottingham is called the Statutory Quality Partnership Scheme, or SQPS. This plan created a formal and legally required agreement between the local government and bus companies. In this agreement, both parties agreed to take on different responsibilities. The operators promised to use vehicles that pollute less, make it easier for people to get around, train their staff, and give users the latest information. In return, the city provided high-quality infrastructure, such as dedicated lanes, modern shelters, and real-time information systems (Transport Nottingham, 2024). As a result, the SQPS made it easy to control who could access the main areas. This made sure that only operators who met the required standards could use the most popular infrastructure.

The legal framework for these measures comes from the Transport Act 2000, which created the Quality Partnership Schemes and Quality Contract Schemes. These instruments allow local governments to set rules about the services and quality that private companies must meet in certain cities (Rye, 2010). The 2021 National Bus Strategy led to the expansion of Nottingham's regulatory mechanisms through Enhanced Partnerships. This strengthened public-private cooperation and allowed access to national funding for infrastructure and fleet improvements (Nottinghamshire County Council, 2022). This combination of agreements and laws shows an evolution towards a hybrid model of transport governance.

The efficacy of these policies is evident. Nottingham has achieved notable levels of public transport utilisation in comparison to other British cities, along with an enhancement in perceptions of reliability and quality of service (Centre for Cities, 2024). Furthermore, the integration of complementary policies, such as the Workplace Parking Levy, which taxes private parking at businesses to fund transport enhancements, has contributed to the reduction of congestion and the enhancement of the competitiveness of the bus relative to the car (Rye, 2010). However, limitations persist: the SQPS does not confer direct control over fares and frequencies, resulting in the partial reliance on the commercial logic of operators (Napier University, 2016).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Fragmented System Experience Undermines Usability

Helsinki, Finland - Regional transport integration under Helsinki Region Transport.

The creation of the Helsinki Region Transport Authority (HSL) marked a turning point in the governance of public transport in the Helsinki metropolitan area. Founded in 2010 by unifying services managed by different municipal agencies, HSL consolidated the planning and management of buses, trams, metro, subways, commuter trains and ferries under a single inter-municipal entity (Helsinki Region Transport [HSL], n.d.-a). This process made it possible to overcome the previous institutional fragmentation and to establish a coordinated mobility strategy between more than ten municipalities, aimed at improving operational efficiency, reducing car use and promoting a sustainable transport model (Centre for Cities, n.d.).

One of the most important parts of the model was fare integration. HSL introduced a zonal fare system that applies to all forms of transportation. This system lets users travel with a single ticket within specific areas (HSL, n.d.-a). This integration was made easier with the HSL App, which is a mobile application that helps people plan their trips, pay digitally, and get real-time information about service disruptions or changes. These tools made it easier for different modes to work together, which made the system seem more unified and user-friendly for passengers.

When it comes to technology, HSL focused on making things easy to use together and on sharing data openly. The Open Data program lets the public use real-time route, schedule, and location data for all modes of transportation. This allows third parties to create new services like trip planning apps or tools that analyze mobility (HSL, n.d.-d). Digitransit is a platform that uses open source software to standardize the exchange of information between different transportation modes. It also has a robust system of APIs that external developers can access (Digitransit, n.d.). This open data strategy made Helsinki a leader in digital innovation in urban mobility in Europe.

In 2023, HSL recorded 344.1 million trips on its multimodal network (HSL, 2024), showing that the system was strong even after the pandemic. In addition, investing in making stations, stops, and vehicles better led to more accessibility and a better perception of the quality of service (Centre for Cities, n.d.). However, HSL doesn't operate services directly. Instead, it contracts private operators through tenders. This means that it is still very important to oversee and coordinate contracts to make sure that services are the same everywhere in the region.


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Fragmented System Experience Undermines Usability

London, UK - Open Data and TfL API for app integration and planning.

Transport for London (TfL) adopted an open data strategy more than a decade ago that has transformed user interaction with public transport in London. In 2007 TfL began releasing public data on timetables, routes, service status and other essential information, in formats accessible to third parties and through a unified API that allows real-time access to transport feeds (GOV.UK, n.d.; TfL, Open Data). This policy enabled external developers to create hundreds of mobility apps, enhancing the user experience by providing journey planning, disruption alerts and live updates on transport status (Stone, Aravopoulou & Nguyen, 2018).

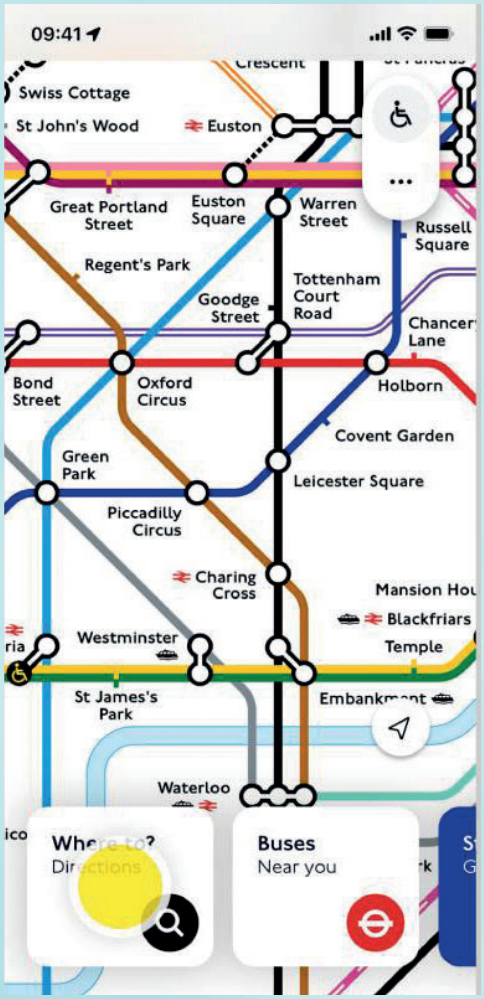
A key feature of the strategy was to preserve government control over data quality and updates. Although external developers build the applications, TfL takes responsibility for maintaining the completeness, timeliness and accuracy of published information, including timetables, disruptions, service status and alerts (Stone et al., 2018; GOV.UK, n.d.). This monitoring is essential to avoid discrepancies between what users rely on and what is actually happening in the system, reducing perceptions of travel uncertainty.

The modal scope of the data is broad: the public data provided by TfL includes information from metro, buses, trams, suburban trains and public bicycles. This multiple coverage facilitates intermodal integration into third-party apps, and allows users to plan combined journeys (e.g. bike + metro + bus).

In addition, TfL enhances its own official tools - app, website, station information - by incorporating real-time tracking, service status and live planning functionality, which complements and reinforces the offerings of third-party developers (Stone et al., 2018; TfL Open Data portal).

The economic, social and user experience benefits have been assessed by independent studies, including one by Deloitte commissioned by TfL, which estimates that open data brings around £130 million a year in economic benefits to London. These benefits derive from commuter time savings, better planning, reduced journey uncertainty, increased route choice, and the development of data-driven businesses and apps.

It is estimated that over 600 apps use TfL data, and that approximately 42-46% of Londoners use apps based on this data (TfL, Open Data; GOV.UK; Deloitte report) (GOV.UK, n.d.; Cambridge Network, 2017; TfL Open Data portal).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Oxford Circus
Holborn
Covent Garden
Green Park
Leicester Square
Piccadilly Circus
Charing Cross
Blackfriars
Westminster
Temple
St James's Park
Waterloo
Buses
Near you

Fragmented System Experience Undermines Usability

Dublin, Ireland - Platform for shared data between operators to improve the network.

In Dublin, the National Transport Authority (NTA) is leading the modernization of public transportation. The NTA has promoted the creation of a national digital infrastructure that will integrate public and private operators under the Transport for Ireland (TFI) framework. This initiative brought together information from buses, trains, and trams in cities and between cities, creating a national data platform that was shared by all. The system is based on the General Transit Feed Specification (GTFS) model, which has improved how different technologies work together and encouraged the development of service planning and monitoring applications (National Transport Authority, 2019, 2024).

One of the most important parts of the system is the real-time information network (RTPI), which collects location data and arrival times using technology that identifies the location of vehicles. You can access this service through mobile apps, text messages, electronic panels, and screens located at over 700 strategic stops (National Transport Authority, 2019). The National Transport Authority (2024) says that sharing correct, up-to-date information has made travel less uncertain and made people trust the system more. This has led to a more reliable experience for users.

The NTA has also promoted the use of digital technology for the fare system to make it easier to use different types of transportation. In 2024, it signed an agreement with the technology company Indra to use an account-based ticketing system for trams, buses, trains, and the future MetroLink (Indra Company, 2024).

This system will allow you to plan, pay for, and validate trips from multiple digital channels, consolidating Mobility as a Service (MaaS). The measure is supported by open data and public access to system information, which promotes transparency, innovation, and collaboration between different sectors.

The Dublin case shows a state strategy that focuses on working together, using technology in the right way, and making things easy for users. Although full fare integration and universal digital accessibility are still being developed, the Irish model shows how public policies based on open data can improve operational efficiency, encourage cooperation between operators, and optimize network planning.

The Dublin experience shows how a modern approach to digital integration can improve public transportation, making it more connected, easy to use, and environmentally friendly.


Connecting
Ireland
Rural
Mobility
Plan
TFI


R137 M50
N4 N7
R114 N11
Rath Maonais
RATHMINES

Fragmented System Experience Undermines Usability

Israel - Integration of private operators under state coordination to unify the system.

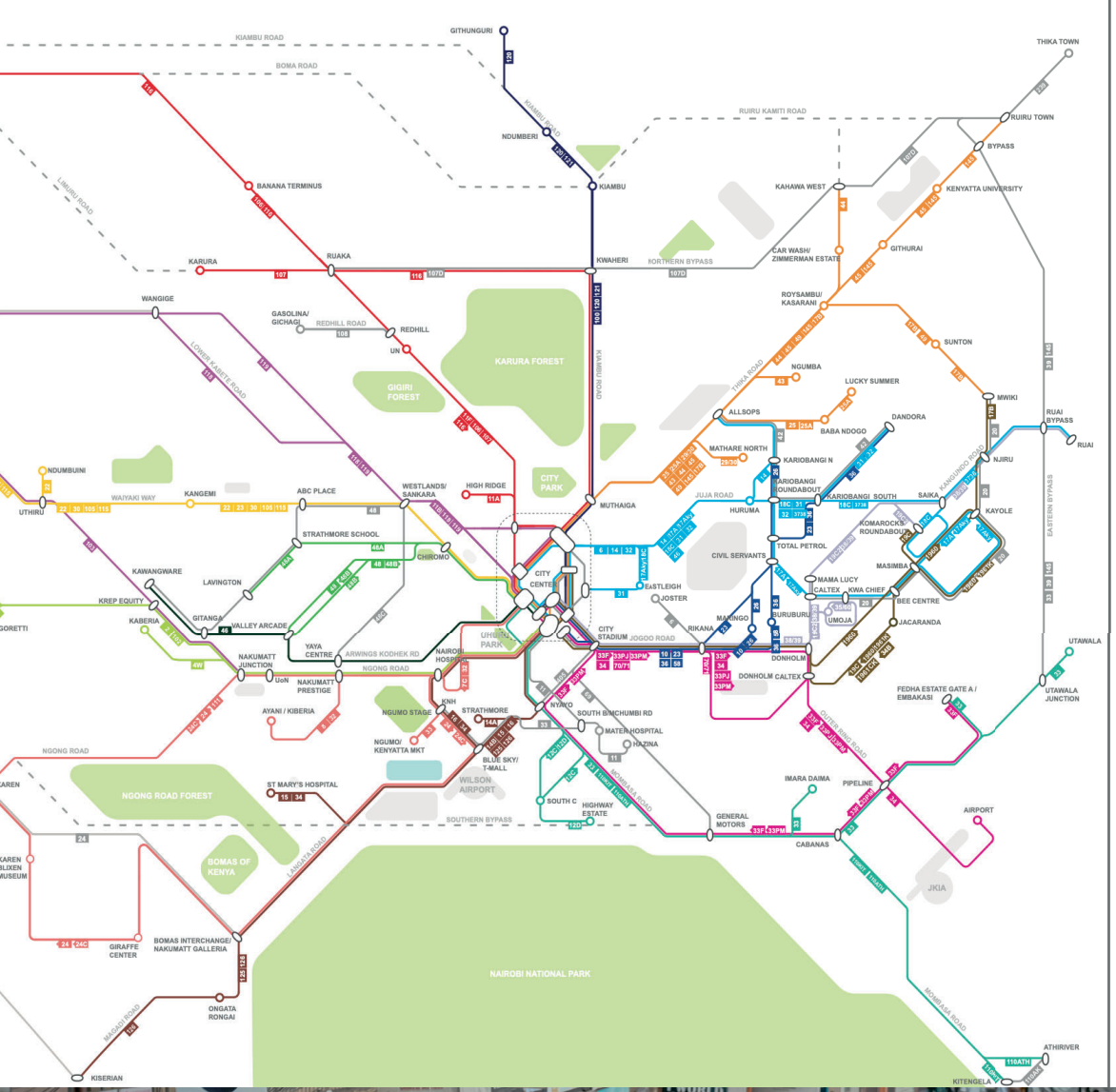
In Israel, the Ministry of Transport made a big change that said all bus companies had to be part of one public transportation network. This plan included putting all route planning and the allocation of concessions under one roof. The goal was to improve efficiency and reduce unregulated competition among companies (PTI, 2025).

A common fare system and a nationwide electronic payment system using the Rav-Kav card were established. Since 2022, passengers can only purchase tickets using cards or mobile apps like Rav-Pass. These apps allow for payment and trip planning on buses, trains, and trams (HopOn, 2025).

The Israeli government also invested in intermodal infrastructure and set quality standards for the vehicle fleet. These actions have resulted in better service coverage and punctuality, contributing to a more consistent and reliable user experience (PTI, 2025).

Israel is a good example of how public transportation can be made to work well for everyone. The government works together to make sure that buses and trains have the same fares and schedules. This makes it easier for people to use public transportation (PTI, 2025).


דרך
שבם/טובלך



NAIROBI MATATU ROUTES

digitalmatatus

Route 36 | Outbound From City Center 33 | Inbound To City Center 48B

Stop — Terminus — City Center — Junction

A line
Kiambu
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Ndumberi
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Kahawa West
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Githurai
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Ruiru Town
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Ngong
Gasoina
Kitengela

*44 lines also to Mwiki, Sunton,Zimmerman,and Githurai
**33 lines also to Fedha, Imara Daima, Highway, South ***36 line also to Kariobangi Roundabout

Data developed through a research collaboration between the Civic Data Design Lab, MIT; Center for Sustainable Urban Development, Columbia University; School of Computing and Informatics, University of Nairobi; Groupshot. Research funded by the Rockefeller Foundation.
Data Collected by:
University of Nairobi School of Computing and Informatics
Paper Maps Illustrated by:
Wenfei Xu and Sarah Williams (Civic Data Design Lab)
FOR FEEDBACK & MORE INFORMATION:
http://www.digitalmatatus.com
Beta Release : Created January 23, 2014

CIVIC DESIGN DATA LAB Massachusetts Institute of Technology

C4DLab University of Nairobi

Fragmented System Experience Undermines Usability

Nairobi, Kenia – Digital Matatus

The Digital Matatus project, developed in Nairobi, Kenya, emerged as an innovative response to the lack of structured information on the city's informal public transport system. Nairobi has a network of minibuses known as matatus, which transport the majority of the urban population, but until a few years ago operated without official data on routes, schedules or stops. In 2013, an interdisciplinary team from the University of Nairobi, MIT, Columbia University and the company GroupShot designed a digital mapping project to record the entire transport network using GPS technology and mobile phones (Williams et al., 2015).

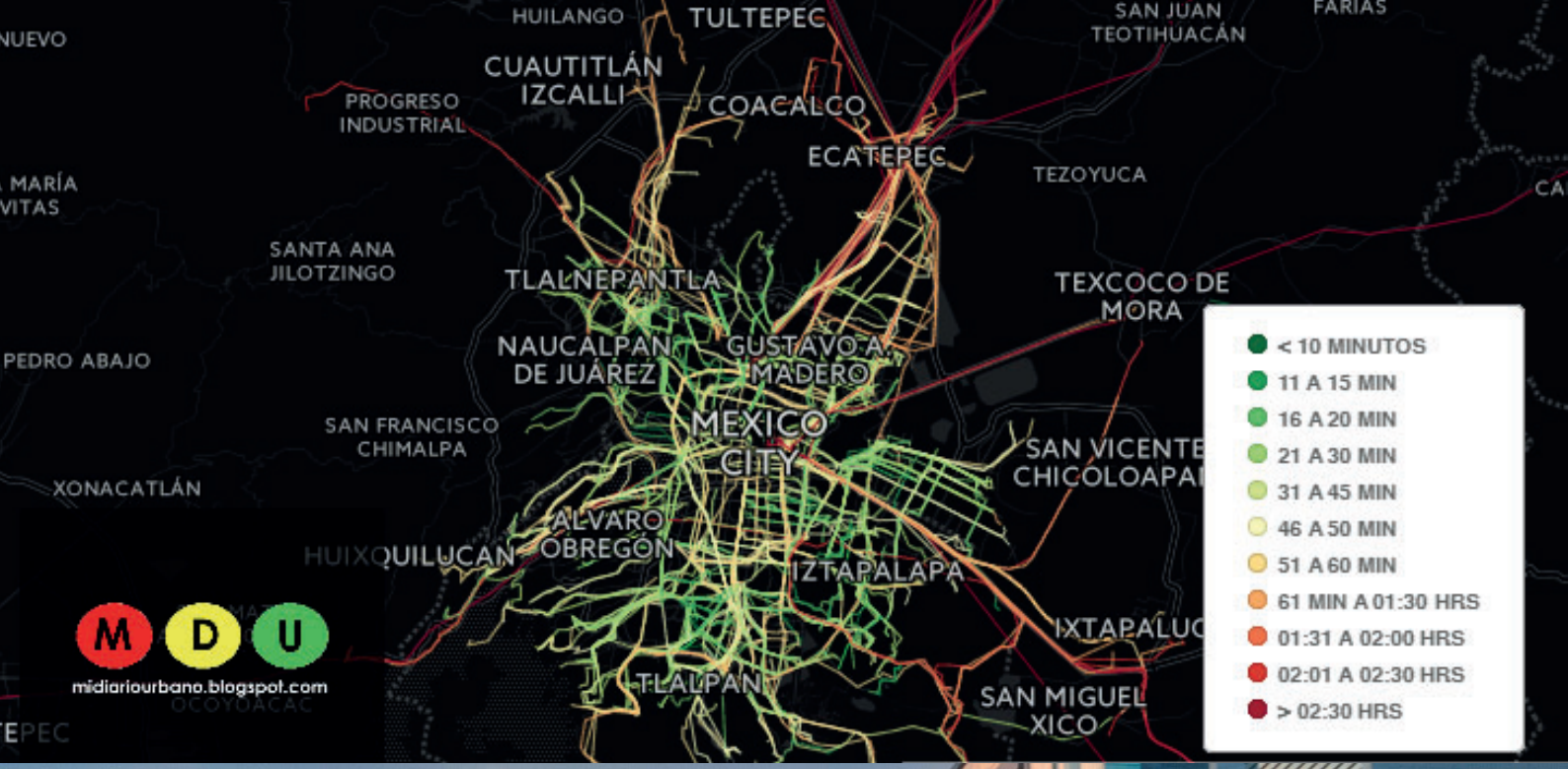
The process involved collecting geospatial data directly from matatus vehicles using GPS-equipped smartphones, which mapped routes, stops and travel times. The collected data was standardised under the GTFS (General Transit Feed Specification) format, the same format used by global applications such as Google Maps. This allowed, for the first time, Nairobi citizens to have access to digital and public information on the urban transport network, promoting more planned and efficient mobility (Williams et al., 2015).

The impact of the project was significant both locally and internationally. In Nairobi, Digital Matatus transformed the way public transport is perceived and used, integrating an informal system within a global technological framework.

The case also became a benchmark for other cities in the Global South with informal transport networks, demonstrating that digital innovation and community participation can fill official data gaps. It also enabled city authorities to use the data to plan routes, improve coverage and reduce duplication of journeys (Klopp et al., 2015).

More broadly, Digital Matatus redefined the concept of inclusive mobility, showing that collaborative data collection can empower citizens and strengthen urban governance. The Nairobi case highlights the importance of combining technology, academia and social participation to create more sustainable and accessible transport systems.

Today, the project is considered a model of open innovation that inspires similar initiatives in cities such as Accra, Lagos and Bogotá, contributing to the development of evidence-based mobility policies and open data (Williams et al., 2015).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ECATEPEC
TEZOYUCA
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SAN VICENTE CHICOLOAPA
XONACATLÁN
ÁLVARO OBREGÓN
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31 A 45 MIN
46 A 50 MIN
51 A 60 MIN
61 MIN A 01:30 HRS
01:31 A 02:00 HRS
02:01 A 02:30 HRS
> 02:30 HRS


INDIOS VERDES
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Fragmented System Experience Undermines Usability

Mexico City, Mexico – Mapatón CDMX

The Mapatón CDMX project, promoted by the Mexico City Government's Laboratorio para la Ciudad, was born as a civic innovation initiative to address the lack of official data on the informal transport network of the metropolis, made up of minibuses, peseros and combis that mobilise millions of people daily. This lack of information hindered urban planning and the integration of the formal transport system. The project therefore set out to create the first open database of informal transport through a collaborative citizen mapping process (Organisation for Economic Co-operation and Development [OECD], 2019).

Between January 29 and February 14, 2016, a "mapathon" was held. During this event, more than 3,000 people used a mobile application to record information about routes, stops, fares, and travel times of minibuses and combis (Kumar & Perepu, 2020). The initiative combined gamification, where participants earned points and prizes for their performance, with geolocation technologies. This allowed information to be collected in a few weeks that traditionally would have taken months to gather. This joint effort not only got more people involved, but also made people trust public institutions more (OECD, 2019).

The most important result of the project was the creation of the first digital map of informal transport in Mexico City, which included more than 4,000 registered routes. Even though some of the data had problems with how it was organized or lacked information, the experience showed that participatory mapping is a useful tool for creating knowledge about cities (OpenStreetMap Mexico, 2016, cited in OECD, 2019). This information helped planners and users understand the informal transport system better. It also helped them see how the informal transport system is connected to the formal transport network. This laid the groundwork for future projects that combine the two systems. It also helped create transportation policies that are based on facts.

Mapatón CDMX is a great example of open innovation and participatory governance, this project made it clear how important informal transportation is for daily life. It also showed how the government, schools, and regular people can work together to solve big problems in cities using technology. Other cities in the Global South, like Nairobi and Accra, have adopted a similar approach.

This shows that open data and citizen participation are important tools for creating more equal and sustainable transportation systems (Kumar & Perepu, 2020; OECD, 2019).


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Fragmented System Experience Undermines Usability

Manila, Filipinas – Community Jeepney Mapping.

The Community Jeepney Mapping project, developed in Metro Manila, emerged as a citizen mapping initiative to address the lack of systematised information on the routes of jeepneys, an informal mode of transport that moves millions of people on a daily basis. In 2012, the World Bank and the Philippine Department of Transportation and Communications (DOTC), together with local universities, pushed for the creation of an open database documenting the actual routes of these vehicles, which are not recorded in official records (Krambeck, 2015; World Bank, 2017). The project was part of the Digital Transport Futures programme, which involved students, drivers and neighbours in mapping routes using GPS-enabled smartphones (Atlas of Public Transport, 2016).

The methodology consisted of a collaborative mapping process or crowdmapping, in which participants recorded information directly from vehicles. During the field days, data were collected on stops, travel times and route variations, which were standardised under the international GTFS (General Transit Feed Specification) format, the same used by planning applications such as Google Maps (Atlas of Public Transport, 2016; Next City, 2017). This strategy made it possible, for the first time, to comprehensively visualise the jeepney network and quantify its actual coverage, which covered more than twice the number of routes officially recognised by transport authorities (World Bank, 2017).

The impact of the project was considerable. The data collected enabled the development of urban mobility apps, such as Sakay.ph, which provide route planning for informal transport users (Next City, 2017). In addition, the government was able to identify underserved areas, duplicated routes and structural gaps, generating evidence for the modernisation of the system (Krambeck, 2015). In this way, the project not only improved citizen access to information, but also strengthened institutional capacity for planning through open data, a first in the history of Philippine transport (World Bank, 2017).

More broadly, Community Jeepney Mapping established itself as an example of how citizen participation and low-cost technology can make up for the absence of official information in urban contexts in the Global South. The Manila case shows that local knowledge – collected by drivers, students and neighbours – can be a valuable input for sustainable transport planning (Atlas of Public Transport, 2016). It also reinforces the notion that informal systems should be recognised not as an anomaly, but as an essential component of urban mobility, whose documentation and participatory regulation can contribute to the equity and efficiency of public transport (Krambeck, 2015; World Bank, 2017).

#DigitalTransport4Africa

An Open Resource Center for Mapping Public Transport across Africa

https://www.transportafrica.org/understanding-public-transportation-in-africa/

Fragmented System Experience Undermines Usability

DigitalTransport4Africa - Sub-Saharan Africa: Network of NGOs and communities.

The DigitalTransport4Africa (DT4A) project emerged as a regional initiative to address the lack of information on informal transport in African cities, a problem that directly affects urban planning and sustainable mobility. Led by the World Resources Institute (WRI) Africa in collaboration with the Agence Française de Développement (AFD) and various local organisations, DT4A seeks to build a continental network of open transport data that integrates both formal and informal systems (World Resources Institute Africa, n.d.).

According to WRI, more than 70% of urban travel in Sub-Saharan Africa is by paratransit or informal means, justifying the need for a unified information system (World Resources Institute Africa, n.d.).

The project's approach is based on community collaboration and using the same data format. DT4A helps governments, universities, and NGOs record informal transport routes, frequencies, and stops. They do this by using open formats such as the GTFS (General Transit Feed Specification). These formats are adapted to the African context (DigitalTransport4Africa, n.d.-a).

The DT4A Innovation Challenge is a competition that started in 2022. It gives money to technology projects that make transportation more inclusive and transparent. This approach allowed for local capacity building and the creation of a regional community dedicated to using open data to improve urban mobility.

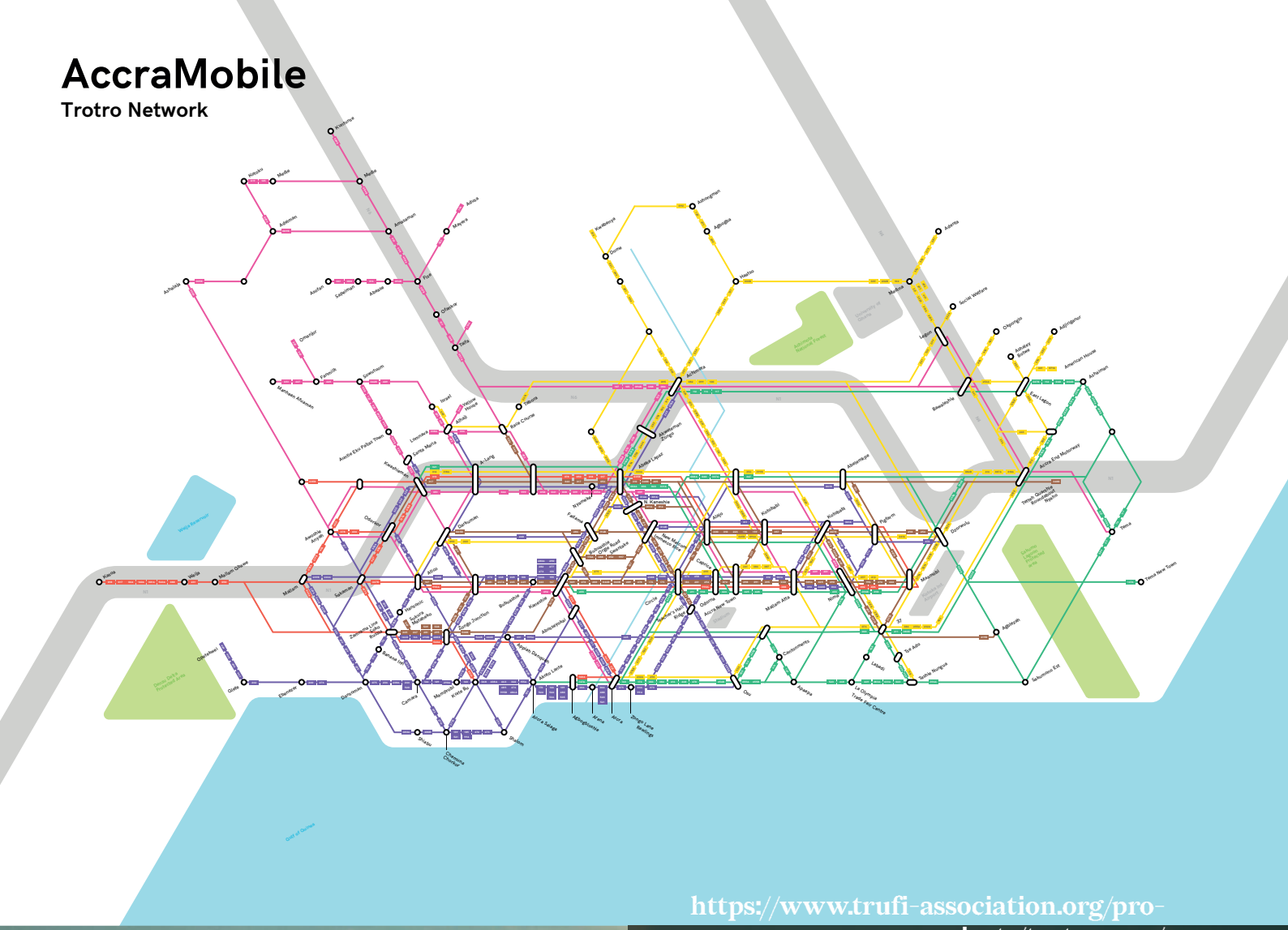
The impacts of DT4A have been seen in several African cities. In these cities, the project has made transport networks that were not visible before visible. It has also made it easier for different types of transportation to work together. The data produced has been used to develop digital planning tools, citizen navigation systems, and accessibility studies. For example, in Gauteng, South Africa, the DT4A network helped create a map of all types of transportation. This map helped create new policies about transportation (World Resources Institute Africa, n.d.). However, there are still challenges related to updating data, standardizing it, and making sure it is sustainable. These challenges are especially difficult in contexts where there are limited technical and financial resources.

DigitalTransport4Africa is an example of how people and organizations can work together to create new technologies and solutions, this collaboration aims to improve how people move around in cities in developing countries. By getting communities, universities, and local governments involved in data production, the project shows that transparency and open data are important tools for creating more equitable, safe, and efficient mobility (DigitalTransport4Africa, n.d.-a; World Resources Institute Africa, n.d.).

Its impact is about more than technology. It changes the way people move around cities in Africa. It does this by using facts, including everyone, and by being good for the environment.

AccraMobile

Trotro Network



https://www.trufi-association.org/projects/trotro-app/

Fragmented System Experience Undermines Usability

Accra, Ghana – Collaborative mapping of tro-tro routes

In the city of Accra, the informal minibus system known as tro-tro is a central part of urban transport: it is estimated that more than 70% of daily trips are made by this mode (Leventhal Center for Advanced Urbanism, n. d.). However, one of the main barriers to its integration into urban and mobility planning has been that many of the routes, stops and operational flows were not formally recorded in official maps or databases. As a result, municipal transport agencies lacked a comprehensive view of the system, which made regulation and service improvement difficult (Transitec, 2022).

Faced with this challenge, a collaborative mapping project, called the Accra Tro-Tro Apps Challenge, was launched in conjunction with initiatives such as Accra Mobile and the Ghana Urban Mobility and Accessibility Project (GUMAP), which used smartphones, in-vehicle surveys and collaborative platforms (such as OpenStreetMap) to record tro-tro routes, stops, frequencies and travel times (Up FI-MED, 2018). For example, in mapping conducted in 2021-2022, 110 routes within the Accra Metropolitan Area were surveyed, obtaining key data on route length, headways (vehicle intervals) and stop locations (Transitec, 2022). This work made visible an informal system that previously operated "off the radar" of urban planners (Dumedah & Eshun, 2020).

The benefits of this collaborative mapping are manifold. First, it provides a spatial database that helps local authorities to better regulate the system, identify areas of high demand or frequency, and plan improvements to stops and interconnections (Transitec, 2022). Secondly, it opens up opportunities for the development of transport applications, route planning and urban accessibility analysis, improving the end-user experience. Moreover, from a technical perspective, the fact that tro-tro and its stops cover a large part of the road network suggests that the data generated can also serve for addressing or geocoding systems where formal records are weak (Dumedah, 2017).

However, there are also challenges: ensuring constant updating of the data (given that routes and operational patterns change frequently), integrating this information into formal regulation without losing the flexibility inherent in the informal system, and ensuring that stakeholders (drivers, cooperatives, citizens) take ownership of the data so that the collaborative effort is sustainable (Up FI-MED, 2018).

In this sense, the collaborative methodology was key: by involving the community, using smartphones and open maps, it reduced the cost and increased the agility of the process. In summary, the Accra case demonstrates how collaborative mapping can give visibility to informal transport, creating a platform for operational improvement, urban planning and inclusion in formal mobility systems (Abbeyquaye, 2021).

Physical and Infrastructure Barriers

Amsterdam, Netherlands – Supercycleways and integrated mobility hubs

In Amsterdam, cycling has been a mainstay of urban mobility for decades. The city has an extensive bicycle lane infrastructure and the national and municipal governments have promoted so-called cycle superhighways – wide, high-quality routes connecting residential and employment areas (Lagendijk & Ploegmakers, 2022). These routes enable long and safe journeys, reducing conflicts between bicycles and motorised vehicles. Dutch national policy actively supports this infrastructure through long-term plans that prioritise cycling over the car in the urban mobility hierarchy (Organisation for Economic Co-operation and Development [OECD], n.d.). In addition, the municipality of Amsterdam promotes low-speed zones and shared streets that promote road safety and mode coexistence (Municipality of Amsterdam, 2022).

In parallel, the city has developed a comprehensive strategy of mobility hubs, which bring together different modes of transport such as bicycles, e-bikes, electric scooters, car sharing and public transport (Debbie Dekkers et al., 2022). These spaces, also called BuurtHubs, eHUBS or SmartHubs, aim to facilitate the transition between modes and reduce dependency on private vehicles (City of Amsterdam, 2022). The eHUBS Amsterdam project, promoted in collaboration with other European cities, installed modular stations offering electric and shared micro-mobility, integrated into the public transport network (OpenResearch Amsterdam, 2022). Its central objective is to offer a flexible and environmentally friendly alternative to improve urban accessibility, especially in residential neighbourhoods and peripheral areas.

The combined effect of superhighways and mobility hubs has been significant. Recent studies show that mobility hubs can induce modal shift towards light electric vehicles or bicycle sharing, reducing private car use in dense urban areas (Liao et al., 2023). Moreover, the optimal location of these hubs directly influences the perceived utility of users: according to Xanthopoulos et al. (2024), distributing more hubs of smaller capacity throughout the city generates greater benefits in travel time and accessibility than concentrating a few large ones. Similarly, the supercycle network complements this strategy by enabling sustainable inter-municipal travel, connecting Amsterdam to nearby cities within the Randstad, which extends the functional radius of active transport (Lagendijk & Ploegmakers, 2022).

However, the implementation of these policies also faces challenges. The expansion of superhighways and mobility hubs requires coordination between institutions, continued funding and a redesign of public space (OECD, n.d.). Recent criticisms point out that the increase in mixed-use streets and road works underway may be temporarily affecting accessibility for less experienced or slower cyclists (NL Times, 2024). Furthermore, achieving a real reduction in car use requires accompanying infrastructure with vehicle restriction policies and incentives for active mobility (City of Amsterdam – Bike City, 2022). Overall, Amsterdam's experience demonstrates how the integration of high-quality cycling infrastructure and shared mobility hubs can sustainably transform urban mobility.

Physical and Infrastructure Barriers

Curitiba, Brazil - Accessible and connected BRT stations

In Curitiba, the Bus Rapid Transit (BRT) system known as Rede Integrada de Transporte (RIT) has established itself as one of the most influential models of sustainable urban mobility worldwide. Implemented in the 1970s under the direction of urban planner Jaime Lerner, the system introduced a network of corridors exclusively for articulated buses, with a comprehensive design combining infrastructure, urban planning and accessibility (Exploring the BRT Systems of Curitiba, 2023). The iconic "tube stations" - cylindrical glass structures with controlled access and pre-boarding payment - were an innovative element that reduced stopping times, improved safety, and provided more equitable access to users (Medeiros et al., 2023).

One of the main features of the system is that it's easy to use. From the beginning, the design of the stations was planned to allow easy access between the platform and the vehicle, so there's no need for stairs or steps. This makes it easier for people who have difficulty walking or use wheelchairs (Gil, 2022). Right now, most stations have ramps or elevators, and most buses can be used by people with disabilities (Institute for Transportation and Development Policy [ITDP], 2022). This infrastructure helps all people, including people with disabilities, older adults, and families with strollers. It makes the system better for everyone.

Curitiba has focused on more than just making it easy to get around. They've also made sure the bus system is useful and connected to other parts of the city. The network combines high-capacity trunk routes with feeder services that reach outlying areas, allowing people to switch between different types of transportation without having to pay extra (Medeiros et al., 2023). Transfer stations and terminals are like hubs where trains can switch lines or modes within the same fare network. This structure has allowed more than 80% of daily public transport trips to use at least one section of the integrated system (Exploring the BRT Systems of Curitiba, 2023).

The design of the stations and how they fit into the city's planning also played a key role. Curitiba developed a Transit Oriented Development (TOD) model along the BRT corridors. This model encouraged people to build more densely and use the spaces around the stations for different purposes (ICLEI, 2023). Stations are important for more than just getting on and off a train. They also help cities grow in a way that is good for the environment.

However, the system is facing challenges. It needs to be updated with new technology. It also has problems during busy times (The Rio Times, 2023). Even so, the Curitiba case is still an important example of how making public transportation easier to use can improve city life.

BRT- Curitiba Brazil
https://www.ebrdgreencities.com

Physical and Infrastructure Barriers

Paris, France – "100% Cyclable" Plan

In October 2021, the city of Paris presented the Plan Vélo 2021-2026, the central objective of which is to make the capital a "100% cyclable" city, i.e. fully accessible and safe for cycling. This plan, promoted by Mayor Anne Hidalgo, has a budget of more than 250 million euros, which is a significant increase compared to the previous plan (Ville de Paris, 2021). The strategy aims to transform urban mobility by prioritising cycling as a means of daily transport and reducing car dependency, in line with the city's climate commitments (Ville de Paris, 2021). The goal is to develop a continuous network of cycle paths and ensure connections between neighbourhoods and the metropolitan region (Ville de Paris, n.d.-a).

In terms of infrastructure, the plan foresees the construction of an additional 180 kilometres of safe cycle paths, integrating both new routes and the consolidation of the so-called 'coronapistes' - temporary lanes created during the pandemic that will become permanent (Observatoire du Plan Vélo de Paris, n.d.). The cycling network is organised hierarchically on three levels: a "réseau principal" or high-capacity structuring network, a "réseau secondaire" that connects neighbourhoods, and a "réseau de desserte locale" that aims to make all streets in the capital cyclable (Ville de Paris, 2021). This model takes up the logic of universal accessibility and safety that has inspired Paris' sustainable mobility policy since 2015 (Rouiller, 2021).

The plan also covers complementary aspects such as road safety, parking and cycling education. It foresees the installation of more than 100 000 new bicycle parking spaces, the creation of 'Dutch-style' intersections and improved signage to reduce conflicts with pedestrians and motorised vehicles (Ville de Paris, n.d.-b). It also promotes the teaching of cycling in schools and the expansion of bicycle repair workshops in each district, in order to consolidate a true urban 'cycling culture' (Ville de Paris, n.d.-b). The plan also includes incentives for the use of cargo bikes and the development of cyclologistique, integrating sustainable freight transport (Rouiller, 2021).

However, despite the progress made, cycling associations have pointed to persistent gaps in the cycling network, especially on the periphery and on inter-municipal axes (Paris en Selle, 2025). Although cycling has increased significantly - already accounting for more than 15 % of daily urban trips - the uneven implementation of the plan shows the need to reinforce metropolitan coordination and the continuity of structuring axes (Ville de Paris, 2021; Observatoire du Plan Vélo de Paris, n. d.).

Overall, the '100% cyclable' plan not only promotes active mobility, but also redefines Parisian urban planning towards a healthier, more equitable and climate-resilient model (Ville de Paris, n.d.-a).

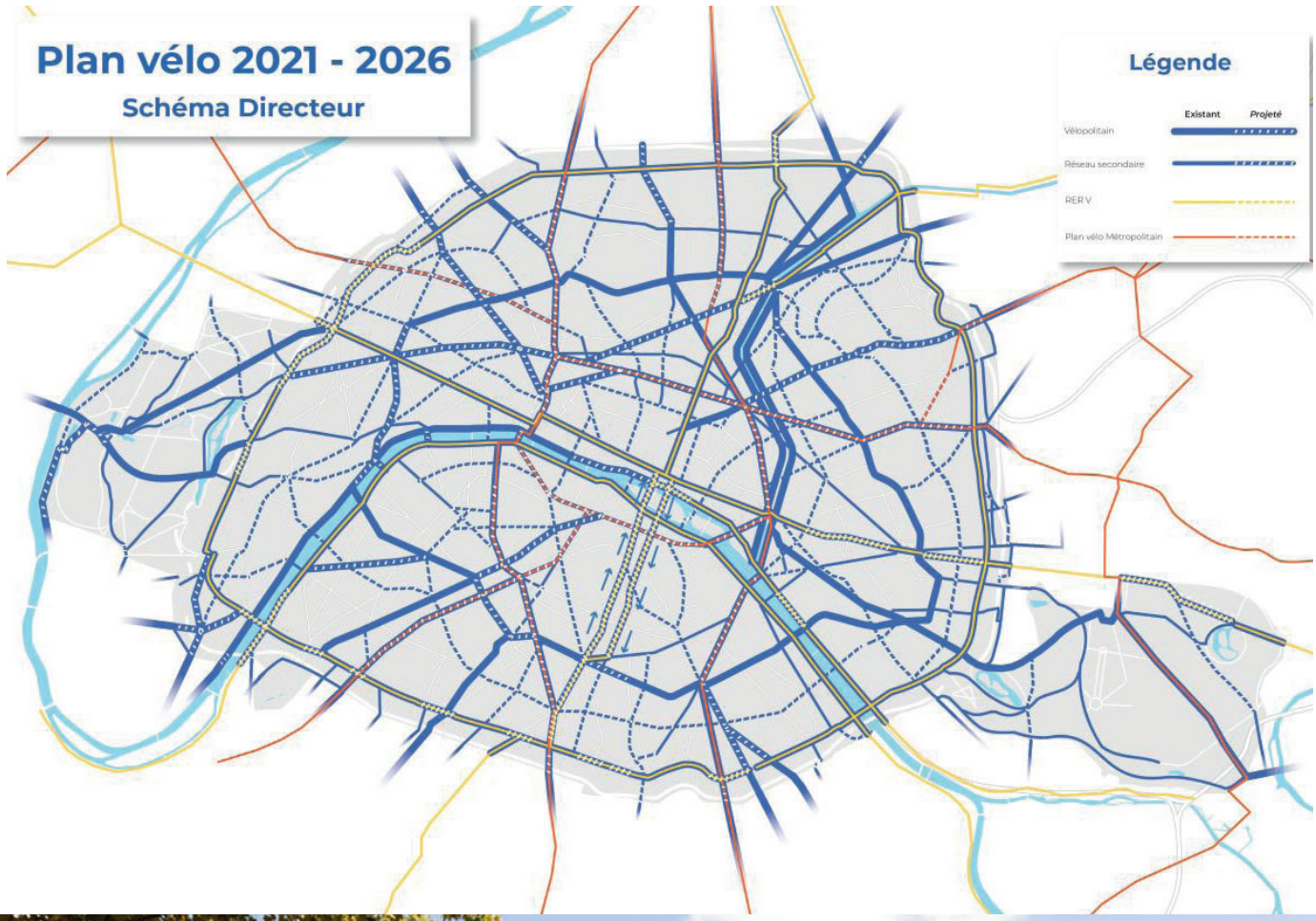


Photo by: Jean-Baptiste Gurliat / Mairie de Paris

Physical and Infrastructure Barriers

Montpellier, France – Tramway with inclusive design

The tramway system in Montpellier, France, is considered a European model of inclusive mobility, both for its universal accessibility and its aesthetic and urban design. Since its inauguration in 2000, the Montpellier Méditerranée Métropole Tramway has been designed to ensure full accessibility for all people, regardless of their physical or sensory condition. The network, operated by the public company TaM (Transports de l'Agglomération de Montpellier), is officially defined as "a 100% accessible means of transport both in terms of rolling stock and station facilities" (Montpellier Méditerranée Métropole, 2024). This means that each station and each vehicle is designed according to universal accessibility principles, integrating both technical solutions and urban design criteria consistent with inclusion (Montpellier Méditerranée Métropole, 2024).

One of the most distinctive elements of the system is the design of its stations and platforms. These include tactile surfaces for people with visual impairments, gently sloping access ramps, validators at different heights, and reinforced visual contrast in the pavement to facilitate orientation (Montpellier Méditerranée Métropole, 2024). Also, low-floor trams allow people to board easily and safely. This is good for people in wheelchairs or with other mobility issues because there are no physical barriers between the platform and the vehicle (Montpellier Méditerranée Métropole, 2024). These measures align with France's rules on accessibility and the city's dedication to the Sustainable Development Goals for inclusive and sustainable transport (Ville de Montpellier, 2023).

The Montpellier tramway is special for more than just how it works. It also stands out because of its look and culture. Each line was created by well-known artists and designers. This makes it easy for all users to understand. Lines 1 and 2 were created by Garouste & Bonetti, while lines 3 and 4 were designed by Christian Lacroix, who incorporated motifs inspired by the Mediterranean and local heritage (Montpellier Tourisme, 2023). This visual identity is valuable for its art and also helps people understand and communicate. The colors, patterns, and designs help passengers, especially the elderly or those with orientation difficulties, easily identify their line of travel (Montpellier Tourisme, 2023).

The city is currently building tramway Line 5, which is expected to open in 2025. This new line will make the system available in places like homes, universities, and research areas. It will follow the same rules for accessibility and visual harmony. The design of the new units is by the Cameroonian artist Barthélémy Toguo, who was chosen for the theme Sciences & Botanique. This theme symbolizes the connection between mobility, biodiversity, and urban life (Tram5 Montpellier3M, 2024).

This helps Montpellier combine social inclusion, sustainability, and urban culture, which makes it look like a city that is always coming up with new ideas about transportation and making things easy for people to use (Montpellier Méditerranée Métropole, 2024).

Photos retrieved from:
https://www.sustainable-bus.com

Physical and Infrastructure Barriers

Nottingham, UK – Workplace Parking Levy

The Nottingham WPL system represents a unique effort in the UK to tackle traffic congestion, promote sustainable modes of transport, and fund improvements to urban mobility infrastructure. In April 2012, Nottingham became the first British city to implement a levy on employer-provided parking spaces, with the revenue earmarked to fund improvements to public transport (Dale, Frost, Ison, Quddus & Warren, 2017). This initiative responds to congestion estimated at around £160 million per year prior to its introduction, with 70% of rush hour traffic attributed to commuting (Santos, Hagan & Lenehan, 2020).

From a transport demand management perspective, the WPL acts both as an economic measure by assigning a real cost to parking provided free of charge by employers and as a financing mechanism for infrastructure: the charge generated revenue that was used to extend the tram network, renovate the railway station, and improve the bus system (Dale, Frost, Ison, Nettleship & Warren, 2017). This positions the Nottingham model not only as a tax, but as part of an integrated urban mobility package that seeks social, economic, and environmental benefits (Dale, Frost & Ison, 2023).

A study in Nottingham found that from 2010 to 2016, about 8.6% of workers who had previously driven switched to more sustainable modes of transportation. This was partly due to the WPL or improvements made, but the authors of the study say that it's not clear if this is the only reason. Around 50% of those who switched said that the WPL itself was the reason (Dale, Frost, Ison, Budd, 2019). Other research shows that the introduction of the WPL had a big impact on congestion once economic, transportation, and climate variables were controlled for (Dale et al., 2017).

The model is new and different when it comes to financing cities. WPL lets employers pay for their part of the transportation system without raising prices for consumers. At the same time, it increases funding for making transportation better. A 2014 analysis shows that the WPL in Nottingham is an effective way to pay for major local transportation improvements (Dale, Frost, Ison & Warren, 2014).

The model also faces challenges, these might include political and employer acceptance, the potential transfer of costs to workers, and the need for revenues to be spent on visible improvements to mobility to maintain legitimacy. A study of WPL policies in the UK shows that, although Nottingham is the only case so far, putting them in place in other places faces problems with governance, communication, and design (Burchell, Ison, Enoch & Budd, 2019).

Photos retrieved from:
https://groups.friendsoftheearth.uk

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Retrieved from: https://sites.utexas.edu

Retrieved from:
https://www.limacomovamos.org

Physical and Infrastructure Barriers

Lima, Peru - Community Interventions at Public Transport Stops

In the peripheries of Lima, where the lack of formal infrastructure is critical and the precarious conditions of bus stops affect thousands of users every day, various community interventions have emerged led by the collective "Ocupa tu Calle" (Occupy Your Street), a citizen initiative promoted by the Lima Cómo Vamos observatory and the organization CITIO: Transdisciplinary City. These actions were born in response to the absence of decent waiting areas for public transport; without benches, shade, or basic signage, and are based on tactical urbanism and co-creation with local communities (Ocupa tu Calle, 2021).

Together, university students, neighbors, and volunteer architects have designed and built street furniture, bus stops, and small public spaces using recycled materials and low-cost modular structures. Two great examples are the Paradero Pizarro in the historic district of Rímac and the Los Jardines Station in San Juan de Lurigancho. At the Paradero Pizarro site, volunteers reused materials like stretchers and donated wood to build a big roof, covered benches, and places to rest. Together with architecture students and local residents, private companies transformed an empty lot into a public space with furniture and green areas. In the Los Jardines Station, architecture students, residents, and private companies worked together to turn an abandoned lot into a public space with furniture and green areas.

Community organization was key to the success of these efforts. Participatory diagnostic workshops were held to identify critical issues, manage materials, and plan volunteer work days. These actions made it more comfortable and safer for people by reducing their exposure to sun and rain. They also made people feel more connected to the space and encouraged more people to use it. In many cases, this has led to discussions with local governments about making these projects official and taking care of them over the long term (Ocupa tu Calle, 2022; IDB, 2020).

From an academic point of view, these types of initiatives show how people can work together to deal with problems in cities. They can also help make sure that everyone has the same opportunities to move around the city. In addition, they are in line with the ideas of the right to the city (Lefebvre, 1968; Harvey, 2012) and with the Sustainable Development Goals, especially SDG 11, which promotes safer, stronger, and more sustainable cities (UN-Habitat, 2020).

Actions taken by communities in Lima show that the design of the area around public transportation can be a driving force for social, environmental, and symbolic change, even when there are limited resources.


GATWEKERA FOOTBRIDGE CONSTRUCTION
A JOINT FLOOD RISK INTERVENTION BY:
GATWEKERA COMMUNITY
NAIROBI CITY COUNTY
ROADS, PUBLIC WORKS AND TRANSPORT SECTOR
KDI KOUNKUEY DESIGN INITIATIVE
KIBERA PUBLIC SPACE PROJECT
GATWEKERA

Physical and Infrastructure Barriers

Kibera/Nairobi, Kenya – Community Footpaths and Pedestrian Bridges

In Kibera, the lack of formal pedestrian infrastructure has been extreme: footpaths are often simple dirt trails, with slopes, periodic flooding, and no amenities, making access to transportation, employment, and basic services difficult (Designathon, 2020). Given the lack of safe walking routes, community interventions have been promoted to improve connectivity, particularly through the construction of pedestrian bridges over the Ngong River and the formalization of walking trails within the settlement. For example, the Kounkuey Design Initiative (KDI), in collaboration with neighborhood groups, designed and built two bridges; at sites KPSP05 and KPSP07, that allow safer access between Kibera and the city of Nairobi, replacing precarious and dangerous structures and transforming the environment (KDI/Kounkuey Design Initiative, 2016–19). These bridges not only improve mobility but also symbolize a legitimization of the informal settlement within the city (KDI, 2016–19).

There are two ways to look at the changes made to the paths and bridges used by people walking. We can think about how useful these changes are and how much the community has been empowered. In terms of practicality, improving paths and walkways reduces the risk of flooding, accidents, or feeling unsafe. It also makes it easier to get to jobs and public transportation. For example, an analysis of the Ngong River channel found important paths for people to walk that could be made official as "greenways" to connect Kibera with the city (ISOCARP, 2010). The community was involved in the process. They held workshops, worked together with residents to design the project, and used local labor to build it. After it was built, the community took care of it. The World Economic Forum says that Kibera's public spaces, which include trails, bridges, and community management, have helped more than 125,000 people. More than 350 residents have worked on construction and maintenance (WEF, 2021).

But the situation in Kibera also shows problems. The formalization of infrastructure in informal settlements (areas where people live that are not officially recognized) clashes with land ownership problems, lack of long-term maintenance, and the need to align community initiatives with broader municipal and transportation policies (ISOCARP, 2010).

Research on pedestrian infrastructure in Nairobi has shown that, in informal situations, pedestrian bridges are not used as much if they involve longer trips or steep stairs that people prefer to avoid (Maigo, 2018). So, building paths and bridges in Kibera isn't just about technical infrastructure. It's also about creating an urban design that fits the context, getting the community involved in the decision-making process, and making sure the community can sustain itself.

Physical and Infrastructure Barriers

Dharavi/Mumbai, India – Solar Lighting and Ramps by Neighbourhood Networks

In Dharavi, one of the world's densest informal settlements located in the heart of Mumbai, the lack of adequate pedestrian infrastructure—continuous sidewalks, access ramps, safe lighting—has long been an obstacle to mobility, safety, and quality of life for its residents. In response to this shortfall, initiatives led by community networks—such as the National Slum Dwellers Federation (NSDF) and Mahila Milan—have emerged, promoting the installation of solar lighting systems in streets and the construction of pedestrian accessibility ramps through local participation (SDI India, 2017).

One of the notable initiatives in Dharavi Koli Wada was a pilot lighting project, where community members, with support from the re:arc Institute and university students, identified critical pedestrian streets and equipped them with solar lights adapted to the environment—for example, by reusing ship lights and adapting locally manufactured supports— which increased the feeling of safety at night, encouraged people to continue spending time outdoors, and enhanced community ownership of public space (Kochery et al., 2025). The plan also included the construction of ramps and improved access to connect homes, workshops, and street spaces with main pedestrian routes, facilitating mobility for people with reduced mobility and those carrying loads for informal work.

These community interventions offer multiple benefits: on the one hand, they reduce darkness and the risks associated with unsafe pedestrian traffic, which can be linked to accidents or nighttime violence; on the other hand, by improving the physical environment of streets and accesses, they reinforce the sense of belonging, the ability of residents to take charge of their environment, and the possibility of negotiating with municipal authorities to formalize the improvements (SDI India, 2017). From a social urbanism perspective, these types of actions reflect that in contexts of urban informality, mobility infrastructure is not only about roads and transportation, but also about "weaving the public" through citizen participation, context-adapted design, and energy sustainability.

However, these projects also face challenges: the scalability of interventions given the size of the settlement, the security of tenure of the spaces involved, the long-term maintenance of solar systems and ramps built, and the institutional integration of neighborhood solutions into formal city and transportation plans (ACASH, 2023). In this sense, Dharavi shows that improving pedestrian accessibility and lighting in informal areas depends as much on affordable technology (e.g., solar panels, modular ramps) as it does on community organization, institutional negotiation, and the recognition of urban citizenship.

Physical and Infrastructure Barriers

Barcelona, Spain – Self-built Bus Shelters and Citizen Signage

In Barcelona (Spain), delays in installing or replacing official bus shelters prompted an exemplary response from residents in the Vallcarca neighborhood, where a group of neighbors decided to design and build their own shelter for bus line 87, located on Farigola Street. The action, coordinated by the Som Barri neighborhood association and supported by residents with technical knowledge, was based on the reuse of recycled materials; mainly wood and metal elements, to erect a simple but functional structure that provided shade, protection from the rain, benches, and everyday details such as plants and newspapers for waiting (El País, 2017; Som Barri, 2018).

The shelter was on land that was owned by a neighbor, so the local police couldn't destroy it right away. This made the shelter well-known and in the news. This action solved two problems at once. It fixed the lack of a good bus stop and showed that the community can solve problems even when city officials don't. Research on tactical urbanism and neighborhood self-management practices shows that these actions are examples of "citizen infrastructure." This means they are community actions that make the right to the city real by directly creating urban space (Iveson, 2013; Sendra & Sennett, 2020).

This initiative had two impacts. First, it made the experience of waiting for public transportation better by offering users of the line more comfortable and safer conditions. Second, it put pressure on the local government to discuss how to make sure that all neighborhoods have access to city services, and to make sure that neighborhoods on the outskirts are given the same attention as the center (Ajuntament de Barcelona, 2019).

This unexpected action was covered by the local media and discussed in academic groups that study how citizens take part in city government (El Diario, 2018; Martí-Costa & Parés, 2015).

The Vallcarca case shows how important it is for neighborhoods to manage themselves in European urban policies. This is especially important when bureaucrats can't respond quickly to people's needs. Sendra and Sennett (2020) explain that these practices change the role of the citizen from someone who simply uses public spaces to someone who helps create them. This strengthens the community and encourages everyone to take responsibility for public spaces.

Operational Unreliability Disrupts Continuity

Madrid, Spain – 100% clean EMT fleet with digital monitoring. UITP (EMT Madrid)

The Madrid Municipal Transport Company (EMT) has established itself as a European benchmark in the transition towards clean, efficient, and digitally managed urban mobility. In 2022, EMT announced that its bus fleet would be 100% clean, i.e., composed exclusively of electric, hybrid, or compressed natural gas (CNG) vehicles, completely eliminating the use of diesel in its regular operations (EMT Madrid, 2022). This process is part of the Madrid 360 Strategic Environmental Sustainability Plan, promoted by the Madrid City Council, and positions the capital as one of the first major European cities to achieve this goal (UITP, 2023).

The technological change also led to a complete digital transformation of the transportation system. EMT set up a smart monitoring system that shows real-time data on energy use, predictive maintenance, how efficiently the routes are, and passenger comfort. The Smart Bus Madrid platform lets vehicles send information to the control center. This helps improve operations and reduce emissions. It also helps manage demand and plan services more accurately (EMT Madrid, 2023; UITP, 2022).

This approach combines environmental sustainability with technological innovation. It follows the guidelines of the International Association of Public Transport (UITP) on the digitization of urban transport (UITP, 2022). The fleet has over 2,100 buses, including electric and compressed natural gas models, as well as a small group of green hydrogen buses.

This fleet is located at the new Entrevías operations center (EMT Madrid, 2023). The charging stations, fast-charging systems, and control software together make up one of the most advanced mobility ecosystems in southern Europe (Madrid City Council, 2022).

The modernization of the fleet has had a notable impact on reducing noise, vibrations, and air pollution. This has improved the urban environment and the travel experience. Also, more people trust the system because of digital tools like the EMT Madrid app and real-time panels at bus stops (EMT Madrid, 2022).

The case of Madrid shows how cities can successfully switch to clean urban mobility. This means using energy in a way that doesn't harm the environment, being efficient, and using new technology. This is in line with the Sustainable Development Goals (UN-Habitat, 2020).


119 BARRIO GOYA
198

Operational Unreliability Disrupts Continuity

Vancouver, Canada – "Ride & Shine" campaign to recover users.

In Vancouver, Canada, the public company TransLink implemented the "Ride & Shine" campaign in 2023, a comprehensive communication and citizen participation strategy aimed at restoring confidence and use of public transport after the sharp drop in demand caused by the COVID-19 pandemic (TransLink, 2023a). This initiative is part of the Ridership Recovery Strategy, which combines marketing measures, improvements to the travel experience, and incentive programs to revive sustainable mobility in the Vancouver metropolitan area.

The Ride & Shine campaign used positive emotions to promote public transportation. It promoted public transportation as a place where people can connect with each other, feel optimistic, and improve their well-being. TransLink tried to make traveling by bus, train, or subway an exciting and comfortable experience by using messages like "Let's get moving again" and "Ride & Shine with us."

These actions included events at stations, live concerts, public art, colorful signs, and partnerships with local artists. They also included digital campaigns targeting young people and hybrid workers (TransLink, 2023b).

At the same time, TransLink used data to figure out how to improve things and change the services they offer. According to reports from different organizations, by the end of 2023, the system had recovered about 82% of the demand it had before the pandemic. There was especially strong growth in non-work and recreational travel (TransLink, 2023a; UITP, 2024). The campaign also highlighted how using public transportation is good for the environment and improves city life.

The Vancouver case is a good example of how strategic communication and redesigned user experiences can help revitalize public transportation. Instead of focusing on efficiency or infrastructure, "Ride & Shine" emphasized the social and emotional aspects of travel. It followed the recommendations of the International Association of Public Transport (UITP) on how to recover from the pandemic (UITP, 2024).

This approach helped to restore a sense of community, trust, and belonging around public transportation. It made Vancouver a laboratory for communicative innovation and urban resilience (TransLink, 2023b; UITP, 2024).


Bicycle
Valet

Operational Unreliability Disrupts Continuity

Mumbai, India – Digitisation of BEST fleet.

The Brihanmumbai Electric Supply and Transport Undertaking (BEST) is one of India's oldest urban transportation systems, and an essential part of getting around Mumbai. In recent years, BEST has started a big project to make its fleet electric and digitize its operations. This will reduce emissions and improve service efficiency. According to the Press Trust of India (2024), the company plans to have only electric vehicles by 2027. This is in line with the national strategy "FAME India II," which is a plan to encourage the adoption of hybrid and electric vehicles. This strategy is promoted by the central government. This program tries to reduce the environmental impact of city transportation and make Mumbai an example of sustainable transportation in South Asia.

At the start of 2024, about 17% of the BEST bus fleet was electric, with over 500 vehicles being used every day (Times of India, 2024a). The switch to electric vehicles (EVs) has been made possible by partnerships between the government and private companies, especially with Tata Motors and Switch Mobility. These companies are responsible for supplying electric buses and charging infrastructure. At the same time, new charging stations with a total capacity of 100 MW are planned for 2026.

These charging stations will be located in the city's main depots and terminals. This infrastructure provides the physical support for a complete energy transformation. If completed, it could prevent the emission of more than 400,000 tons of CO▌ per year.

Digital technology is also a key part of the plan to update the system. BEST has added real-time monitoring systems, telematic sensors, and digital platforms for predictive maintenance management. It has also added mobile applications integrated with the "Chalo App" payment system. These applications allow users to plan routes, purchase tickets, and track bus locations in real time (Chalo Mobility, 2024). These new features make it easier for users and improve how well the system works by reducing wait times and making the most of the available vehicles. The introduction of digital tickets and the collection of travel data also create the possibility of planning that is based on evidence, in line with smart mobility and digital urban governance policies (Bhasin & Sahu, 2023).

However, BEST is trying to switch to a digital and clean transportation model, and they face many challenges. This includes making more charging stations, making sure there's enough electricity, and teaching technical staff new digital skills. The city must also find a balance between the cost of electrification and making fares affordable for people with low incomes. This is a key issue in Mumbai's socioeconomic context (Kumar et al., 2022).

Despite this, the process led by BEST is becoming an international example of combining technology, sustainability, and public service. It shows how a long-standing operator can change to meet the current needs for sustainable city transportation.

Operational Unreliability Disrupts Continuity

Boston, USA - Real-time map of road conditions powered by City Hall.

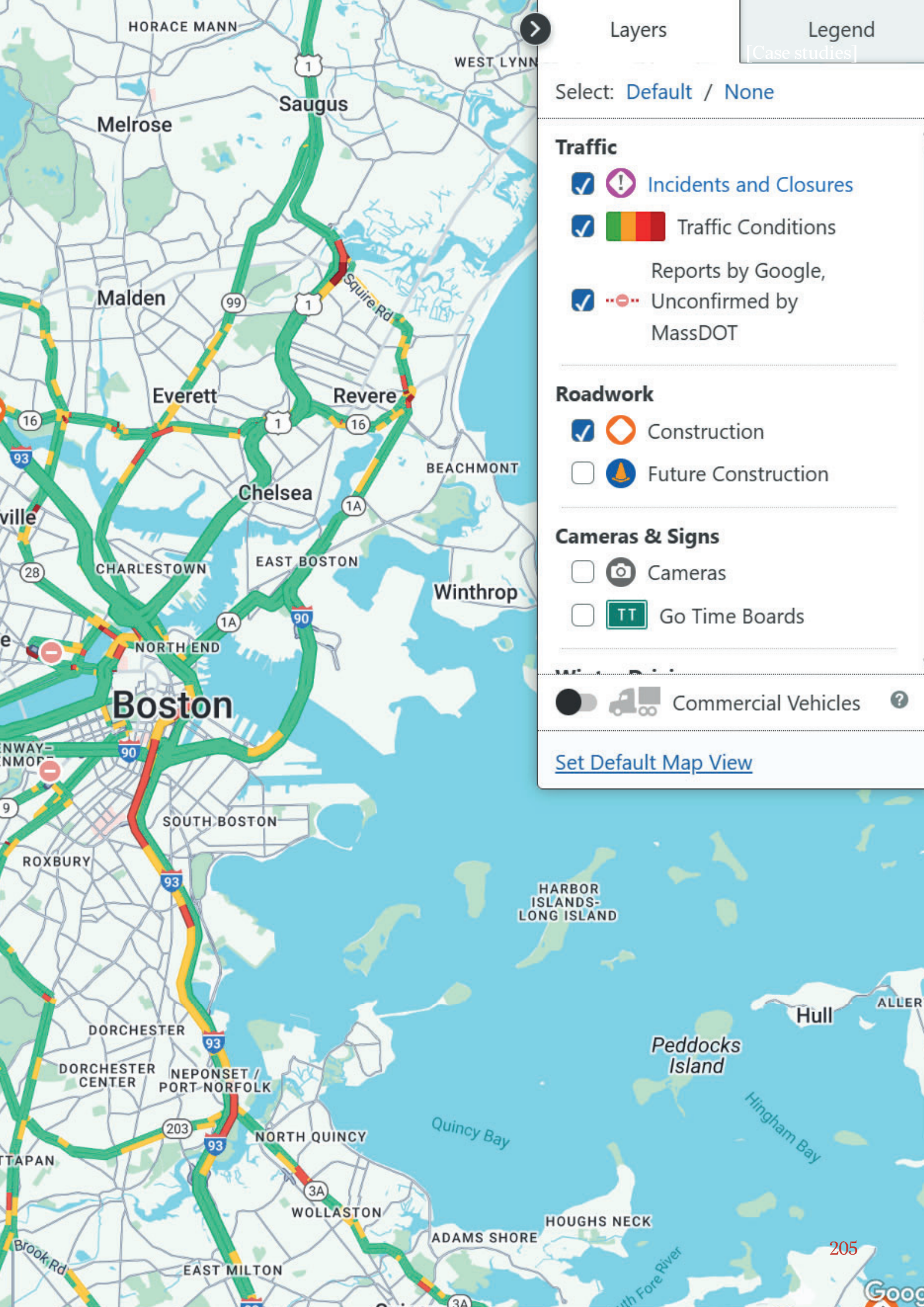
In the city of Boston, the City Council and the Massachusetts Department of Transportation (MassDOT) have created online tools that let people check traffic conditions in real time. The Massachusetts State Government's official Traffic and Travel Information portal lets users check interactive maps for road conditions, closures due to construction, weather conditions, and estimated travel times (Massachusetts Executive Office of Transportation, n.d.). This tool is part of the city's smart mobility strategy, which aims to improve urban travel and manage roads better by using open data and geospatial technologies.

The Mass511 platform is a digital service that collects information from traffic cameras and sensors installed on highways. It also receives live reports from transportation agencies (Mass511, n.d.). On this website, people can see how busy the roads are, check on bridges and tunnels, and get alerts about traffic or road closures. The platform also works with navigation systems and mobile apps, helping users make better decisions and reducing travel times and traffic (Mass511, n.d.).

From an urban planning perspective, the real-time monitoring system is an important step toward creating a public digital infrastructure. The City Council and state agencies can use the combined data from these services to understand how people move around, find traffic jams, and create traffic policies that are based on facts (Massachusetts Executive Office of Transportation, n.d.).

This combination of public data and operational management improves emergency response and coordination between different administrative levels. It also makes Boston an example of digital urban governance.

But the experience also shows problems with equity and accessibility. Even though real-time information is available, its use depends on access to digital devices and stable internet connection, which could leave certain users out. Also, the use of road data with public transportation and active mobility (like walking or biking) is still being developed. But the situation in Boston shows how open data and digital infrastructure can be used as tools to improve city life, increase government transparency, and encourage a more participatory relationship between citizens and local institutions.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Operational Unreliability Disrupts Continuity

Lisbon, Portugal – Multimodal robustness assessment led by local government.

In Lisbon, the metropolitan government, together with research centers, developed an initiative to assess the robustness of the city's multimodal transport system, i.e., how the combination of modes (bus, tram, metro, rail, river) can withstand failures, disruptions, or incidents and continue to operate efficiently.

This study was conducted by the National Laboratory for Civil Engineering (LNEC), the University of Lisbon, and the municipality, within a framework called ILU (Integrative Learning from Urban Data) (Aparício, Arsénio & Henriques, 2022). The analysis started with the construction of a "multiple network" integrating eight modes of transport with their stations and intermodal connections, and simulated the removal of nodes or links to measure how many network resources must fail for the system to collapse in terms of connectivity (Aparício et al., 2022).

The study showed that Lisbon's transportation system is relatively strong. To disconnect all stations, about half of the nodes in the network would need to be removed (Aparício et al., 2022). However, it also identified specific weak points. For example, failures at important train stations or where train lines meet other lines have a much bigger impact than the loss of smaller routes or links that are not connected to other lines. This gives local governments a clear plan for how to manage things like transportation hubs. They should focus on making sure there is enough of everything and taking care of these hubs, not just on one type of transportation at a time.

From a public policy perspective, this robustness assessment is an urban governance tool. It allows the Lisbon City Council and mobility agencies to identify where to invest to improve integration between different types of transportation. It also ensures that services continue in the event of incidents and guides the transition to more sustainable and resilient mobility. In its official strategy, Lisbon says that it needs "an integrated, connected, and accessible multimodal ecosystem" (Lisbon City Council, 2024). The study's technical approach backs up this vision, giving local governments concrete ways to make improvements.

However, the process also reveals challenges. Although the system's structure has been thoroughly modeled, aspects such as its ability to adapt to changing demands, real-time adjustments, and managing data remain areas that are still being developed (Lemonde, Arsénio & Henriques, 2021).

The study is important for creating policy, but to make real changes that last, different government agencies need to work together. They also need money and political support to make weak areas stronger, improve connections between different modes of transportation, and make sure that the infrastructure can handle extreme events.

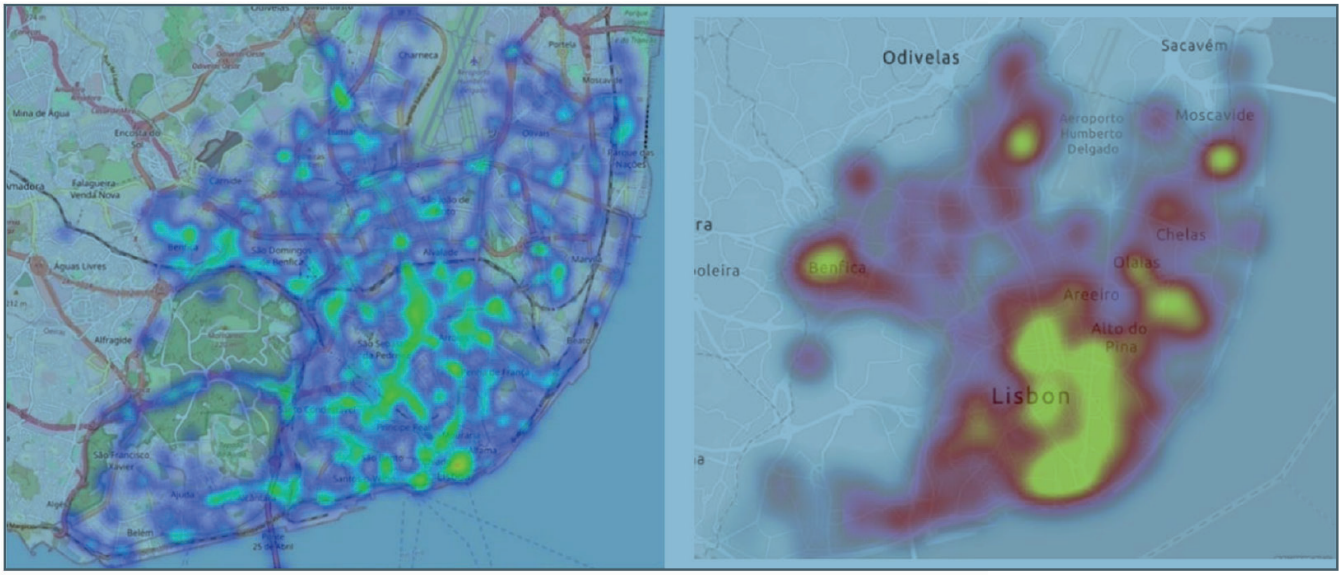

Fig. 2 Distribution of incidents in the city of Lisbon from [19]. On the right is the occurrence of incidents and on the left, their impact on pathways, i.e., the number of roads affected

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Assessing robustness in multimodal transportation systems: a case study in Lisbon

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Abstract

Introduction: Worldwide public transport systems are exposed to disruptions caused by malfunctions, accidents, maintenance, reduced fleet, and disasters, compromising mobility. Transport networks' multimodal planning and management can be explored to increase their robustness against these events. In this context, this research paper proposes and empirically compares methods to assess the robustness of a multimodal transport network, looking at aspects regarding the single-mode and multimodal network topology.

Materials and Methods: We hypothesize that the appropriate multilayered and traffic sensitive modeling of a multimodal transport network can help characterize robustness and further unravel vulnerabilities related to the integration of different transport modes. Using metric-based targeting, we evaluate how the network decreases performance when simulating failures on stations and pathways using different scenarios. The following six extraction strategies for nodes and edges were used in the simulation: Random removal; Initial Degree removal; Initial Betweenness removal; Recalculate Degree removal; Recalculate Betweenness removal; and Multimodal Hubs removal. Lisbon's public transport is used as a case study and is modeled as a multiplex network integrating eight different modes of transport. Proposing a novel normalized version of assessing the impact of failures, we were able to compare side by side the robustness of each modality layer, regardless of their size. Lastly, we simulate cascading events such as the breakdown of an entire transportation line.

Conclusions: Using different ways to induce failures in the network, we observe that to leave all nodes completely disconnected, we would need to remove about half the network nodes, highlighting the robustness of the Lisbon public transport network. Comparing different failure scenarios, methods that rely on recalculating network metrics yield a higher impact on the network robustness assessment. The impact of different events is quantified, showing that failures in stations are generally more dangerous than in pathways and offering views on the consequences of deactivating particular network modules. Overall, the results of this study allow decision-makers to gain further under-


Indomie

Operational Unreliability Disrupts Continuity

Lagos, Nigeria - Formal and informal integration to improve reliability

In the metropolis of Lagos, Nigeria, a prominent challenge to urban mobility pertains to the coexistence of formal transport systems, notably Bus Rapid Transit (BRT), and informal ones, predominantly danfos (yellow minibuses) and okadas (motorcycle taxis). This duality has given rise to a highly fragmented user experience, characterised by multiple transfers, protracted waiting times, and considerable uncertainty regarding vehicle arrival times. The study by Alcorn and Karner (2021) meticulously analyses the potential for integrating these systems to enhance operational reliability and mitigate user vulnerability to a system that has historically been characterised by irregularity and a lack of coordination.

According to the authors, Lagos' formal infrastructure, particularly the BRT system and regulated transport corridors, fails to extend across the entire metropolitan area, compelling passengers to rely on informal transport to complete their journeys. This predicament gives rise to inconsistent schedules, unofficial stops, and a conspicuous paucity of continuity in the urban travel experience. However, informal drivers and transport associations have spontaneously devised self-regulatory mechanisms, such as coordination by zone, route delimitation, and vehicle rotation to avoid saturation, which demonstrates the potential for structural collaboration with the formal system (Alcorn & Karner, 2021).

The integration process proposed in Lagos is based on a hybrid transport model, where formal and informal modes of transportation work together under shared planning schemes (Alcorn & Karner, 2021). In this approach, informal transport connects to formal transport, making it easy to travel from rural areas to the main roads. The researchers say that this cooperation has started to be used in pilot agreements between the local government and transport unions. This includes making digital records of informal routes and registering drivers. This improves predictability and safety for users.

The study also found that users like it when both systems work together. This makes it so that they save time and don't have to worry about missing their connection (Alcorn & Karner, 2021). In neighborhoods like Oshodi and Ikeja, having shared stops and using digital platforms to monitor danfo frequencies has made traveling more stable. This suggests that working together can be an effective way to deal with unreliability without losing the flexibility and adaptability that characterizes informal transport (Alcorn & Karner, 2021).

The situation in Lagos shows that people can count on public transportation in informal settings not just because more infrastructure is built or more rules are made, but also because different groups work together. Danfos play an important role in the urban mobility ecosystem. This role helps improve transportation and makes it more inclusive.


DERBYSHIRE
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Operational Unreliability Disrupts Continuity

UK, Canada – Community Transport's Dual Role as a Transport and a Social Scheme

In various rural and peri-urban communities in the United Kingdom and Canada, where formal public transportation is unreliable or non-existent, voluntary community transportation initiatives have emerged that seek to ensure the continuity of residents' daily commutes. The study by Wilson and Forrest (2023) explores how these services, managed mainly by local associations and volunteer networks, play a dual role: not only as functional means of transport, but also as mechanisms for social cohesion and community support. These initiatives tend to operate in areas where public buses run irregularly, are subject to unexpected cancellations, or have insufficient routes, particularly affecting older people, young people, and people with disabilities.

The community transport model described in the article is based on self-management and local cooperation. People living in the area organise different ways for people to share lifts, like minibuses run by volunteers, or on-demand transport services coordinated by local neighbourhood associations. In the UK, many of these networks are run by "community transport charities". These are partly supported by local governments, but they are also very flexible and can change to meet local needs (Wilson & Forrest, 2023). These projects not only deal with the problems of the official system, but also make communities stronger when services are stopped or there is no coverage.

The study shows that the social value of community transportation is about more than just getting around. For many older or isolated people, these services offer a chance to get out and about, to help each other, and to feel like they belong. Volunteer drivers are more than just drivers. They are well-known people in the community who provide emotional support and company during the trip. In Canada, for example, there are Volunteer Driver Programs that allow people with cars to offer lifts to neighbours who can't drive or can't get to public transport. This creates local networks where people trust each other (Wilson & Forrest, 2023).

Wilson and Forrest (2023) also say that these plans show how people can take on operational responsibilities when public systems are not working well, without relying too much on the state. When transport is unreliable, volunteering means you can keep going even when there is a budget crisis or problems with the infrastructure. The authors also say that these programmes help to make the community stronger and more sustainable by encouraging people to get involved and take responsibility for managing transport locally.

The article says that voluntary community transportation can be a useful extra option in public mobility policies, especially in areas where formal systems don't meet demand or guarantee regular service.

This new approach combines the social and the practical, and makes reliability mean more than just being on time. It also means making sure that people can get where they need to go and that they are looked after in the transportation system.


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(several cities) – Trufi, Community apps for planning routes in informal networks

The Trufi case exemplifies the potential of community technology to address the operational unreliability of informal public transport systems. Developed as an open-source platform combining a mobile application and server, Trufi enables communities, local organisations, and developers to create trip planners tailored to their own mobility realities (Trufi Association, 2019).

In cities with informal networks, such as minibuses, motorcycle taxis, or collectivos without fixed schedules, users frequently lack basic information about routes, times, or connection points. Trufi addresses this issue by leveraging the local knowledge of drivers and residents, digitising it, and converting it into open data that facilitates route planning, estimated travel times, and transfer facilitation for users.

Trufi is different from other business applications because it uses a shared, open-source model. This means that the community itself plans its routes and keeps them up to date. This approach has been used in cities such as Cochabamba (Bolivia), Accra (Ghana) and Medellín (Colombia), where most people travel around the city without using formal transport (Trufi Association, 2019). In these situations, volunteers collect information using GPS and interviews with drivers. They then put this information into digital platforms that everyone can use. This interactive process improves the quality of the available information and also makes citizens more involved in local travel systems.

Trufi has a big effect on making passengers feel less uncertain. The app provides updated maps and "virtual schedules" to help users plan their journeys, calculate estimated times, and plan combinations of formal and informal transport. This makes it easier to plan and safer, especially for people who can't get official information. Trufi makes informality easy to understand and use, connecting local practices with digital infrastructure.

Trufi's open governance model also encourages people to work together. This includes community groups, NGOs and local governments. It helps to include informal data in urban mobility systems. This bottom-up approach is an example of a new way of innovating in the area of mobility. It shows how citizens can create technological solutions that are both cheap and have a big impact in places where it is difficult to make things work (Trufi Association, 2019).

The Trufi case shows that people's trust in public transport doesn't just depend on big investments by the government. It also depends on the smart ideas of communities working together. Trufi changes everyday knowledge into digital infrastructure, which helps to make transport systems more connected and improve coordination between different types of transport, making it easier for people to travel around cities.

Vulnerability and Insecurity Are Built Into the Journey

London, United Kingdom – Operation Pickpocket (TfL + Metropolitan Police)

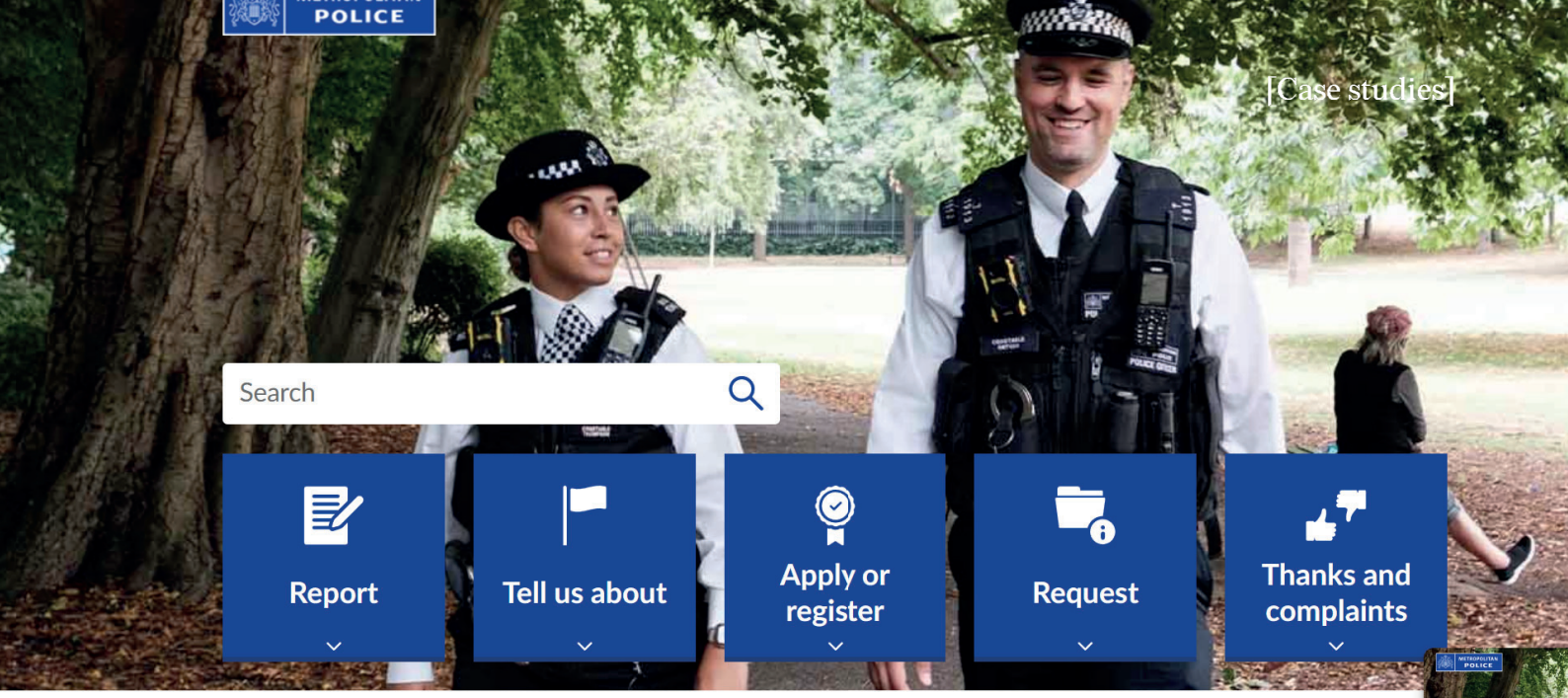
Operation Pickpocket in London is a prime example of civic-institutional collaboration to reduce passenger vulnerability on public transport, especially against petty crimes such as theft and harassment. This initiative, developed jointly by Transport for London (TfL) and the Metropolitan Police Service (MPS), seeks to address one of the most invisible dimensions of everyday insecurity in urban mobility: the constant risk of theft or assault in transit spaces (Transport for London, 2022). Unlike traditional surveillance programs, Operation Pickpocket is based on a preventive and participatory strategy, combining visible police presence, awareness campaigns, and citizen cooperation.

While the program was being used, it created public information campaigns in subway stations, buses and trams. These told users about the most common methods used by criminals and encouraged people to protect themselves. The messages "Look out for your stuff" and "Keep your eyes on your bag" are supported by digital materials and social media ads, encouraging everyone to be watchful and responsible for their own safety (TfL, 2022). This communicative dimension has been recognised as an effective tool for empowering passengers without generating fear. It also promotes preventive behaviours and informal care networks within the system.

At the same time, the Metropolitan Police has started secret operations and joint patrols with TfL staff, especially on routes and at stations where there have been more reported incidents, such as Oxford Circus, King's Cross, and Victoria Station. According to official reports, these actions have led to a continued fall in thefts on London's public transport, with mobile phone thefts dropping by 25% between 2018 and 2022 (Metropolitan Police, 2023). This shows that if police forces, operators and users work together, people will feel safer when travelling.

An important part of Operation Pickpocket is the use of data intelligence and predictive analytics. The Data Driven Policing program helps TfL and MPS to see how crime is spread across the city and at what times it happens most often. This means they can send police officers to the places and times when they are most needed. What's more, information from the public, sent via the TfL Go app and social media, is added to the system. This makes the community element of surveillance stronger (Metropolitan Police, 2023). This strategy shows how shared information and technology can help connect citizens with the government, reducing the difference between personal experiences and official actions.

Operation Pickpocket is a project that tries to tackle the problem of people not feeling safe when travelling around the city. It does this by trying to stop the problem before it happens, by teaching people about it, by sharing information, and by getting citizens to get involved. It is a government project, but it will only work if people use it and trust it. This program is helping London to make public transport safer for everyone. It shows that safety on public transport is about more than just watching what happens. It is also about the community helping each other.



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Vulnerability and Insecurity Are Built Into the Journey

Brussels, Belgium – Intelligent lighting and cameras in stations.

In Brussels, Belgium, one of the most notable ways of making people feel safer on public transport was installing smart lighting and video surveillance systems in metro stations and on buses and trams. This project, which is being run by the Société des Transports Intercommunaux de Bruxelles (STIB/MIVB) together with the Brussels Regional Security Agency, aims to deal with problems of feeling unsafe, being harassed and feeling exposed in underground stations and waiting areas, especially at night (STIB, 2022).

The smart lighting system uses motion sensors and thermal cameras to adjust the brightness of the lights based on whether someone is there. This makes it safer and more visible, and also uses less energy when there are fewer people using it. According to STIB (2022), the project has shown that adaptive lighting can stop crime and reduce harassment, while making the environment better for women, older people, and people using it at night. This approach is also included in the Brussels 2030 Sustainable Mobility Strategy, which recognises it for its contribution to making cities safer, more sustainable and more accessible (Brussels Mobility, 2023).

At the same time, modern stations like Bourse, De Brouckère, and Gare du Midi have smart cameras that can spot unusual movements or groups of people, which could mean there is a risk or an emergency. These cameras can be used not only to watch over an area, but also to respond quickly if something strange happens.

They send information to the police and STIB control centre as soon as they can. This means that the police can get to places quickly if someone is acting strangely or if someone needs medical help (Brussels Security Observatory, 2022).

An important part of the project is looking at how citizens feel. Before it was put into action, meetings were held with user associations and women's groups to find out which areas were the most dangerous and come up with solutions that would be fair to both men and women. According to a survey by Brussels Mobility (2023), 68% of female users said they felt safer in the renovated stations, with the best improvements being made to the lighting. This shows that subjective safety—the feeling of well-being and control in the space—is as important as the objective reduction of crime.

The case of Brussels shows how technology and city planning can work together to create a security policy that is open to everyone. This policy uses infrastructure to show trust and dignity, the mix of light, data, and people getting involved is now being used in other European cities too. This shows that security doesn't just depend on the police watching things, but also on building environments where people can feel safe and where the police can do their job well.

Vulnerability and Insecurity Are Built Into the Journey

Tokyo, Japan – Women-only carriages implemented by the metropolitan government.

In Tokyo, Japan, the introduction of women-only carriages on the train system is one of the most well-known ways of reducing sexual harassment on public transport. This plan, started by the Tokyo Metropolitan Government with the help of big railway companies like JR East, Tokyo Metro, and Toei Subway, was put in place bit by bit in the early 2000s because more and more people were reporting cases of chikan (sexual harassment on trains) and because groups of citizens and feminist organisations were putting pressure on the government (Tokyo Metropolitan Government, 2021).

Women-only carriages are used mainly during the morning and evening rush hours on lines where there is a lot of demand, such as the Chūō, Saikyō, Marunouchi, and Tozai lines. The carriages are clearly marked with colours and signs in several languages, and staff and volunteers at the station check who is getting on and off. The aim is to make sure female passengers feel safe and comfortable on public transport, so they don't have to worry about being harassed and can enjoy using it. According to information from the Tokyo Metropolitan Government Bureau of Transportation (2022), women said they felt 70% safer after the change, and there were 70% fewer reports of harassment on lines with separate carriages.

As well as being useful, the measure has led to a lot of debate about safety, fairness and separation in public spaces. Research by Yamaguchi (2020) and Kim (2021) shows that, although the women-only car policy has been good in the short term, it does not deal with the reasons for harassment or encourage lasting cultural change. However, these authors recognise that these carriages provide a place to rest in busy cities and can be a way to give power to people when the government is not able to help.

The case of Tokyo also shows how working together can help, groups like the Chikan Zero Campaign and the national media put pressure on transport companies to adopt active prevention policies. The city then used these measures as part of a bigger plan to improve safety for everyone. This included things like putting up signs and having more women working at stations. They also made improvements to the lights and signs on the platforms (Tokyo Metropolitan Government, 2021).

The Japanese model has been an example for other countries that have faced similar problems, like India, Mexico and Egypt. Tokyo's experience shows that infrastructure can be a tool for social justice. But it works best when there is a balance between protecting people now and changing their culture in the long term. Women-only carriages are a step towards making public transport safer and more inclusive for everyone.


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Vulnerability and Insecurity Are Built Into the Journey

Barcelona, Spain – Local police in stations and buses

In Barcelona, the presence of local police (Guardia Urbana) in metro and bus stations was consolidated as a strategy for prevention and deterrence against insecurity and incidents of harassment or theft on public transport. Since the mid-2010s, Barcelona City Council, in coordination with Transports Metropolitans de Barcelona (TMB) and Mossos d'Esquadra, has implemented the Transport Metropolità Segur program to reinforce operational security and public confidence in everyday travel (Ajuntament de Barcelona, 2018).

The program was created to deal with an increase in theft and a feeling of danger in the busiest metro stations, such as Sants Estació, Catalunya, and Liceu, as well as on night bus lines. In 2019, there were more than 21,000 reports of petty theft on public transport (Mossos d'Esquadra, 2020). This led the authorities to set up joint patrols between the Guardia Urbana and Mossos, with both teams being out in public and working undercover. These patrols are there to catch criminals and also to make users and operators feel safer (TMB, 2021).

The police are joined by a network of CCTV cameras, emergency buttons on buses and stations, and direct communication systems with the TMB Control Centre. According to data from the Barcelona City Council (2022), this combination led to a 28% reduction in incidents between 2020 and 2022, especially on lines with more passengers and during the night.

Also, staff who drive and work in customer service were taught how to deal with situations involving harassment, medical emergencies or arguments. This shows that the human side of the system is very important.

The Barcelona model is special because it focuses on the community and stopping problems before they happen. In 2021, the City Council launched the Barcelona, Ciutat Segura per a Tothom (Barcelona, a Safe City for Everyone) campaign. This campaign aims to raise awareness against harassment and promote respect on public transport.

This project included working with local groups and feminist groups. They helped to find important places and tell people about 'espais segurs' (safe spaces) at stations. Citizen participation is important for balancing police presence with social and educational actions. This helps to prevent security from being seen as a way of controlling people (Ajuntament de Barcelona, 2022).

The situation in Barcelona shows that how well a system works and how safe it seems are connected: a reliable system must not only meet its deadlines and schedules, but also make sure that users feel safe during their journey. The city's public transport system is one of the best in Europe. This is because it works well with other organisations and with the people who use it.


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Vulnerability and Insecurity Are Built Into the Journey

Mexico City, Mexico – Transport Police and Panic Button

In Mexico City, the Banking and Industrial Police (PBI) and the Secretariat of Citizen Security (SSC) implemented a comprehensive public transport security model that combines permanent police presence and citizen emergency technology, with the aim of reducing crime and sexual harassment in the system. This approach is mainly applied in the Metro Collective Transport System (STC), the Metrobus, and the Electric Transport Service (trolleybuses and RTP), where panic buttons and video surveillance cameras connected directly to security control centers have been installed (SSC CDMX, 2022).

The program was strengthened in 2019 with the creation of the Metropolitan Transport Security Unit (USMET), a specialized body with more than 2,000 police officers deployed in stations, stops, and transport units to prevent theft, assault, and sexual harassment (Mexico City Government, 2021). At the same time, the installation of panic buttons in stations and vehicles has enabled an immediate response in less than three minutes to incidents reported by users, according to data from the Digital Agency for Public Innovation (ADIP, 2022).

The security technology is made even better by the "Mi Policía" app, which lets users report dangerous situations or harassment straight away and set an alert for a specific location. These reports are sent to the nearest units, using a rapid response model. The Metrobús has also added physical buttons inside the buses.

These are linked to the C5, the city's urban monitoring system. The C5 has more than 15,000 active cameras (C5 CDMX, 2023). This surveillance network has been very important in recording incidents and making passengers feel safer.

The social side of things is also really important. The SSC worked with the Secretariat for Women (SEMUJERES) to promote campaigns like "Viajemos Seguras" (Let's Travel Safely) and "Acoso No Es Normal" (Harassment Is Not Normal). These campaigns encourage people to report gender-based violence and respect in public spaces (SEMUJERES, 2021). The units also have special areas for women and girls, and staff who have been trained to deal with cases of harassment and help victims during the reporting process. These actions aim to reduce incidents and change the culture of transportation. They also aim to raise awareness of everyday violence in urban mobility.

It shows how using technology, having police around, and being aware of what's going on can make public transport safer. Although it still has problems with how well it covers the whole system and how it reports crimes, the program has reduced reports of sexual harassment by 25% between 2019 and 2022 (SSC CDMX, 2022) and has become an example for other Latin American cities that want to improve the safety of public transport users.


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Vulnerability and Insecurity Are Built Into the Journey

South Africa – Transaid, Initiative in the women's shared taxi sector

The informal shared taxi sector in South Africa, led mainly by men, is a key artery of mobility for peri-urban communities in large urban centers. However, women as passengers—and to a lesser extent as operators—face specific challenges in terms of safety, access, and governance. In response to this reality, Transaid launched an initiative focused on gender equality in public transport, working with shared taxi associations, gender justice agencies, and communities to promote safer environments for women users and operators (Transaid, 2022).

The project, which is funded by the Canada Fund for Local Initiatives (CFLI), operates mainly in the Western Cape Province, in the minibus or "minibus taxi" sector. In 2020, this sector carried approximately 80.2% of commutes in South Africa (Transaid, 2025). Key actions include creating a Safe Taxi Charter, training drivers and operators to prevent gender-based violence, raising awareness of women's rights, and working with the South African National Taxi Council (SANTACO) and the organization Sonke Gender Justice (Transaid, 2023).

From an impact perspective, these interventions aim to achieve three key outcomes:

(1) Doing more to make it easier for women to use public transport without feeling afraid of being attacked or harassed, so they can get to work and education more easily.

(2) Changing the culture of a job where there are mostly men, so there are more women working and taking part.

(3) Encouraging more accountability, keeping users safe and getting more women to take part in shared taxi services. The Transaid report (2023) shows how trained drivers changed their behaviour, got support from other drivers, and told their peers what they had learned, showing how culture can be changed.

The project faces some big challenges. These include the fact that the sector is informal, without formal concessions or rigorous state oversight. There is also persistent violence on certain routes. Limited participation of women as drivers or operators is another challenge. And there is a need to maintain reporting and oversight mechanisms beyond the pilot phase.

What's more, making sure taxis always protect people's privacy depends on the willingness of associations, the existence of a paid reporting system, and the state recognising the rules (Transaid, 2023). These things need to be thought about if the model is used in other cities or countries.

She RISES: Responsive Inclusive Safe and Equitable Spaces

Vulnerability and Insecurity Are Built Into the Journey

India – Safetipin, app for mapping and reporting insecurity and informal transport

In several Indian cities, including New Delhi, Bengaluru, and Pune, the Safetipin initiative emerged, a participatory civic app that allows citizens to map, assess, and report unsafe conditions in public spaces, including bus stops, metro stations, and informal transport hubs. Founded in 2013 by activist Kalpana Viswanath and urban planner Ashish Basu, the platform combines geospatial technology, community participation, and urban analysis to promote safer and more inclusive mobility, especially for women and vulnerable groups (Viswanath & Basu, 2015).

Safetipin collects information from users and volunteers. These people check how safe they think different places are. The assessment looks at nine things: lighting, visibility, how many people are walking by, if it's easy to get to, if there are any cameras, how many different things people use it for, if it's well looked after, how safe people feel, and if it's easy to get to (Safetipin, 2021). The information is shown on an open digital map, which indicates safe or unsafe areas. This allows authorities and citizens to decide what to do first.

The app has been really useful for public transport. It has helped to identify dangerous bus stops and routes where there is not enough lighting or police. It has also been used to record cases of harassment and assault. The Delhi Transport Department and UN-Habitat worked with Safetipin. Between 2017 and 2021, they used the data collected by Safetipin to move more than 700 bus stops and improve lighting at 8,000 places in important areas (UN-Habitat, 2021). This process made urban planning safer and more user-friendly by including the voice of users.

The project is innovative because it involves citizens working together to create urban spaces. Safetipin works with different groups, like communities, local organisations, and universities, to collect information about what it's like to live in a place. In neighbourhoods and areas where people don't have formal transport, local people were asked to look at what was needed. This led to things like streetlights, signs and people patrolling the area. These were organised with NGOs (non-governmental organisations) and local governments (Datta, 2020).

It has helped to change how we think about safety in cities from a feminist and participatory perspective, it has made safety a collective right and not just a matter of surveillance. The project has been done in other cities in the Global South, such as Bogotá, Nairobi, and Manila. This shows that citizens and digital technology can help deal with the everyday problems in public transport.


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Vulnerability and Insecurity Are Built Into the Journey

Cape Town, South Africa – Walking and active transportation in informal settings

In Cape Town, walking and active transport are essential forms of mobility in informal and low-income contexts, where access to formal public transport is limited or unreliable. In areas such as Khayelitsha, Gugulethu, and Mitchells Plain, thousands of residents walk long distances every day to reach train stations, minibus taxis, or workplaces. However, this daily commute exposes pedestrians to high levels of vulnerability due to insecurity, gender-based violence, lack of lighting, and poor pedestrian infrastructure (Mahapa, 2020).

In response to these conditions, local community organisations, NGOs and groups have developed various plans to improve safety and accessibility for pedestrians, without relying exclusively on the government. A good example of this is the "Walk This Way" project, which is run by the ChildSafe Foundation with the help of schools and community leaders. The aim of the project is to encourage children and women to walk or ride bikes safely by creating safe paths for them to walk on, putting up signs in the community, and having volunteers go with them when it is dangerous (ChildSafe, 2018). Local people work together to find dangerous spots in their community and suggest ways to improve them. For example, they might suggest using solar lighting, painting community murals or creating paved paths using materials found locally.

Another good example is "Open Streets Cape Town," a group of people who want to take back public spaces by closing some streets to cars for a while so that people can walk and ride bikes there, and so that cultural activities can take place. This project, which started in 2013, aims to draw attention to the fact that people do not have equal access to city spaces and to show how active travel can help people to get along with each other better (Boulle, 2016). In informal settings, the project has worked with local communities to turn dangerous streets into places where people can meet. This has made people feel more connected to their surroundings and has increased safety by encouraging everyone to watch out for each other.

In other informal settlements too, like Khayelitsha and Nyanga, local networks and women's groups have come up with their own ways to deal with the problem. For example, they've installed solar lights, arranged group walks, and set up safe routes to bus stops (Gxubane, 2021). These strategies, although small, make people feel safer and strengthen the community. This shows that it is not only necessary for people to be able to walk around in these places, but it also helps to build a sense of community and citizenship in the city.

These projects show how communities can step in to provide services that the government does not provide. Instead of relying on expensive infrastructure, communities in Cape Town have shown that local organisation, knowledge of the area, and cooperation among neighbours can create safer and more walkable environments, promoting sustainable and fair mobility from the local level up.


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Vulnerability and Insecurity Are Built Into the Journey

Kampala/Uganda, South Africa – Women's social networks for informal transport

The comparative study by Ankunda, Harvett, and Mokoma (2023) analyzes how women in Kampala (Uganda) and the Tshwane/Pretoria region (South Africa) use their social networks to overcome the challenges of informal public transport. In both cities, mobility depends largely on minibuses, privately owned taxis, and other informal modes of transport.

These offer advantages in terms of availability and price, but also present multiple challenges, such as personal insecurity, poor mechanical conditions, lack of reliable information on routes and fares, and a poorly regulated organizational structure. Women are particularly affected, as formal modes of transport are less accessible or suitable, increasing their dependence on informal alternatives (Ankunda, Harvett, & Mokoma, 2023).

The study shows that, when faced with these conditions, many women use their informal networks, such as travel companions, neighbours, family members and social media groups, to exercise their agency. These contacts can tell you everything you need to know about travelling, like when and how to go, which routes to avoid, how much it will cost, where to stop safely, and any alerts about incidents. So, even though the system is "chaotic" and informal, these networks make travelling better and safer (Ankunda, Harvett, & Mokoma, 2023).

The authors also suggest that, to improve the user experience and make the informal transport sector more formal, we should think about the role of these existing networks. Any new technology or information should be added to the trusted channels that women already use. This will make it more effective. This vision is important for transport policy, urban planning and gender in cities (Ankunda, Harvett, & Mokoma, 2023; Outline Africa, 2023).

Kampala and Tshwane show how women can be more resilient to the limitations of informal transport by recognising and empowering existing social networks. These findings show that transport policies need to be changed to include female users and to work with communities to improve transport in informal areas (Ankunda, Harvett, & Mokoma, 2023).

Territorial disadvantage in peripheral areas

Medellín, Colombia – Aerial cable + metro integration.

Medellín's transportation system uses both the traditional metro and aerial cable cars (called Metrocable) to connect areas that are hard to reach, especially the neighborhoods on the city's hillsides (Dávila & Daste, 2012). The metro is like the backbone of the system, and the cable cars connect areas that are far away directly to metro stations. This makes it easier for residents to get around. The first Metrocable line, which opened in 2004, was connected to the Acevedo metro station. This made it much faster to travel from outlying neighborhoods to the city center (UITP, n.d.).

Integrating both modes of transport focuses on efficiency and the user experience. By connecting cable cars with metro stations, travelers can make quick and safe transfers, reducing their dependence on buses that run on steep and crowded routes (Dávila & Daste, 2012). This has allowed many users in hilly areas to travel from two hours to just 30 minutes on average, improving access to jobs and basic services (UITP, n.d.).

The project has also had a big impact on society. The construction of the cable car stations has also led to improvements in public spaces, the addition of libraries, and increased connectivity between neighborhoods (Dávila & Daste, 2012). These actions have helped reduce the isolation of certain communities, strengthen the social fabric, and increase urban inclusion. This strategy shows that mobility can be a tool for social change, beyond just being a way to get around (UITP, n.d.).

From an environmental point of view, aerial cable cars are a good solution because they run on electricity and reduce the need for motorized transportation that generates polluting emissions in steep areas (Dávila & Daste, 2012). This additional approach not only makes the transportation network more efficient, but it also helps make cities more sustainable. This is an important thing to consider when planning cities like Medellín, which are built on hilly or mountainous terrain.

But cable cars have a limited number of passengers they can carry at one time. Their main job is to provide a final link in the transportation network, while the metro is the backbone of mass transit. However, Medellín's experience shows that combining transport technologies with social and urban changes can create a network that is inclusive, efficient, and adapted to local conditions (Dávila & Daste, 2012; UITP, n.d.).

Territorial disadvantage in peripheral areas

Mexico City, Mexico – Night network in peripheries.

Mexico City has a nighttime transportation service called Nochebús. It is available after conventional hours. This system operates between midnight and 5 a.m., connecting both central and peripheral areas of the city (The Mexico City Post, 2023). The initiative was created to help people who work night shifts, people who are heading home from a night out, or people who need a ride when public transportation is not available during the day.

The Nochebús is organized into specific routes that cover peripheral areas and neighborhoods that are traditionally less connected, such as "La Villa-Periférico," "Pantheon San Isidro-Aragón," and "Medio Bicentenario" (The Mexico City Post, 2023). This integration makes it easier for people who live on the outskirts to get to the city center and other areas of the city at night. At the same time, it tries to reduce the need for informal nighttime transportation, which often isn't safe or doesn't run often enough (Steer, 2018).

The design of the nighttime network also considers safety and social equity. "Ciudad Nocturna" (Night City) is a legislative initiative that promotes the consolidation of nighttime services with a gender and human rights focus. This initiative ensures that nighttime travel is accessible and safe for women and vulnerable groups (Industria & Movilidad, 2024). This approach shows that nighttime mobility is not only a technical issue, but also a way to include people and cities.

Even though there has been progress, the Night Bus is still used less than the bus services during the day. Many smaller roads have fewer buses and they don't come as often. This makes it hard to count on the buses and makes people feel less safe (ICLEI, 2019). This is a big step toward making sure everyone can get around easily. But the system needs to get bigger and better if it wants to be a good choice for everyone who needs to get around at night.

In conclusion, Mexico City's Nochebús is a good example of transportation during the night in areas outside of the city. It offers safe and regulated connections when regular services are not available. It is important to consider nighttime mobility as an essential part of urban planning.

This means that policies should be created to ensure that public transportation is frequent, widespread, and safe throughout the metropolitan area (The Mexico City Post, 2023; Steer, 2018; Industria & Movilidad, 2024).


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Territorial disadvantage in peripheral areas

France – Rural mobility subsidies

In France, the government has created different programs to help people in rural areas. These programs give people more options for getting around, because public transportation is usually limited in rural areas, and many people drive. For example, the France Ruralités Plan has a fund called Fonds vert that will invest €90 million in sustainable and local mobility projects in rural areas between 2024 and 2026 (Padam Mobility, 2024).

This shows that mobility in rural areas is no longer seen only as a "transport problem," but as a question of whether people feel included in the area. Despite recent laws like the Loi d'orientation des mobilités (2019), many rural communities still don't have enough services. This leads to greater social isolation and high travel costs (Le Monde, 2024).

Aid is not only given to buses or traditional networks: "Rural mobility stations" are also being promoted in certain areas. These stations offer low-cost options such as shared bicycles, carpooling, or small electric vehicles that are designed for areas with fewer people (Groupe SNCF, 2024). These initiatives offer alternatives to using private cars alone. They also help the country reach its goals for reducing emissions.

This is important because studies on innovation in rural mobility warn that costs per user in low-density areas remain high, even with subsidies. Public funding should be efficiently directed towards flexible models, such as on-demand transport or light vehicles. This is better than replicating urban schemes in rural areas (International Transport Forum [ITF], 2023).

France is a good example of how public policy can help rural mobility. They have started offering subsidies and other programs that are designed to fit the needs of each area. However, there are still challenges related to the amount of money, working together across different areas, and adapting the model to rural areas. These are important factors in making sure that these subsidies lead to real improvements in connectivity and quality of life (Agence Nationale de la Cohésion des Territoires [ANCT], 2024).

Territorial disadvantage in peripheral areas

Chile – Program "Subsidio Nacional al Transporte Público de Pasajeros"

In Chile, public transportation policy includes subsidy mechanisms that seek to improve accessibility to the public transportation system, especially in rural, isolated, or less densely populated areas. Law No. 20,378 establishes a national subsidy for paid public passenger transport, with the aim of promoting the use of public transport and assisting students, non-tendered areas, and territories with low coverage (Regional Government of Coquimbo, 2024).

The subsidy is applied in various ways. In regulated areas, it allows for reduced fares for different population groups, such as adults, students, and seniors (Rural Public Transportation Directorate [DTPR], 2024). In "non-tendered" or rural areas, there are contracted routes that receive subsidies to operate routes that would otherwise not be profitable; for example, in the La Araucanía region there are more than 250 subsidized routes, of which 169 correspond to isolated areas and 84 specifically to rural transport (Biobío Chile, 2020).

A recent case of implementation can be seen in the Valparaíso region, where the regional government approved an investment of close to $2.932 billion pesos to extend public transport in isolated rural areas, incorporating 32 new routes that benefit approximately 26,000 new potential users, increasing coverage by 38% compared to the previous scenario. On these routes, seniors and people with disabilities travel for free, and students have a reduced fare of 33% (Los Andes Online, 2024).

Even though there has been progress, there are still problems with the structure. State resources are not always distributed equally or proportionally. In the O'Higgins region, more than $11.24 billion is expected to be spent on subsidies by 2025. However, transport unions say that the difference between adult and student fares has not been fully covered by the state. This puts financial pressure on local operators (El Tipógrafo, 2025).

The Chilean example shows how a country with medium population density can use government support to improve public transportation in areas that would otherwise have limited access. Law 20.378 and related programs improve coverage for students, seniors, and rural areas. However, they also show how difficult it is to make sure there is enough money, that rural routes can be operated in a sustainable way, and that benefits are distributed fairly. It is possible to expand coverage, but it would require changes to the institutions and money used to manage these subsidies.

These changes would make the subsidies an effective way to include more people (Regional Government of Coquimbo, 2024; DTPR, 2024; Biobío Chile, 2020; Los Andes Online, 2024; El Tipógrafo, 2025).


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Territorial disadvantage in peripheral areas

Oaxaca, Mexico – Rural transport cooperatives

In the state of Oaxaca, public passenger transport cooperatives have historically emerged as a community organizing mechanism in response to the scarcity and precariousness of mobility services, especially in semi-rural and rural areas. A study on the cooperative transport industry in the Oaxaca Metropolitan Area finds that these cooperatives were originally created by drivers, mechanics, and assistants in order to take on concessions and operate collective transport services under principles of mutuality and self-management (Carmona López, 2024).

The study also found that these cooperatives have a "dual" nature. While they are organized as cooperatives, in practice, many have started to focus more on making a profit. This has led to a weakening of the democratic principles of cooperativism, as well as labor protection for drivers and the presence of financial reserves within the organization (Carmona López, 2024). This change affects how cooperatives are set up and how transportation services work for people in rural areas.

The conditions in rural Oaxaca make public transportation more difficult to operate. There are few routes, limited infrastructure, and low population density. This makes it challenging for cooperatives to provide public transportation. For example, economies of scale don't work the same way in rural areas. This makes access to services more expensive and less frequent.

This study doesn't have all the information about fares or coverage, but it's clear that the cooperative model is facing challenges from the market and local regulations.
It shows how the cooperative model can succeed in helping rural communities grow, but it also shows its limits. On the one hand, community organizations help people who are far away from others stay connected. But if they don't have support from the government, banks, and other infrastructure, cooperatives can become functional but not fair or sustainable (Carmona López, 2024).

This difference shows us important things to consider in rural transportation policies. We need to make sure that organizations have strong structures in place. We also need to make sure that there is enough support for routes that don't make a lot of money. Finally, we need to keep the ideas of cooperation in mind that led to the creation of these organizations.

Territorial disadvantage in peripheral areas

Peruvian Amazon – Community boats

In the Peruvian Amazon, rivers are the main means of communication for many indigenous and rural communities, given that much of the territory lacks passable roads (Al Jazeera, 2018). In this context, community boats have become an essential means of mobility, allowing not only the transport of people, but also the transfer of food, medicine, and other basic supplies. These boats are usually operated by the communities themselves, who organize and manage resources collectively, strengthening local autonomy and social cohesion (Dammann, Neville, Gómez Pisco & Alegría, 2021).

One example of this is the Wampís community's adoption of solar boats. They use eight-seater boats that are powered by solar energy. This project reduces fuel costs and pollution in rivers. It also strengthens the community's independence from fossil fuels and external services (Size of Wales, 2024). Local people help design and operate these boats. This makes sure that the technology is adapted to the local conditions and the specific needs of the population.

Community boats are important for more than just getting around. They also help people get to health services. In places like Sarayacu, boats have been used to transport health personnel and patients. This has reduced the time it takes to get patients to the right care, even in places that are hard to reach (Dammann et al., 2021). These projects show that river infrastructure is an important part of social welfare and fairness in the Amazon.

River transportation in communities, however, faces significant challenges. During the dry season, water levels change, boats are not well-maintained, and there is not enough money. This makes these services less effective and not sustainable. A recent report said that more than 130 communities were temporarily cut off because of falling river levels, which affected the supply of food and medicine (Mongabay, 2024). These factors show that, although river transport improves connectivity in communities, it is still vulnerable to environmental and structural conditions.

The example of community transportation in the Peruvian Amazon shows how river transportation organized by the communities themselves is a strategy that works well in places where land is hard to reach. Using sustainable technologies, like solar boats, and connecting these communities to health and supply services makes them more independent and strong. But the model needs constant attention to maintenance, financing, and adaptation to the impacts of climate change to ensure equal and reliable transportation (Al Jazeera, 2018; Dammann et al., 2021; Size of Wales, 2024; Mongabay, 2024).

Territorial disadvantage in peripheral areas

Lima, Peru – Solidarity motorcycle taxis

In the outskirts of Lima—especially in the northern and eastern districts—mototaxis have proliferated as a transportation solution for areas with limited access to bus routes or narrow streets where conventional vehicles cannot operate efficiently. For example, in the district of San Juan de Lurigancho there are more than 2,600 motorcycle taxis, while in the districts of Comas and San Juan de Miraflores there are more than 2,500 and more than 2,200 respectively. These vehicles mainly serve feeder routes to major transport stations or areas not covered by the formal system (Quintana, 2020).

"Since in most of the districts on the outskirts of Lima people live in areas that are difficult to access... the motorcycle taxi service is more than necessary to transport and connect people from their homes to the city's mass bus transportation system." (Quintana, 2020, p. 58)

This phenomenon plays a crucial "feeder" or "last mile" role in contexts where topography, urban density, and road infrastructure limit bus operation. A report by the Japan International Cooperation Agency estimated that approximately 45,000 motorcycle taxis operate in the suburbs of Lima and Callao, providing services on minor streets that are inaccessible to larger vehicles (JICA, 2020).

From an economic point of view, motorcycle taxis are a small business that many people can afford. Many motorcycle taxi drivers moved to the city from other provinces. They borrowed money from microcredit programs to buy their motorcycles.

These drivers make more money than the local minimum wage, which means that they make enough money to both get around and support their families. This makes motorcycle taxis not only a way to get around, but also a way to find a job (Quintana, 2020). This shows that informal transport has two roles: it helps people get around and support their families in areas with few formal services.

But this informal nature creates problems. It can be hard to regulate, and it can create safety and service quality issues. It can also create problems with equity in cities. These services don't follow the same rules as regular transportation services, so they're not included in official transportation policies. This can be dangerous for passengers because they might not have insurance, the standards can be inconsistent, and it can make them dependent on the market. The government of Lima has said that these options need to be included in a larger plan for city transportation in the suburbs (JICA, 2020).

The case of motorcycle taxis in the outskirts of Lima shows how, in places like this, these informal options are important ways for people to get around and find jobs. However, to be included in a transportation policy that everyone can use, they need to be made official, their operating conditions need to be improved, and they need to be connected to the larger urban mobility network.


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Territorial disadvantage in peripheral areas

Johannesburg, South Africa - Community minibus routes

In Johannesburg, South Africa, community minibus routes, commonly known as minibus taxis, are the main means of transport for a large part of the population, especially in outlying areas and townships. It is estimated that approximately 70% of the metropolitan area's inhabitants depend on this system for their daily commutes, which operates on some 2,813 registered routes and covers more than 44,000 km, with average fares of R13.13 per trip (Businesstech, 2023). These routes are essential to ensure mobility in areas where formal transportation, such as buses and trains, has limited or no coverage.

These routes are organized through associations of minibus owners and operators. These associations control specific territories and manage the operation of the vehicles. Around 12,300 private taxis operate on about 1,000 routes from over 450 departure points in the city. This creates a radial network, meaning traffic flows towards the center of Johannesburg. (City of Johannesburg, 2018) This system lets users access different transport hubs and minibuses that feed into larger routes, even though the system is still mostly informal.

Community routes are important because they connect areas that don't have many other options for transportation. Some daily minibus journeys cover between 110 and 284 km, with 4 to 19 trips per day and transporting between 39 and 176 passengers (Government Technical Advisory Centre [GTAC], 2024).

However, the division of territories controlled by different associations creates coordination challenges, especially for routes that cross jurisdictional boundaries. This can lead to inefficiencies in coverage and possible delays for users (World Bank Blogs, 2020).

From a social and economic point of view, community routes create jobs for thousands of drivers and other workers. These routes form a small economic system within the city. The system can adapt to changing needs and adjust to the needs of people who don't have access to regular transportation. However, there are still big problems with making sure the service can continue in the long term. This is because there are no official rules and there are no safety standards that are used the same way every time (Roads & Kingdoms, 2018).

Community minibus routes in Johannesburg are very important for getting around the city. They connect areas that would otherwise be isolated and offer economic opportunities to thousands of operators. Whether or not they can continue to exist in the future depends on several things. They need to become a part of the public transportation system. They also need to work together with the government to make sure everything is done safely and efficiently.

Territorial disadvantage in peripheral areas

Kampala, Uganda – Popular market stops

In Kampala, Uganda, popular markets such as Nakasero Market act as strategic hubs within the informal urban transport system. Collective taxis, minibuses, and motorcycle taxis (boda bodas) converge around these markets, connecting residential and peripheral neighborhoods with high-traffic commercial centers. As Monteith (2018) shows, Nakasero Market—the oldest in Kampala—combines commercial intensity and informal mobility in the same urban space.

Transportation to and from these markets is mainly organized informally, with routes that adjust to the flows of vendors, buyers, and workers. For example, a pilot study found that route competitions in Kampala revealed that informal operators serving market vendors were able to reduce costs and travel times (Kerzhner & Mbabazi, 2024). These types of routes usually start very early in the morning—when the merchandise arrives—and repeat their trips at midday or in the afternoon, coinciding with the influx of customers to the market.

But this combination of shopping and getting around also creates problems for city planners and traffic. The Kampala Capital City Authority (KCCA) has noticed that many informal routes don't have organized stops. This makes traffic worse around markets and makes it hard for people to walk safely (KCCA, 2020). Also, the high number of informal markets and traffic make it hard for people to move around easily at these busy places.

From an inclusive mobility perspective, stops around markets are a chance to connect low-income populations with jobs, services, and city stores. Even so, some people still don't have the same access. The way transportation works at these hubs means that people in poor areas may have to wait longer, get rides that are not as comfortable or safe, and have to pay more (Monteith, 2018). So, making things better for people walking, controlling stops, and combining different kinds of transportation are important steps toward a network that is more fair.

In Kampala, large popular markets like Nakasero are important centers for the city's informal mobility network. These markets are places where people can buy and sell things, and they are also places where people can get around the city. Their location helps them connect smaller areas with larger ones, but they don't have the right infrastructure, rules, or plans to reach their full potential. Making these things better would be key to creating more efficient, safe, and inclusive ways to get around.

Opportunities.

Database & Digital integration

The formal transport system usually has problems with coverage, reliability, and equity across different areas. Building a complete and connected database can be a key tool to improve the planning and operation of the service.

Structural improvements

Making bus stops and stations better can have a big effect on city transportation, especially if the new design focuses on making it easy for people to use, keeping them safe, and ensuring that everyone has access to them. Adding new things like furniture, signs, lights, or technology makes these spaces more useful, safe, and easy to get to.

Formal Informality

Integrating informal transport processes into the formal system can be a powerful strategy to improve the travel experience of users, especially in rural areas. These services don't follow the same rules as other services, but they're still really important. They help people stay connected, make information easy to access, and can be used in different ways.

Concept.

The development of a system that includes digital, social, and physical parts. The idea is to collect and combine data from different online sources to create a complete list of transportation options, including formal and informal ones. This will make planning easier, help you visualize the route, and allow you to make decisions based on real-world evidence.

We also need to redesign the bus stops. This will make these spaces easier to get to, safer, and more comfortable. It will also turn these spaces into places where users can interact with the digital platform. To achieve these goals, we need to include invisible sectors and informal services. This will help us integrate additional flows, expand coverage, and make the transportation network more flexible.

The system.

The proposed urban mobility system in Bogotá is designed to create a connected network of information, infrastructure, and services. This network is intended to address the current challenges with public transportation and to create a connection between formal and informal systems.

In other words, the system works like a mix of different ecosystems. Each part works together to make things easier to access, more efficient, and fairer for different areas.

The system is based on a centralized digital platform. This platform was developed from the redesign of the TransMiApp application. It serves as a data integration hub; this platform should collect information from all types of transportation. It should include route information, travel times, important locations, accessibility levels, and how citizens feel about these issues. By putting all this data in one place, the system allows for planning based on data, making it easier for users to see different routes, and provides tools like digital payments and safety alerts. This digital layer is the foundation for the rest of the system to work together in a clear and organized way.

The second part of the system is the physical infrastructure, such as bus stops. These bus stops are designed to be micro-mobility centers. These spaces have been redesigned to be more accessible, safe, comfortable, and digitally connected. They allow users to interact directly with the platform, plan their trips, and access real-time information. The infrastructure connects data and the physical experience of transportation, making the system more cohesive and reducing the gap between central and peripheral areas.

Finally, the system considers the social aspect by integrating informal transportation. Services such as bicycle taxis or neighborhood routes are mapped, made visible, and connected to official routes. This allows their flows to integrate with official routes without the need for complete formalization. This makes sure that the network reflects the daily lives of residents and improves coverage, especially in areas with little institutional presence.

In general, the system works like a connected urban ecosystem. Data helps make decisions, infrastructure makes it easy to move around, and including informal areas makes transportation better and more flexible. Its goal is to create a better way for people to get around that is inclusive, strong, and efficient. It wants to create a positive impact on people's lives and make sure that everyone in the city has access to these new ways of getting around.

Formal informality.

Integrating informal transport processes into Bogotá's formal public transport network represents a powerful strategy to enhance the travel experience for thousands of users, particularly in peripheral neighborhoods or areas with limited state coverage. Services such as colectivos, motorcycle taxis, bicycle taxis, and neighborhood routes operate outside official regulation, yet they play a crucial role in providing connectivity, accessibility, and flexibility that the formal system cannot always deliver. Recognizing the importance of these services is essential to building a more resilient and inclusive urban mobility network.

By incorporating informal transport into urban planning, cities can generate operational synergies that benefit both users and operators. Mapping informal routes and connecting them to major nodes of the formal system, such as TransMilenio or SITP stations, allows for the creation of multimodal corridors, reduces waiting times, and facilitates smoother transfers between different modes of transport. This integration can also support the development of safe boarding areas, clearer signage, and infrastructure improvements that guide passengers efficiently, while encouraging informal operators to adopt basic standards of quality, safety, and reliability.

It is important to note that integrating informal transport does not necessarily mean full formalization. Instead, it involves acknowledging its social and functional value within the broader mobility ecosystem. Digital platforms can play a central role in this process by making informal routes visible, enabling route planning and journey management, and supporting hybrid payment systems that bridge informal and formal services. Additionally, partnerships with local communities can provide critical insights into user behavior, travel patterns, and local challenges, ensuring that interventions are context-sensitive and user-centered.

Together, these strategies contribute to the development of a transport system that is inclusive, adaptable, and responsive to the diverse realities of Bogotá. By fostering collaboration between formal and informal services, the city can create a more efficient and reliable network that reduces travel barriers, improves accessibility, and strengthens trust between users and transport operators. Ultimately, integrating informal transport is not only a matter of efficiency but also a step toward equity, resilience, and urban cohesion, ensuring that all residents can access mobility solutions that meet their needs.

1. Territorial recognition & mapping

The first step is to recognise the functional and social value of informal transport, understanding that these services - such as colectivos, motorbike taxis, bicycle taxis or neighbourhood routes - play essential roles in areas where the formal system does not reach. This phase involves mapping their routes, schedules, boarding points, demand and operating conditions, through participatory methodologies involving local communities, informal operators and public entities. The objective is to make the informal visible as part of the urban ecosystem, not as a problem to be eradicated.

2. Articulation with the formal system

Once mapped, informal processes can be articulated with the formal system through connectivity strategies, shared infrastructure and operational coordination. This includes creating safe transfer zones, integrating informal routes into digital platforms, establishing minimum quality standards, and creating incentives for collaboration. Articulation does not imply total formalisation, but rather regulated coexistence that improves the user experience and reduces territorial gaps.

3. Transformation into agents of change

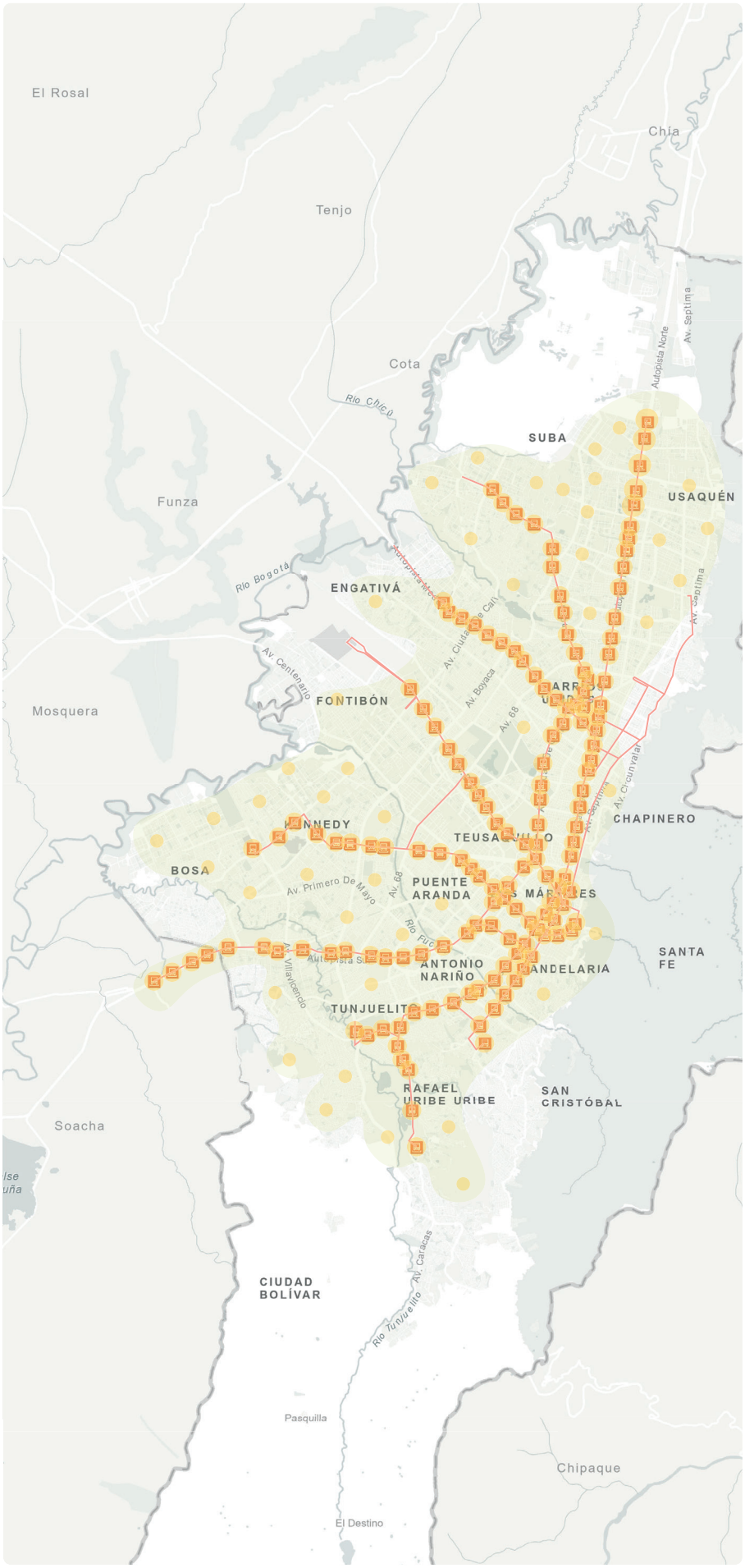
Finally, informal processes can also bring about positive change if they are seen as valuable partners in city building. This means including them in planning meetings, training them in community management, encouraging cooperative models, and allowing their practices to inspire new ideas in the formal system. This helps make the city more resilient, increases mobility for all, and creates a more inclusive public transportation system that can adapt to the many different routes in Bogotá.

Formal informality.

A favourable outcome for this opportunity would be the development of a comprehensive map integrated into the central transport database. The map would initially include informal transport services that are already partially regulated by the state, such as bicitaxis. This map would show where users can find these services, alongside formal options like TransMilenio and SITP stations. This would enable better journey planning and accessibility. Importantly, the platform would also create opportunities for other informal services to cooperate with authorities. These services would gradually adopt minimal safety and quality standards. They would also become eligible to appear on the map. By making these services visible and connecting them to the formal system, the map serves both as a practical tool for users and as a strategic instrument for urban mobility planning. This would foster safer, more inclusive, and better-coordinated transport networks.

Outcome

Formal informality Map.



Transmilenio route

Transmilenio station

Informal service hotspot

Delimitation

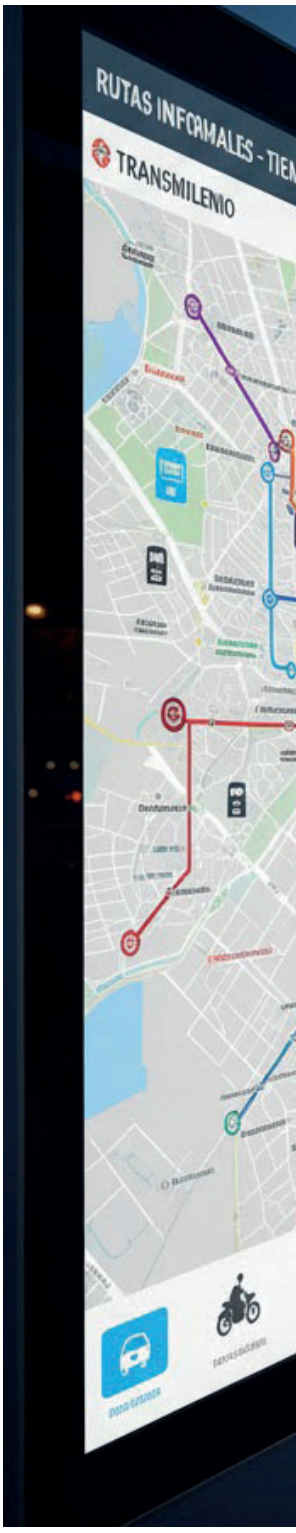
0 3.75 7.5km

Data & Digital integration.

In Bogotá, the planning and operation of the public transport system faces persistent challenges in terms of coverage, reliability, and territorial equity. -The city still has peripheral areas where formal services do not run frequently or efficiently enough, leaving the population dependent on informal transport, which is an essential complement to the urban mobility system. In this context, the creation of a comprehensive, centralized, and continuously updated database is a key strategic tool for improving institutional management, optimizing transport operations, and enhancing the user experience.

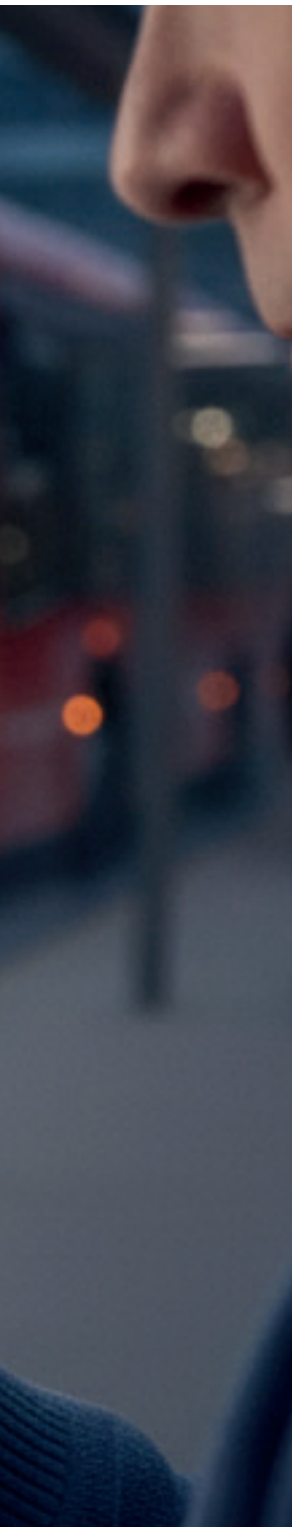
This database would allow for the recording of detailed information on routes, schedules, travel times, critical nodes, accessibility conditions, citizen perception, and the dynamics of interaction between formal and informal transportation. The centralization of this information not only strengthens evidence-based decision-making, but also facilitates the identification of areas where the system has deficiencies, bottlenecks, or redundancies. The integration of this data into mobile applications and digital platforms would allow users to plan multimodal journeys, receive real-time safety alerts, check route availability, and access electronic payment methods, promoting a safer, more efficient, and more comfortable travel experience.

The value of incorporating information on informal transport is evident in international examples. In Mexico City, the "Mapatón CDMX" project allowed citizens to document minibus and combi routes, creating the first open database of informal transport, which helped to plan improvements in formal transport and understand mobility patterns in traditionally invisible areas (Digital Transport4Africa, 2020). Similarly, in Manila, Philippines, collaboration between drivers and communities to map jeepney routes contributed to better urban planning and integration with formal systems. These experiences show how data generated by users themselves can complement institutional information and generate a more complete view of the urban transport ecosystem.




OS REALES
TRANSMILENIO

Data & Digital integration.



In Bogotá, the inclusion of data on informal transport would make it possible to identify how this system complements formal transport and where operational gaps are generated. For example, some informal routes cover peripheral areas with low frequency of formal buses, offering an opportunity to design integration routes or adjust existing service schedules. The collection of data on schedules, frequencies, stops, and perceptions of safety can guide the implementation of public policies that are better adapted to local realities, such as targeted subsidies, improvements in road infrastructure, or flexible regulations that recognize and complement informal operations. In addition, involving organized communities in information gathering fosters citizen co-responsibility, as users provide direct knowledge about risks, accessibility, and mobility patterns that institutions cannot always perceive.

From a technical perspective, this data infrastructure would enable the implementation of passenger flow analysis, demand modeling, and route optimization, supporting the planning for the expansion of mass transit systems such as TransMilenio and integration with SITP. By combining formal and informal data, more inclusive solutions can be designed that take into account the most vulnerable populations and historically underserved areas. Likewise, early warnings can be generated for security incidents or service interruptions, increasing user confidence in the system and promoting territorial equity.

The creation of a comprehensive database represents a commitment to operational efficiency, territorial justice, and city building from a systemic approach. Systematized information allows for evidence-based decision-making, reduces inequality in access to transportation, and promotes integration between formal and informal modes. Furthermore, the experience of other cities shows that the combination of technology, citizen participation, and institutional management can transform urban mobility, making it safer, more efficient, and more resilient. In Bogotá, this strategy opens up the possibility of transforming the way transportation is planned and operated, recognizing the importance of informal transportation, valuing the user experience, and building a more inclusive and sustainable mobility system.

Although the construction of this database requires investment, inter-institutional coordination, and collaboration with citizens, its potential benefits are manifold: optimization of operations, evidence-based planning, integration of formal and informal transport, greater safety, and territorial equity. By looking at global experiences and adapting them to the local reality, Bogotá could establish a more inclusive mobility model, where information becomes the basis for more efficient, safe, and accessible public transportation, thus consolidating a more equitable and connected city.

1. Structural diagnosis and design.

The first step in creating a complete transportation database is to clearly define its objectives and the information it should include. The database should not be seen only as a place to store data. It should be seen as a tool that can help make plans for, operate, and improve public transportation services. To do this, it is essential to identify the most relevant variables for understanding how people move around cities. These include things like where the bus routes are, how often the buses come, where people can get on and off the bus, how easy it is for different groups of people to use the bus, how safe and comfortable the bus is, and also things like ride-sharing and other ways people get around that are not part of the bus system.

After identifying the important factors, the next step is to design a system that includes land, air, and sea transportation and that can record both formal (planned) and informal (unplanned) transportation processes. For formal services, such as TransMilenio, SITP, and taxis, the structure must record operating schedules, vehicle capacities, how the lines connect, and the most important locations within the system. It's also important to map out different routes, understand when there's the most demand for transportation, and identify gaps in the system. This combined approach makes sure that the database shows not only the way the city's transportation network is set up, but also the ways people use it every day. This includes ways people adapt when there are problems or things that could be done better in the system.

When the database is connected to digital visualization tools and mobile platforms, users can access real-time information on routes, travel times, and multimodal connections. This improves the user experience and satisfaction. At the same time, this information is used to design public policies. These policies can include targeted subsidies, infrastructure improvements, or regulations that make it easier to combine informal services with the overall mobility system.

The database is a dynamic tool that supports operational efficiency, inclusive planning, and more equitable urban mobility. This is because it is more than just a static set of information. It is defined precisely, with objectives, variables, and a territorial and multimodal structure. By understanding all the different parts of Bogotá's transportation system, including both official and unofficial players, the system can provide useful information to help make decisions about the city, make things better for users, and help build a public transportation network that is easy to use, efficient, and strong.


CONJUNTO RESIDENCIAL
LA ESTACION IMPERIA
PARE
ESCOLAR
TSM-852
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TransMilenio
TransMilenio

2. Collaborative data collection.

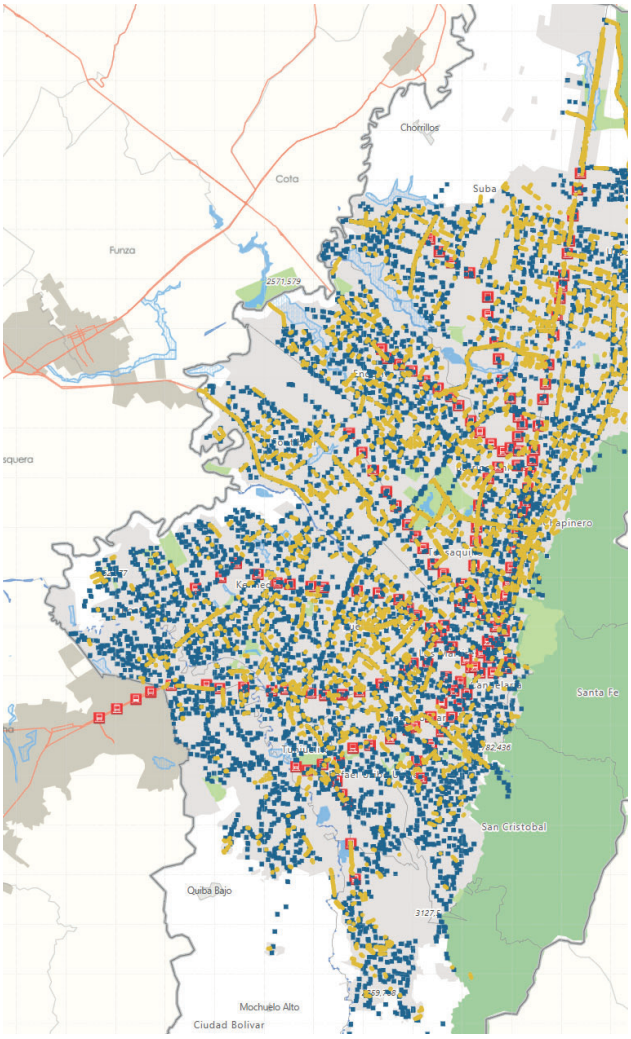
After the database structure has been defined, the next step is to collect information together with official entities, universities, local communities, and informal operators. This means that the data collected accurately reflects the complexity of the transport system. It incorporates different perspectives and experiences of those who use and operate transport in the city on a daily basis. By working together, different groups can access different types of information. This makes the data more reliable and better. The end result is a database that actually represents the city of Bogotá.

The collection stage requires the use of advanced digital tools, such as georeferenced forms, mobile applications, GPS systems, and social networks. These technologies help map out routes and schedules, identify important boarding and alighting points, and record travel experiences and how safe and easy it is for users to get around. Georeferenced forms help identify important locations and areas with a lot of traffic, while mobile apps collect real-time data on how often services are available, how long they are delayed, and if their routes are changing. GPS information can show the exact location of informal routes, which are not usually included in official systems. Social media and community platforms can also capture what citizens think and experience when they move around, which might otherwise be missed.

It is very important that users and neighborhood leaders take part in the process. They provide useful and relevant information that goes beyond the technical details. This helps to make sure the collected data is correct and useful. When we combine all these different contributions, we can create a reliable database that shows how the transportation system in Bogotá works and how it is organized. This database includes regular routes, routes in peripheral areas, and routes that are added based on demand. This partnership also encourages residents to take responsibility for improving city transportation and creating plans that meet their needs.

Also, when information is collected together, it helps us see how people use transportation, where there are problems, and how formal and informal transportation can work together. This information is important for making decisions based on facts, designing public policies that include everyone, and planning improvements to infrastructure and services. It also helps build a stronger transportation system that can adapt to changing needs and unexpected problems. It also makes it easier for citizens to participate in urban management.

The collaborative collection phase is an essential part of making sure that the database is complete, accurate, and functional. By combining advanced digital tools with the active participation of users, communities, and informal operators, Bogotá can develop an information system that not only serves operators and planners, but also empowers citizens, improves transportation efficiency, and promotes more equitable and sustainable mobility throughout the city.


Chorrillos
Cota
Suba
Funza
Usaquén
Santa Fe
San Cristobal
Quiba Bajo
Mochuelo Alto
Ciudad Bolivar

Stakeholders

1. Government and regulatory entities

- **The District Mobility Secretariat** (SDM) is in charge of transport regulation and urban planning. It is also the main user of data for decision-making.
- TransMilenio S.A. is in charge of the BRT system. It wants to improve routes, travel times, and passenger flows.

- **SITP** (Integrated Public Transport System): manages local buses; receives information to improve coverage and punctuality.

- **The traffic police and public safety authorities** can use the data to improve security at stations and on routes, and to prevent crime.

- **The people who work at City Hall** in Bogotá are responsible for making decisions about what happens in the city. They can use the information to plan where things will be built and how money will be spent on things like roads and buildings.

2. People who run transportation services

- **Formal taxis and ride-sharing apps** (like Didi, Beat, Uber, etc.) can share information about where they are, when they're available, and how many people want to ride with them.

- **Informal transport operators**, like collectivos, bus cooperatives, pirate buses, and motorcycle taxis in the suburbs, help to map unregistered routes and understand how they work with the formal system.

3. People who use public transportation

- **TransMilenio, SITP, and informal transport users** are important for understanding how accessible, safe, and reliable these systems are.

- Some groups are particularly vulnerable. These groups include **women, people with disabilities, older adults, and young students.** Information about these groups can help identify areas where they face challenges and what they need.

- **People who use digital communities and apps** can share information about routes, times, and how safe they feel through mobile platforms.

4. Academic and research institutions

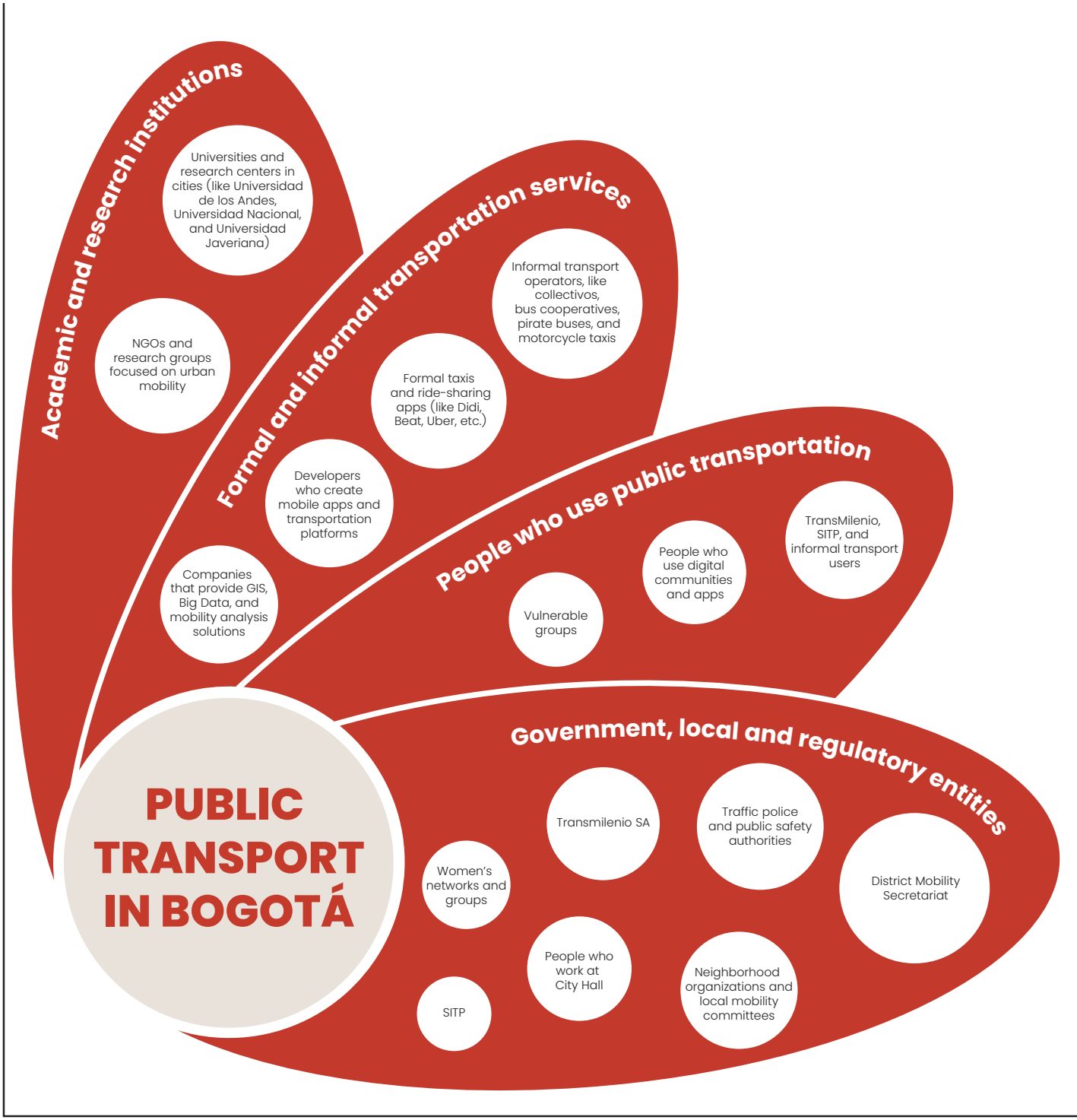
- **Universities and research centers in cities** (like Universidad de los Andes, Universidad Nacional, and Universidad Javeriana) can work together on analyzing data, creating route models, and assessing the impact of policies.
- NGOs and research groups focused on urban mobility could use the data for studies on fairness, accessibility, and transportation that includes all people.

5. Technology companies and data providers

- Developers who create mobile apps and transportation platforms are responsible for designing interfaces. These interfaces help people visualize routes, receive alerts, and make digital payments.
- Companies that provide GIS, Big Data, and mobility analysis solutions help with integrating, processing, and analyzing large amounts of transportation data. This data can be both formal and informal.

6. Community and local organizations

- Neighborhood organizations and local mobility committees should share information about safety, accessibility, and obstacles in peripheral neighborhoods.
- Women's networks and groups focused on shared transportation can provide important information about safety on the road, different routes, and gender-related challenges.


Academic and research institutions
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NGOs and research groups focused on urban mobility
Formal and informal transportation services
Informal transport operators, like collectivos, bus cooperatives, pirate buses, and motorcycle taxis
Formal taxis and ride-sharing apps (like Didi, Beat, Uber, etc.)
Developers who create mobile apps and transportation platforms
Companies that provide GIS, Big Data, and mobility analysis solutions
People who use public transportation
TransMilenio, SITP, and informal transport users
People who use digital communities and apps
Vulnerable groups
PUBLIC TRANSPORT IN BOGOTÁ
Government, local and regulatory entities
Transmilenio SA
Traffic police and public safety authorities
District Mobility Secretariat
Women's networks and groups
People who work at City Hall
Neighborhood organizations and local mobility committees
SITP

Stakeholder map

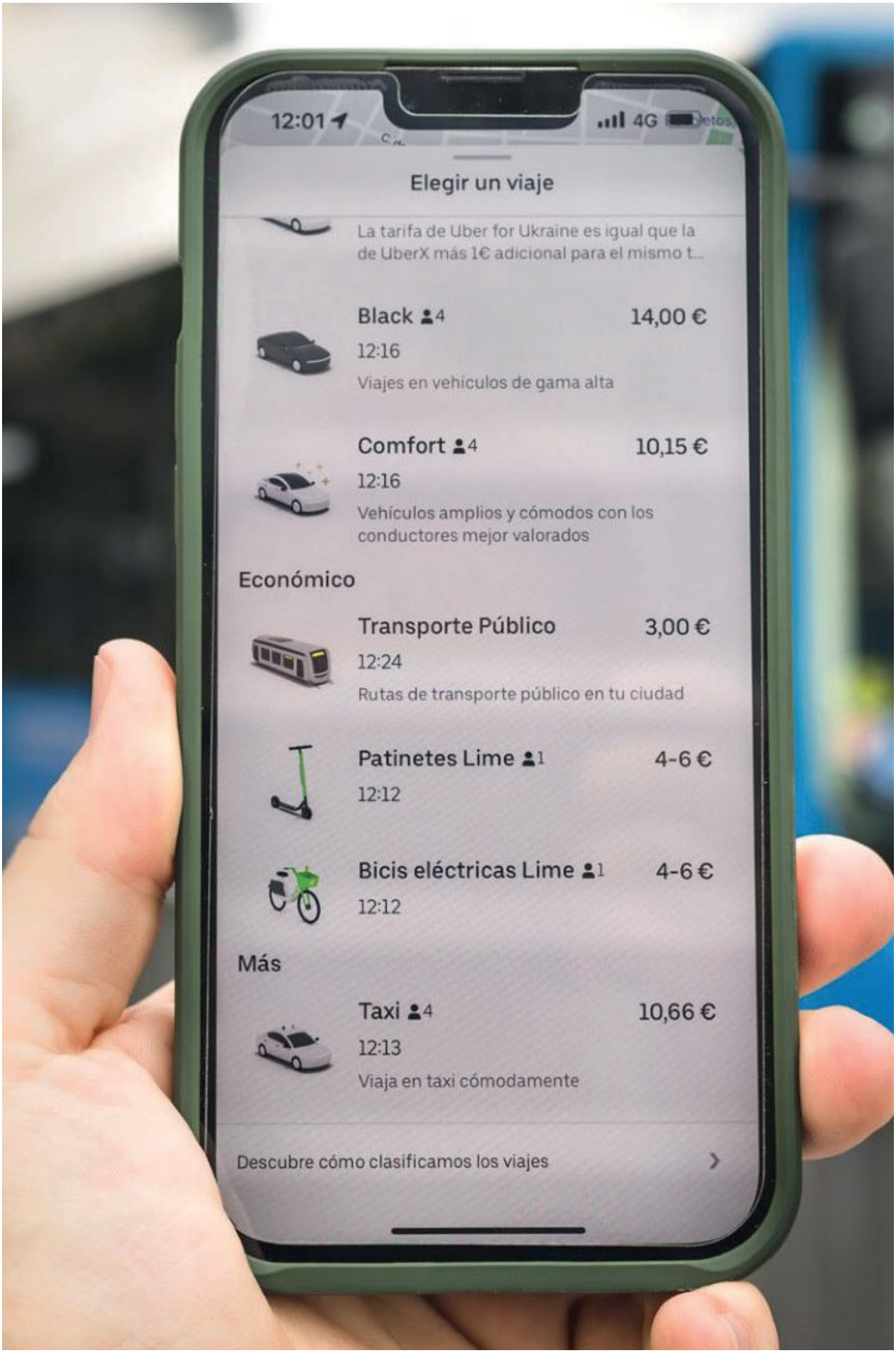
3. Digital integration & visualization.

The last step is to add the database to digital platforms that citizens, operators, and planners can use. This integration turns the collected information into a tool that helps manage and plan, transferring data from a static repository (a storage place) to a dynamic system (a living, changing system) that helps with daily operations and strategic decision-making . By connecting to existing apps like Moovit, Google Maps, or specific local developments, users can view routes, plan trips using different modes of transportation, receive real-time community alerts, and access digital payment options. This improves the travel experience and interaction with the public transportation system.

Integration into digital platforms also allows for real-time monitoring of services, recording information on schedules, frequencies, congestion, and changes in operation. This creates a steady stream of data that can be used to improve how operations are done, predict problems, and respond quickly to unexpected situations. The digital system also lets citizens give direct feedback. People can report problems, share their experiences, and help keep the information up to date. This makes users active participants in the system, strengthening citizen responsibility and service quality.

Another key benefit of this integration is the ability to create indicators and metrics to guide future public transportation projects. The information collected and shown on the platforms makes it possible to identify areas of high demand, routes that are not used enough, gaps in coverage, and specific needs in different parts of the city. These indicators are essential for designing better public policies, planning infrastructure improvements, and making both formal and informal services work better. It also helps to ensure that planning decisions consider the city's different areas and make sure that public transportation is accessible to everyone.

When the database is used with digital platforms, it represents the end of a step-by-step process. First, the goals are defined. Then, information is collected and organized. Finally, the data is used. This strategy improves the user experience and operator efficiency. It also provides transparency, strengthens governance, and promotes a more inclusive, resilient, and sustainable transportation system. By using digital technology and getting citizens involved, Bogotá can move toward a better urban mobility model. This model would be more connected, efficient, and fair. Information would be a key resource for planning and managing the city.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Elegir un viaje
La tarifa de Uber for Ukraine es igual que la de UberX más 1€ adicional para el mismo t...
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Comfort 4
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Vehículos amplios y cómodos con los conductores mejor valorados
Económico
Transporte Público
3,00 €
12:24
Rutas de transporte público en tu ciudad
Patinetes Lime 1
4-6 €
12:12
Bicis eléctricas Lime 1
4-6 €
12:12
Más
Taxi 4
10,66 €
12:13
Viaja en taxi cómodamente
Descubre cómo clasificamos los viajes

Benchmark

Transmiapp

- TransMiApp is the official app for Bogotá's TransMilenio and SITP systems. TransMilenio S.A. developed the app to make using public transportation easier. It helps people plan their routes, find out how long the bus will be arriving, and see where the bus or train stops are. It also provides information on the services available at each point in the system and allows users to check their TuLlave card balance, integrating everything on a single platform. It has become a useful tool for people in Bogotá who use public transportation every day because it focuses on local issues and the information is confirmed by the official entity.

Moovit

- Moovit is an app that helps you plan and manage public transportation trips. It is available in more than 3,500 cities around the world, including Bogotá. This service allows you to combine different types of transportation, such as buses, the subway, cycling, and walking, on the same route. Its main strength is that it gives real-time information on schedules, arrivals, and service alerts, guiding the user step by step during the journey. It also includes features to make the data easier to understand, recommendations based on your personal use, and contributions from the community, which help keep the data up to date. Moovit is an app that helps you get around the city efficiently. It has a multimodal approach and an intuitive interface.

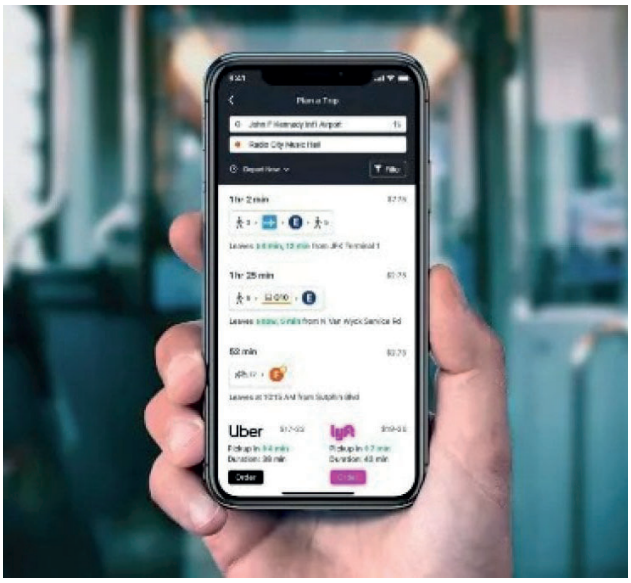
Maas

- Maas is an app designed to improve the transportation experience in Bogotá. It combines planning, paying for, and managing public transportation trips in one place. The best thing about it is that you can use your TuLlave card on your phone to pay for your bus or train ride, so you don't have to stand in line and can get on and off the bus or train faster. It also offers tools to plan the best routes, combine different types of transportation, and find nearby charging stations or stops. Maas is a local transportation platform that aims to make life easier for people in Bogotá by offering a simple way to get around.

TransmiSITP

- TransmiSITP is an app that provides detailed information on the routes and stops of Bogotá's Integrated Public Transport System (SITP). It was developed by Movilixa, and it's really good at showing the exact routes for different zones. You can also check out stops, maps, and recharge points for the TuLlave card. It even has some features that you can use even when there's no internet connection. It was designed with the SITP blue buses in mind, making it a useful and easy-to-use tool for people who travel by bus often.


Hola, ¿Qué quieres consultar?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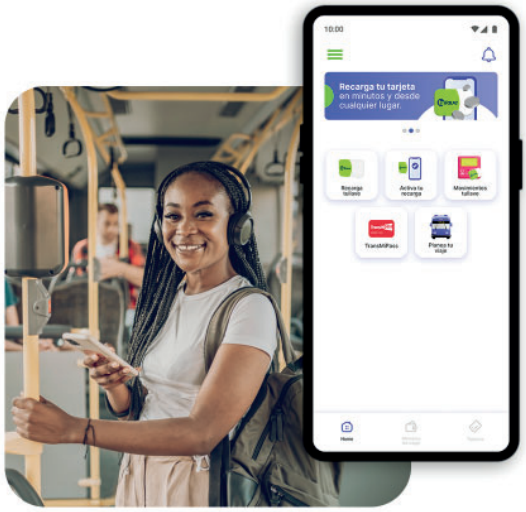

Recarga tu tarjeta
en minutos y desde
cualquier lugar.


TransmiSitp
by MoviliXa

1. Structural diagnosis and design

The first step is to clearly define the objectives of the database and the type of information it should contain in order to improve the planning and operation of public transport. This involves identifying relevant variables such as routes, frequencies, boarding points, accessibility conditions, citizen perception and informal dynamics. Based on this analysis, a territorial and multimodal structure is designed to capture both formal services (TransMilenio, SITP, taxis) and informal processes (colectivos, motorbike taxis, bicycle taxis), ensuring that the database is useful for decision-making, digital visualisation and public policy formulation.

2. Collaborative data collection

Once the structure is defined, the next step is to collect the information collaboratively, involving official entities, universities, local communities and informal operators. This stage requires the use of digital tools such as geo-referenced forms, mobile applications, GPS and social networks to map routes, schedules, critical points and travel experiences. The active participation of users and neighbourhood leaders is essential to validate the data, ensure its relevance and build a reliable base that reflects the territorial and functional diversity of Bogotá's transport system.

3. Digital integration and visualisation

With the database consolidated, the final step is to integrate it into digital platforms that enable practical use by citizens, operators and planners. This includes connecting the information with applications such as Moovit, Google Maps or local developments, allowing visualisation of routes, multi-modal route planning, receipt of community alerts and access to digital payment options. In addition, this integration facilitates real-time monitoring, citizen feedback and the generation of indicators that can guide future interventions, thus strengthening the user experience and territorial equity in the public transport system.

Data & digital integration.

The TransmiApp redesign project aims to transform the application into a comprehensive digital mobility tool for Bogotá, moving beyond simple route mapping. The central goal is to strategically integrate information from both formal (TransMilenio, SITP) and informal transport services. This move seeks to significantly enhance the user experience, facilitate better travel decisions, and promote equitable access to urban services across the city. Ultimately, the redesign is intended to position TransmiApp as an accessible, inclusive, and efficient platform for managing and planning urban mobility.

The updated application structure is focused on delivering key user-centric features. Users will gain access to Multimodal Journey Planning, allowing them to quickly and reliably combine formal systems with informal options (like taxis and local transport) to find efficient connections. Crucially, the app will provide Real-Time Information and Alerts regarding delays, route changes, or incidents, significantly boosting travel reliability. Furthermore, the development prioritizes a superior User Interface and Accessibility, ensuring the app is easy to use for people of all ages, abilities, and technology familiarity levels.

A core innovation of the new TransmiApp is the incorporation of collaborative data and actionable intelligence. It introduces a powerful Crowdsourcing Function, enabling citizens and community leaders to report incidents, validate schedules, and record accessibility issues, ensuring the database remains current and captures the previously undocumented dynamics of informal transport. This data feeds into the system, which also facilitates Digital Integration with external platforms and payment tools, centralizing the entire trip management process. By generating valuable, aggregated data, the app empowers transport planners and authorities to make evidence-based decisions that improve routes, frequencies, and resource allocation, thereby strengthening territorial equity and system transparency.

Outcome

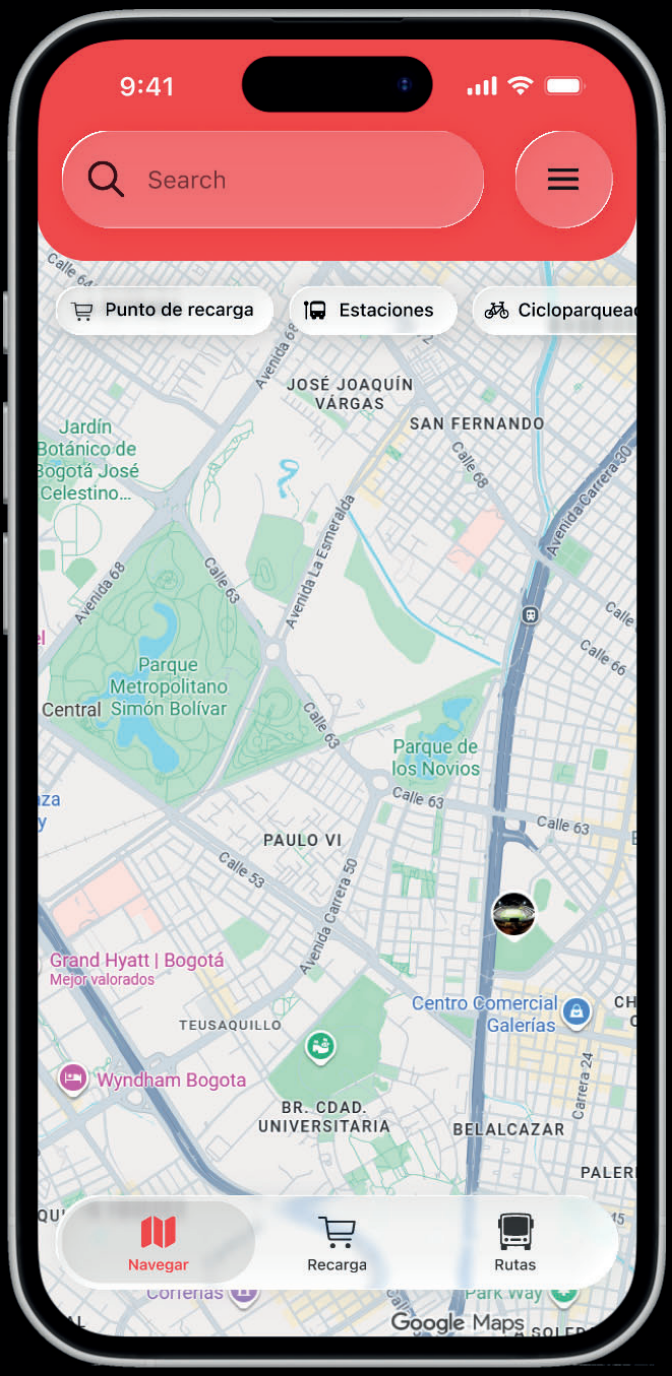
Transmiapp Redesign.

The redesigned TransMiApp introduces a simpler and more intuitive experience by focusing on three essential functions: navigation, card top-up, and routes/stops. Streamlining the app into these core menus allows users to move through the system more efficiently and reduces the visual and cognitive overload present in earlier versions.

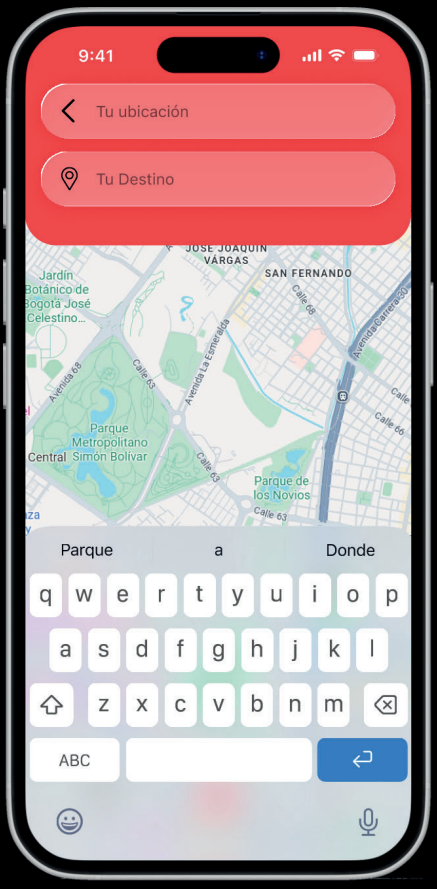
To strengthen the navigation experience, the redesign draws on reference systems such as Google Maps, taking advantage of the shared database that now enables access to information that was previously restricted. This integration allows the app to offer more accurate data, clearer directions, and smoother trip planning.

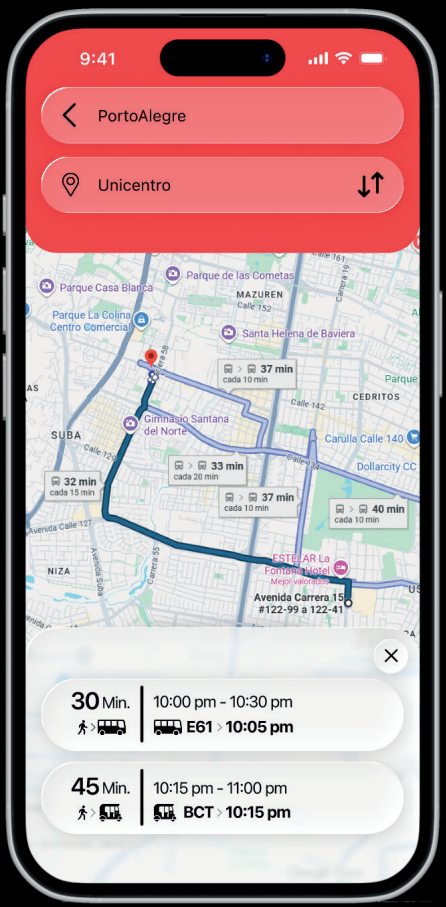
At the top of the interface, users find the search bar and the options menu, which serve as the main entry points for locating destinations, stops, stations, or system features. Just below, the app displays personalized suggestions, including nearby services, nearby stations, or TransMilenio routes that users may not have known about.

Overall, the new TransMiApp is designed to guide users with clarity, provide useful real-time information, and offer a more connected and accessible mobility experience throughout the city.



In this screen, we reposition the search bar into a format that feels familiar to users—similar to widely used navigation apps. Here, you can easily enter your current location or starting point, along with your desired destination. This intuitive layout simplifies trip planning and makes the process of finding the best route more straightforward and accessible for everyone.





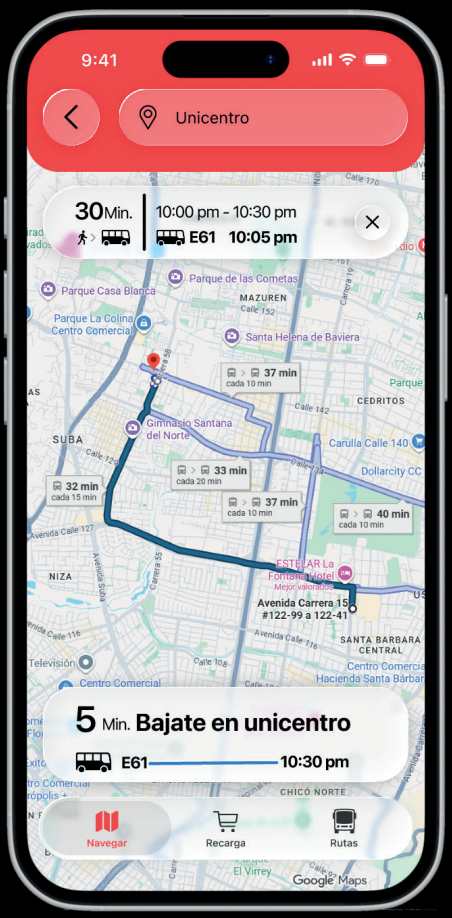
With the redesigned app, users can now access information about certain informal mobility options available in their area, such as bicitaxis. By integrating a selection of informal services that meet safety regulations, the app provides a more complete overview of real mobility choices in Bogotá. This allows users to make better decisions when planning their trips, combining formal and approved informal services to reach their destinations more efficiently.

Thanks to the continuous flow of information coming from both users and buses, the app can now offer far more accurate estimates of when each service will arrive. Instead of relying on static schedules or rough approximations, the system analyzes real movement patterns, delays, and live updates to provide a realistic picture of what is happening on the road.

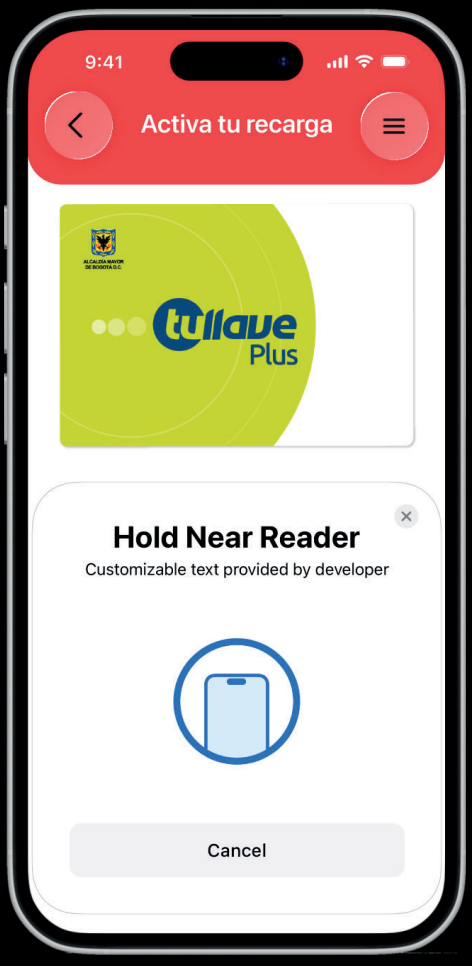
With this improvement, passengers can plan their trip with confidence. They can see when the next bus is expected to reach their stop, how long the wait might be, and whether a different route could get them to their destination faster. By knowing the right time to leave home, the office, or any other location, users avoid unnecessary waiting and make better decisions about their daily mobility.

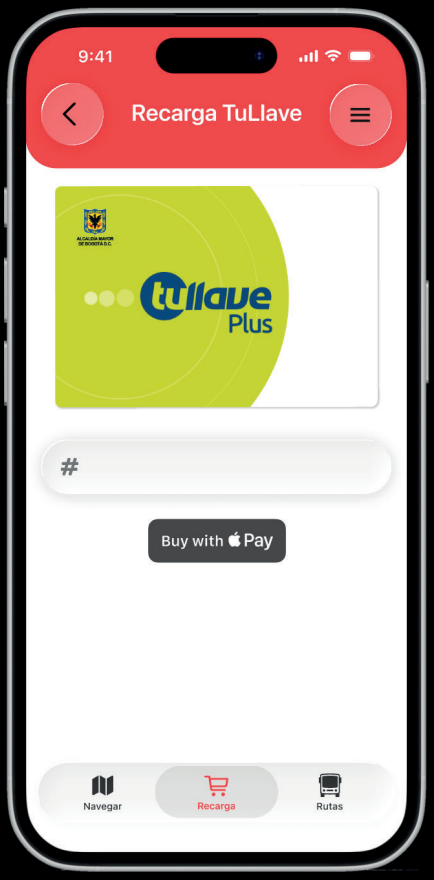
This feature brings Bogotá's transit system closer to real-time reliability, helping people move through the city with greater certainty and efficiency.

On this screen, the app introduces real-time, step-by-step travel notifications designed to help users stay oriented throughout their entire journey. By combining GPS data from both the user and the buses, the system can identify exactly where you are, when you're approaching a transfer point, and when you need to get off. Inspired by international navigation platforms like Moovit, this feature minimizes confusion by sending timely alerts, reminding you of upcoming stops, route changes, and important walking connections. With these live updates, travelers can move with greater confidence, avoid mistakes, and stay fully aware of what's happening during every stage of their trip.



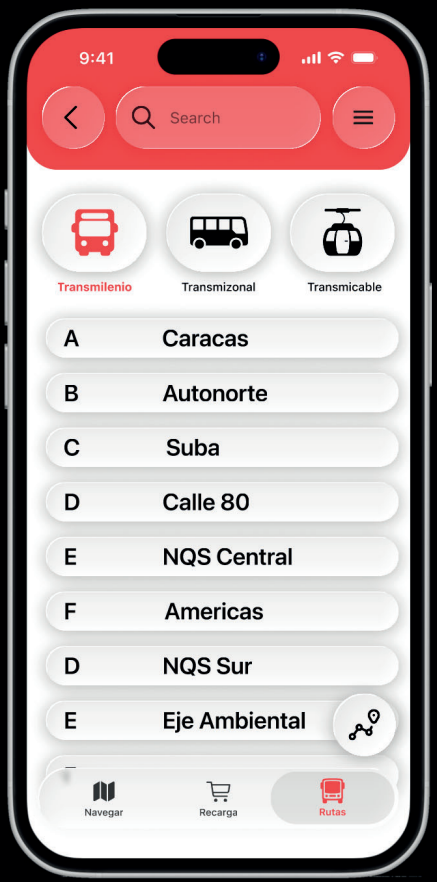
From the Recharge menu, users can now manage their transit card directly from the app with three simple and intuitive options. First, they can add funds through NFC, using their phone's built-in sensor to transfer the balance instantly—no need to visit a physical point of sale. Second, they can activate a previously purchased reload with just one tap, making the process faster and more convenient. Finally, users can review their card history, including past trips, charges, and remaining balance.





Finally, one of the strongest features of the redesigned app is the improved access to system information. From your phone, you can quickly view all the stops around you and see exactly which buses serve each one. This makes it easier to understand your options at any moment, whether you're planning ahead or navigating on the go. By keeping this information clear and always updated, the app helps users move confidently through the city and stay aware of every nearby service.

On this last screen, users can access a full overview of Bogotá's public transport network. The app displays every route across TransMilenio, SITP, and TransMiCable, organized by trunk line, service type, and direction of travel. By selecting a corridor, users can see all the services operating through it, their destinations, and their main stops. This unified map helps riders understand how the entire system connects, making it easier to plan longer trips, switch between modes, and navigate the network with confidence.



Structural improvements.

Making bus stops and stations better can have a big effect on city life in Bogotá. It can help people move around the city better. It can be especially helpful when the new bus stops and stations are designed to be easy for people to use, safe, and that everyone can use them. Many stops and stations in the city have lacked basic elements that make it comfortable for passengers, help them find their way, and ensure their safety. Adding new things like street furniture, clear signs, lights, or technology changes these spaces into more useful, safe, and easy-to-reach places. This makes them more important for transportation and the city as a whole. For example, installing roofs, benches, and clear signs at bus stops makes it much more comfortable and easy for passengers to get around, especially in the outskirts of the city where informal transportation is common. Roofs protect people from rain and sun, while benches that are easy to get on and off allow people to wait for vehicles more comfortably. This is especially important for older people, pregnant women, and those traveling with children. Clear signs help riders understand which routes pass through the stop and how to connect to other lines. This reduces uncertainty and makes it easier to use public transportation in combination with other forms of transportation.

Also, adding safety features like solar lighting, panic buttons, or community cameras can make people feel safer and prevent theft, harassment, or dangerous situations at bus stops and train stations. Technology makes it possible to provide real-time information through route maps, screens with estimated arrival times, or even QR codes that connect to digital mobility applications. These tools make trip planning easier, improve the reliability of the system, and connect different types of transportation, offering users a smoother and safer experience.

An important part of these structural improvements is making sure that they are easy for all users to access. Making sure that public transportation is accessible for everyone is important. Installing ramps, tactile signs, pictograms, or handrails can help make this happen. These changes can help people with disabilities, older adults, and children use public transportation more easily. These measures make it easier for people with disabilities to get around. They also make public spaces more dignified and strengthen the feeling of justice in the city. When users feel that the system is designed for them, they trust it more. They also feel like they belong and that they are responsible for the public spaces and transportation they use.

Structural improvements.

When they are well-equipped, these places can become real meeting points, sources of information, and places of protection. This is especially important in a city like Bogotá, which is very diverse and fragmented. These spaces help people get around and also become places where people can connect with each other. Investing in good infrastructure, with a focus on safety, accessibility, and how easy it is to use, can make people like public transportation more. This can increase confidence in public transportation, encourage people to use it, and help create a more fair and sustainable system.

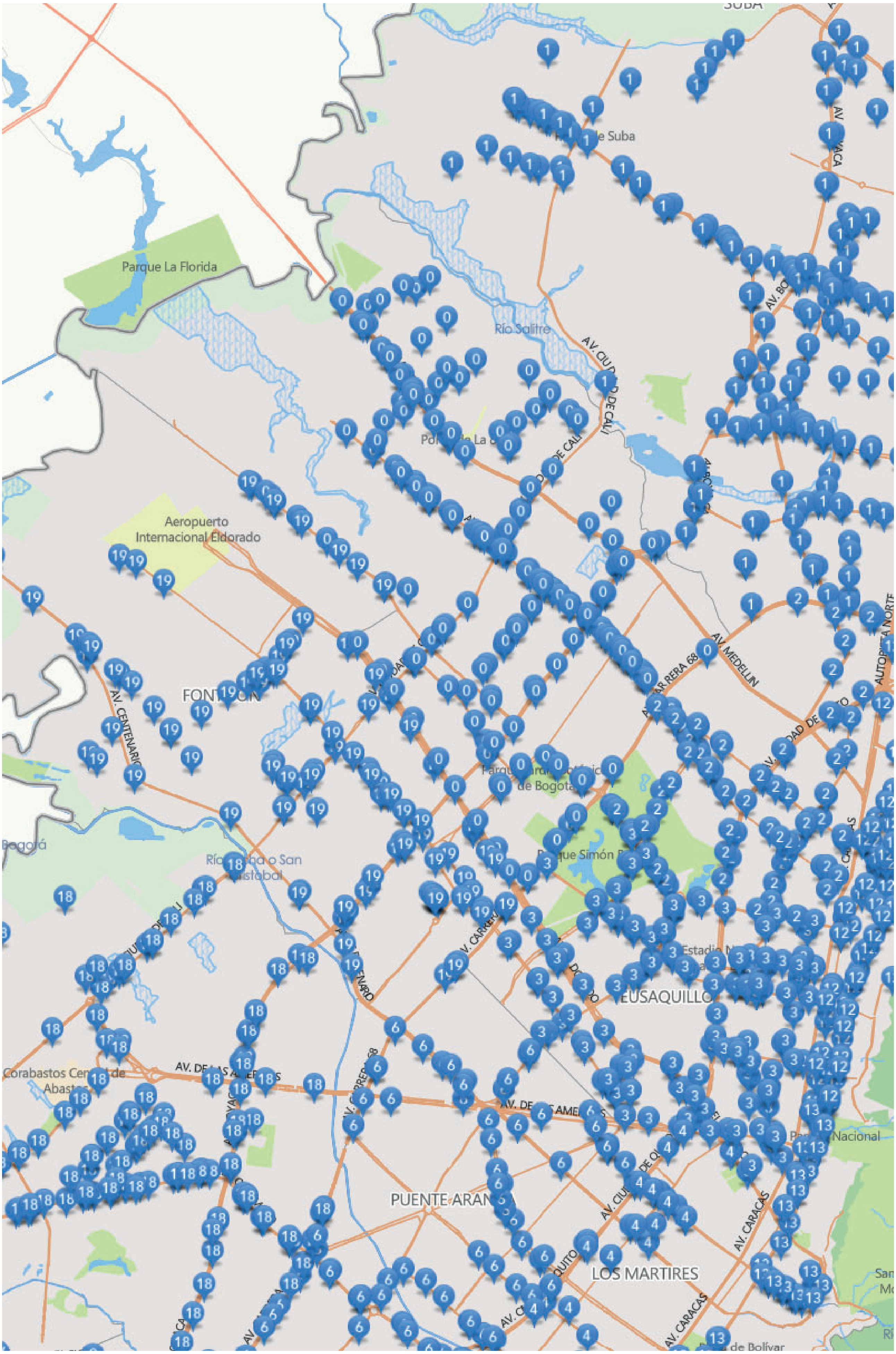
Making improvements to bus stations should be understood not only as physical changes, but as a complete plan that combines comfort, safety, accessibility, and information. By making these spaces useful, open to all, and reliable, the relationship between citizens and the transportation system is strengthened. This also promotes fairness in the city and encourages the creation of a better and more humane way for people to get around Bogotá.


SITP
SITP

1. Diagnosis of the territory

The first step towards making structural improvements is doing a territorial diagnosis. This diagnosis should include a physical map of the existing infrastructure, such as roofs, benches, signs, lights, and accessibility. It should also include observations of passenger behavior at different times and in different situations. It is also important to hear the voices of citizens through surveys, interviews, and workshops, especially in rural areas where there is more vulnerability.

By comparing this information with data on mobility, safety, and operation of the formal system, clear criteria can be established for intervention at stops and stations. This will prioritize those that require urgent improvements in comfort, safety, and inclusion. This approach, which is used in many different areas and sizes, allows for the design of solutions adapted to Bogotá's urban diversity and strengthens the link between infrastructure, user experience, and territorial justice.


Parque La Florida
Aeropuerto
Internacional Eldorado
Río Salitre
AV. MEDELLIN
LOS MARTIRES
AV. CARACAS
AV. CARACAS

The bus stops.

Flag Bus stop

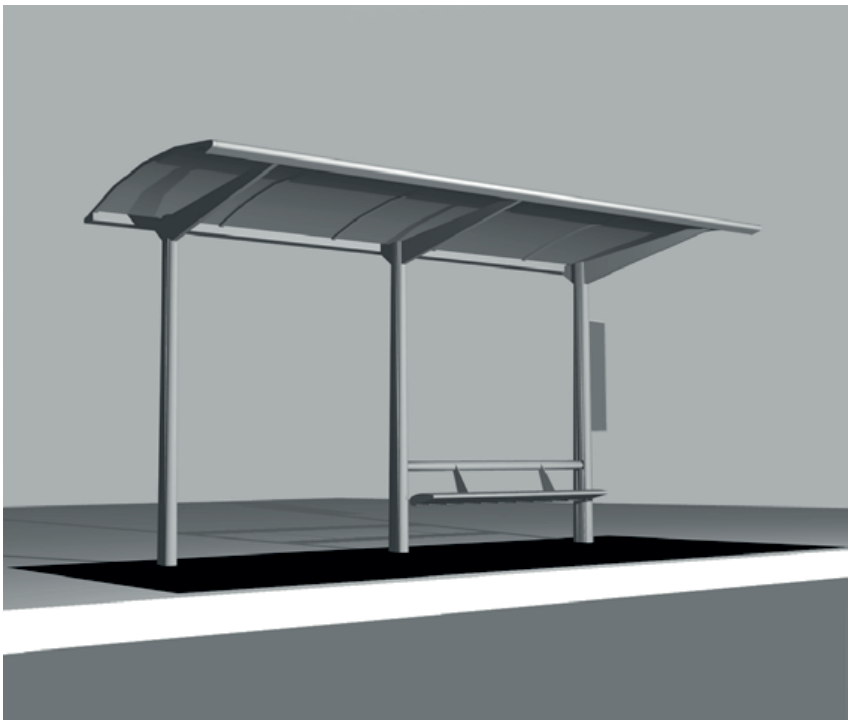
Flag stops are public transportation stops, especially for the SITP and traditional buses. They have minimal infrastructure and are places for passengers to board and alight on the road. You can find them at intersections or in areas where a lot of people go by. They are marked with a flag, pole, or sign. Unlike formal stations, these stops don't have roofs, benches, or protection from the weather, which makes them less comfortable and safer for users. Also, the bus doesn't always come at the same time, so sometimes you have to wait a long time. While they allow for more transportation options in areas where there are no formal stations, the passenger experience is affected by the irregularity of the service and the lack of adequate infrastructure.

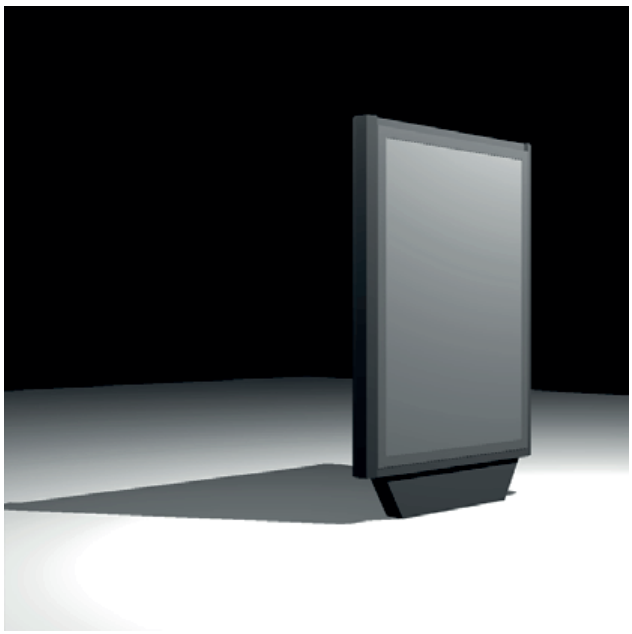
M-10.

The M10 bus stops in Bogotá are special structures designed to make it safer and more comfortable for passengers compared to traditional bus stops. They have a galvanized steel structure, sheet metal or transparent polycarbonate roofs, glass or acrylic side panels, reinforced concrete benches and bases, as well as lighting and route signs. These features protect passengers from the weather, make them more visible, and help manage traffic. However, despite their advantages, M10 bus stops have significant limitations. They are often unable to meet high user demand. They are not well-maintained, and some elements, such as benches or roofs, may be in poor condition. Also, sometimes bus stops are in the wrong place, and buses don't come often enough. This makes it hard for people to get on and off the bus safely and comfortably.

Panel publicitario

In Bogotá, many bus stops have advertising panels that are part of the city's infrastructure. These panels are either flag-type or M10-type. These panels are usually made of acrylic or tempered glass, with a metal structure to hold the advertising securely and withstand the elements. In addition to their commercial function, some of them have internal LED lighting. This lighting allows for visibility at night and makes them more visually appealing. However, advertising panels can cause problems. They can block signs for roads or traffic. They can attract graffiti or be damaged by vandals. They can distract drivers and pedestrians in busy areas. Despite this, they are considered an important source of money for maintaining bus stops.





2. Plan for Intervention.

After doing a participatory territorial diagnosis to identify the physical, social, and operational conditions of stops and stations in Bogotá, the next step is to design a prioritized intervention plan.

This plan should focus on the most important areas based on things like safety, state of disrepair, or how often they're used, and decide on ways to improve them. These improvements could range from simple things like roofs and lights to more extensive solutions that include signs, panic buttons, or technology.

It's also important to check the proposals with local communities to make sure they're relevant, owned by the community, and will last. This will turn each bus stop into a useful, safe, and dignified part of the public transportation system.

3. Implement and monitorize

The third and final step in improving the structure of bus stops and stations in Bogotá is to put the changes in place and keep an eye on them. This will make sure that the improvements meet the needs we've seen and stick around over time.

This means doing the work in the order that is most important, getting communities involved in putting things up and owning them, and setting up ways to check the impact of each step.

It's also important to record the lessons learned, adjust the prototypes based on the situation, and create quality, safety, and user experience indicators. This way, the improvements are not only physical, but also social, sustainable, and can be used in other areas of the city.


UMV
CAT
UMV
B.O.A.L

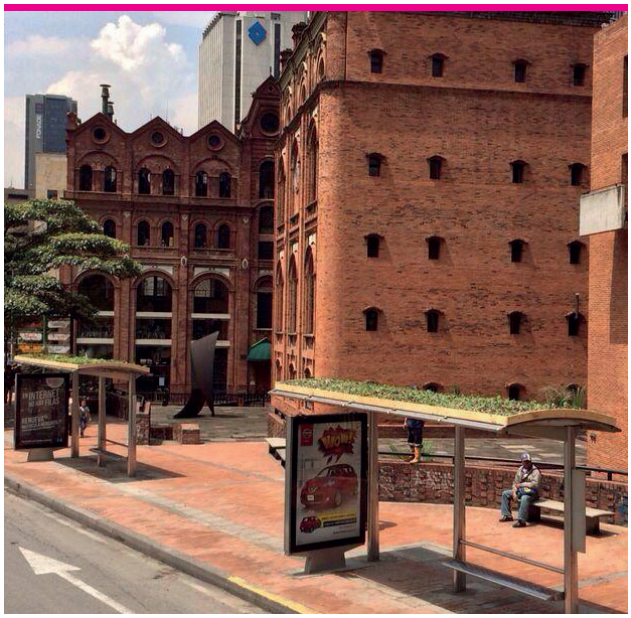
New developments and proposals

- Bogotá is undergoing an ambitious transformation of its public transportation system, seeking to consolidate mobility that is more sustainable, efficient, and inclusive. More than just a means of getting around, the Integrated Public Transportation System (SITP) and TransMilenio are evolving into platforms for innovation that directly impact the quality of life for residents.

  The spearhead of this modernization is the massive electrification of the fleet. With the arrival of hundreds of new electric buses for the SITP and TransMilenio trunk lines, including the pioneering electric dual-articulated buses (a globally unique typology), the Colombian capital is positioning itself as a regional leader in zero-emission mobility. These vehicles not only drastically reduce air pollution and urban noise but also incorporate advances in accessibility and comfort, such as inclusive seating (for caregivers, larger sizes, etc.), USB ports, and a more robust video surveillance system.

  The infrastructure is also adapting to the digital and ecological era. The system is moving toward the integration of technological tools that improve the user experience, notably through smart stops and stations which provide real-time information on routes and travel times. Furthermore, safety is being reinforced through the implementation of panic buttons in stations and buses, connected directly to authorities to strengthen security and ensure immediate emergency response. Finally, the commitment to the environment is visible in proposals for ecological stations and sustainable depots, which involve renovating infrastructure with sustainability criteria to minimize environmental impact and efficiently manage resources, such as charging the new electric fleet. Essentially, these developments reflect Bogotá's vision for a system that is technologically advanced, environmentally friendly, and people-centered, ensuring more equitable and safer mobility for all citizens.


inDrive
039A06
Zonas TransMilenio
inDrive
Elige tu precio. Elige tu conductor. Elige tu destino




Botón de pánico
BOGOTÁ

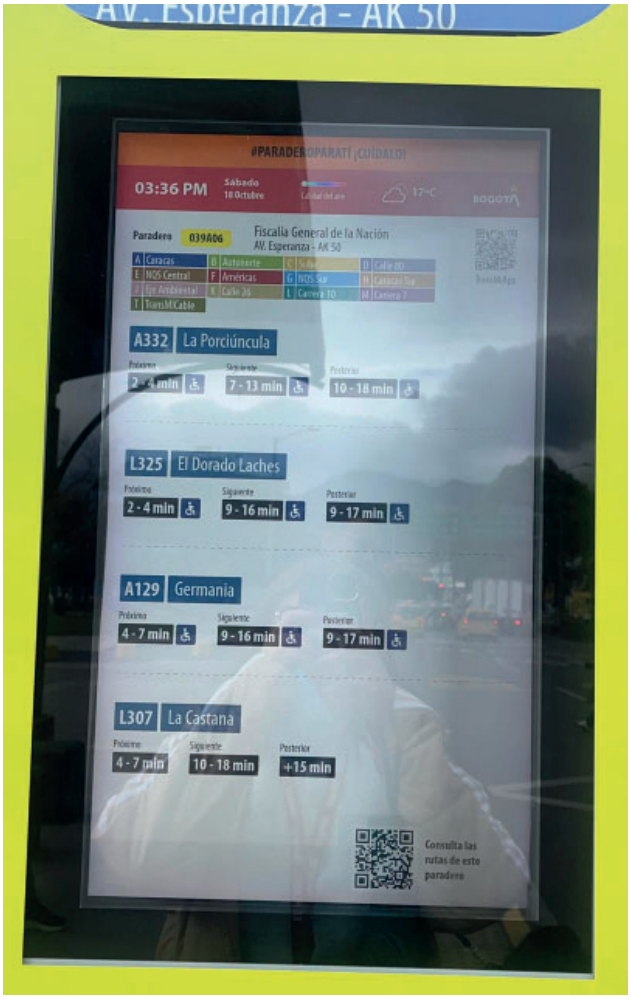

Torino
Marcopolo
BYD
Z67-7046

Bus stops.

New bus stops have been added.
The new bus stops in Bogotá have technology like digital information panels, charging modules, WiFi hotspots, and solar panels. This is an important step for the city because it is making public transportation better for the people who use it. This project is part of a larger plan by Bogotá to improve city transportation through the use of technology. This technology gives people real-time information about routes, how often services are available, and how long people have to wait. This makes it easier to plan trips and makes people happier (Bogotá City Hall, 2024; Largo, 2024).

Solar panels are being used to power these modules. This is an example of using renewable energy in urban infrastructure. These changes help reduce greenhouse gas emissions and save money. They also support Bogotá's sustainability goals and climate action strategies (Bogotá City Hall, 2022). Also, having WiFi and charging points makes it easier for people to connect and be part of the digital world. This is especially important in areas where internet access is limited.

Overall, these improvements make Bogotá's public transportation better by combining practicality, environmental friendliness, and the experience for the people who use it. The new bus stops are designed to be energy efficient, safe, and easy to access. They are part of a vision for public spaces that encourage social interaction, technological integration, and environmental awareness. This comprehensive approach makes Bogotá an important example for other Latin American cities that want to use smart and green ways to manage transportation.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L307 La Castana
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Consulta las rutas de este paradero


Wi-Fi
USB


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inDrive
Elige tu precio. Elige tu conductor. Elige tu destino

EcoBus stops

One of the most innovative ways to combine transportation and the environment in Latin America is by installing green bus stops in Bogotá. These structures add plants to the roofs of bus stops. This helps reduce the impacts of urban climate change and improve the environmental quality of public spaces. At first, eight bus stops that were good for the environment were put in neighborhoods like Kennedy, Engativá, Fontibón, Santa Fe, and Chapinero. These bus stops were put in areas where a lot of people walk or drive, like Carrera 7ma and Avenida El Dorado (La República, 2014a). This model of urban intervention aims to change how people view the environment and encourage citizens to take ownership of public transportation waiting areas.

From an ecological perspective, bus stops with green roofs offer multiple environmental benefits. Green plants help to keep rainwater in the ground. They also keep the ground cooler, catch tiny particles like dust, and soak up some heavy metals. This helps to reduce the effects of air pollution and the urban heat island effect (La República, 2014b). These actions align with the district's green infrastructure policies, which are supported by the District Environment Secretariat. This organization has encouraged the creation of green roofs and vertical gardens in different areas of the city. It has also integrated sustainability criteria into urban planning (District Environment Secretariat, 2023).

Green bus stops serve two important purposes. They help the city's transportation system work well. They also help make Bogotá more environmentally resilient. These actions show that the District is working to achieve the Sustainable Development Goals (SDGs), especially those related to sustainable cities, climate action, and urban health. These projects show how small changes to buildings and spaces can make a big difference in creating a more livable and environmentally friendly city.


Proyectos de
CASTELLANA EMPRESARIAL
Entregado 100%
OFFICE
POINT

Panic Button.

The panic button is a new feature in the TransMilenio S.A. system in Bogotá, Colombia. It is a big step forward in public safety. It helps prevent and respond to cases of harassment and gender-based violence on public transportation. This device was first installed as a pilot project at the Universidades – City U station. It has four buttons in two carriages. People can use the buttons to quickly tell the TransMilenio Control Center about an assault. The Control Center will then send help right away. This is part of the district's plan to create safer and more inclusive spaces for everyone, especially women and people with disabilities.

The panic button has the potential to be useful, but it has also revealed problems with how it is used and with the social aspects of its use. According to recent reports, the tool has been used many times, but it has also gone off 92 times in the wrong way. This shows that people need to know more about how to use the tool the right way (El Espectador, 2025). These results suggest that technology alone does not guarantee a substantial improvement in safety. It must be part of a broader public policy that takes into account educational, cultural, and institutional management factors.

In this regard, the District Secretariat for Women and TransMilenio have pointed out that the success of the program depends on its progressive expansion to other stations and on coordination with educational campaigns that promote reporting and accompany victims of harassment. The panic button, as a technological and social innovation, can be considered a significant step toward building safer, more equitable, and more reliable transportation for the citizens of Bogotá (Actualidad Colombia, 2025).


Botón de pánico
Botón de pánico
BOGOTÁ

Electric Buses.

New electric buses in Bogotá

The addition of a new fleet of electric buses in Bogotá is a big step in the transition to sustainable, low-emission urban transportation. TransMilenio S.A. has announced that it will buy 101 new electric buses that do not pollute the air. This will include 25 articulated-dual units, which are the first of their kind in the world. These buses will start operating in the first half of 2026 (Bogotá City Hall, 2024a). This project is part of a larger plan to modernize the system. This includes updating the fleet with 269 new electric buses as part of phase VI of the Integrated Public Transport System (SITP). These buses will reduce about 26,000 tons of CO2 per year once they start operating (Bogotá City Hall, 2024b).

The electrification of the fleet is good for the environment and technology. It reduces air and noise pollution, improves energy efficiency, and makes the service better. The new buses have advanced accessibility systems, Wi-Fi, USB ports, security cameras, and real-time monitoring. This makes users feel safer and more comfortable (Bogotá City Hall, 2024c). The electric charging infrastructure will be combined with solar panels and smart management systems. This makes Bogotá one of the Latin American cities most committed to electromobility and urban sustainability.

Finally, the project is an example of the national government and the capital district working together. It will invest about 1.5 trillion Colombian pesos to buy vehicles and adapt yards and charging stations (National Planning Department [DNP], 2024). This joint effort shows a long-term plan to update the vehicle fleet and improve the public transportation system. This will be done in a way that is efficient, fair, and responsible to the environment. This is in line with the goals to develop in a sustainable way and to be carbon neutral by the year 2040.


Marcopolo
BYD
Z67-7046
KYP 342

1. Territorial diagnosis

Physical mapping of existing infrastructure - such as roofs, benches, signage, lighting, and accessibility - along with observations of passenger behaviour at different times and in different contexts. In addition, it is essential to collect the voice of citizens through surveys, interviews and workshops, especially in peripheral areas where territorial vulnerability is more evident. This multi-sectoral and multi-scale approach allows for the design of solutions adapted to Bogotá's urban diversity and strengthens the link between infrastructure, user experience and territorial justice.

2. Intervention Plan

After conducting a participatory territorial diagnosis that identifies the physical, social, and operational conditions of stops and stations in Bogotá, the next step is to design a prioritised intervention plan. This plan should prioritise critical points according to criteria such as insecurity, deterioration or high demand, and define improvement typologies adapted to the context: from basic interventions such as roofs and lighting, to comprehensive solutions with inclusive signage, panic buttons or digital integration. In addition, it is key to validate the proposals with local communities to ensure relevance.

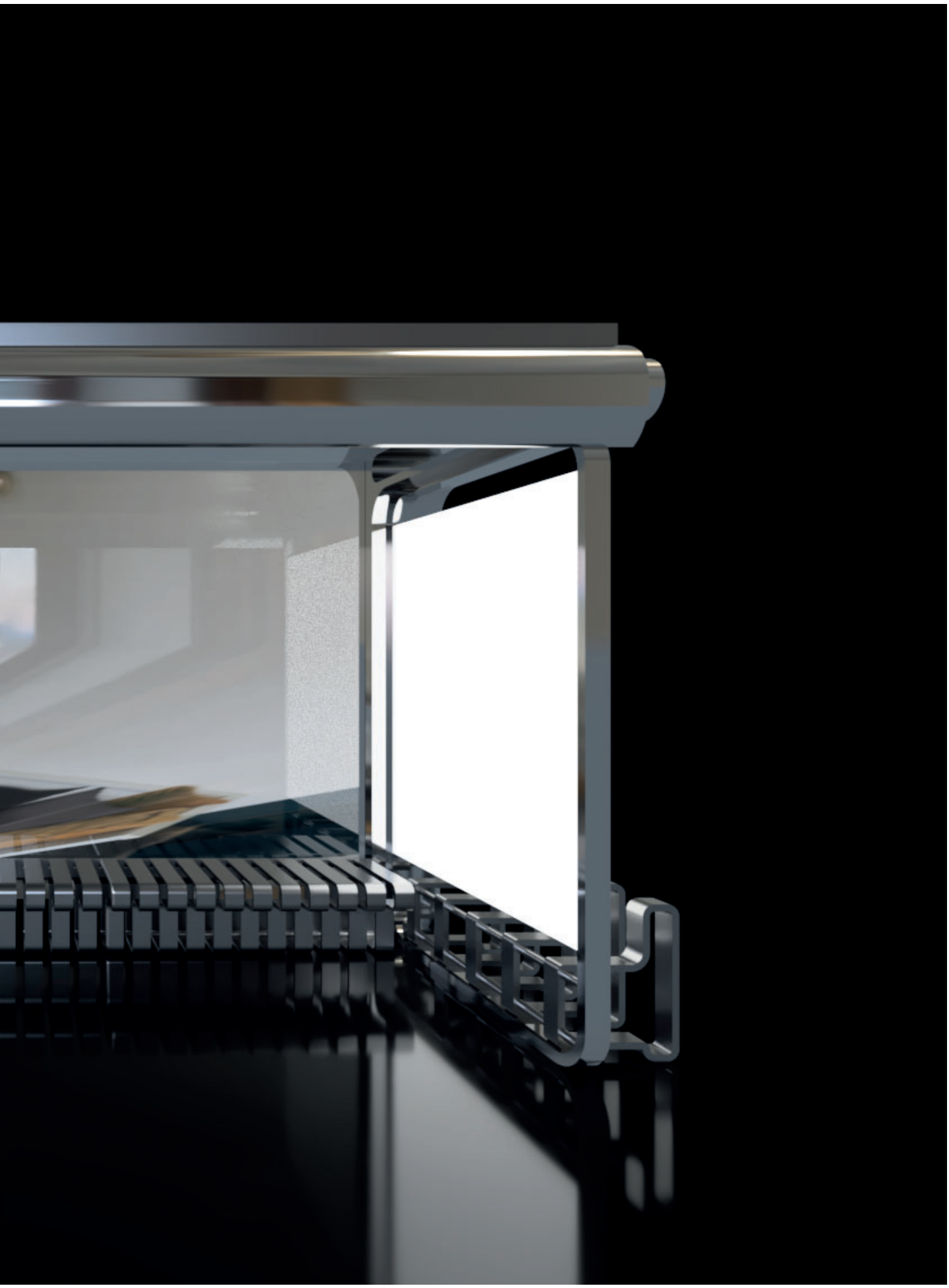
3. Implement and monitorize

The third and final step in improving the structure of stops and stations in Bogotá is to implement and monitor the interventions, ensuring that the improvements effectively respond to the needs identified and are sustained over time. This implies executing the works according to the prioritised plan, involving communities in the installation and ownership process, and establishing monitoring mechanisms to evaluate the impact of each intervention.

Structural improvements.

Our proposal is a bus stop that can be adapted to different areas of Bogotá and the needs of its people. The key idea behind it is something called “modularity.” This means that the bus stop can be built, expanded, or reduced using different parts that can be easily put together or taken apart. This design logic allows the infrastructure to adapt to different urban and social contexts, optimize resources, and ensure efficient, safe, and durable installation.

Outcome



Key components.

The structural module is the most important part of the system. The whole structure is made of stainless steel, a material chosen for its strength, durability, and low maintenance in the face of weather conditions and continuous use. Steel makes the bus stop stable and long-lasting. It also makes the bus stop look modern and in line with an urban design that is good for the environment. The parts are put together using a modular joint system that allows components to be replaced or expanded without taking the whole structure apart. This means that the same structural base can be used in different sizes or with different features, depending on how many passengers there are or where the bus stop is.

The roof or cover module is designed to protect and function. It is also made of stainless steel and has solar modules that use natural light during the day to power the nighttime lighting system. Its design allows for different roof sizes. It can be a light and compact structure in areas with less traffic, or a wider and more continuous one in areas with more traffic. This component protects people from rain and sun and makes spaces more comfortable and safer.
The lighting system is part of the structural and roof module. A solar-powered, self-operating LED lighting system is suggested. This system is sure to be energy efficient and will keep working even in places with poor electrical systems. The light points are placed in key spots to light up the inside of the stop and the area around it, ensuring there are no dark areas that might make people feel unsafe. This component can include motion sensors and timers that help conserve energy by adapting to how the space is used and reducing the environmental impact.
The seating module is an important part of the design. It is designed to be comfortable, flexible, and able to be used in different sizes. It is made up of stainless steel plates that can be adjusted to different sizes as needed and to fit different environments. In areas with a lot of people, you can put in more seats by adding several modules in a row. In small spaces, you can use a version that is smaller and more compact. The seats are designed to support good posture while waiting, and their durable material makes them easy to clean and maintain in outdoor conditions. The design is also flexible. It can be set up in different ways, depending on the location and how many people will be using it.

The modular and replicable structure of the stop allows for gradual and adaptable implementation. In central or high-density areas, you can install the complete system, including all the modules: wide roof, extended furniture, smart lighting, and digital signage. In intermediate or peripheral areas, the structure can be reduced, keeping only the essential elements—the roof, basic furniture, and solar lighting. This flexibility makes it easier to plan the system at the local level. It allows each community to receive infrastructure that is the right size for them and that meets their needs without losing the things that make it look good or work well.
Its design can change to fit the needs of different parts of Bogotá, making it fair for everyone and helping people feel like they have a right to public spaces. This modular system is more than just a bus stop. It represents a new way of building cities. It is efficient, inclusive, and ready to evolve along with urban dynamics.

Key components.

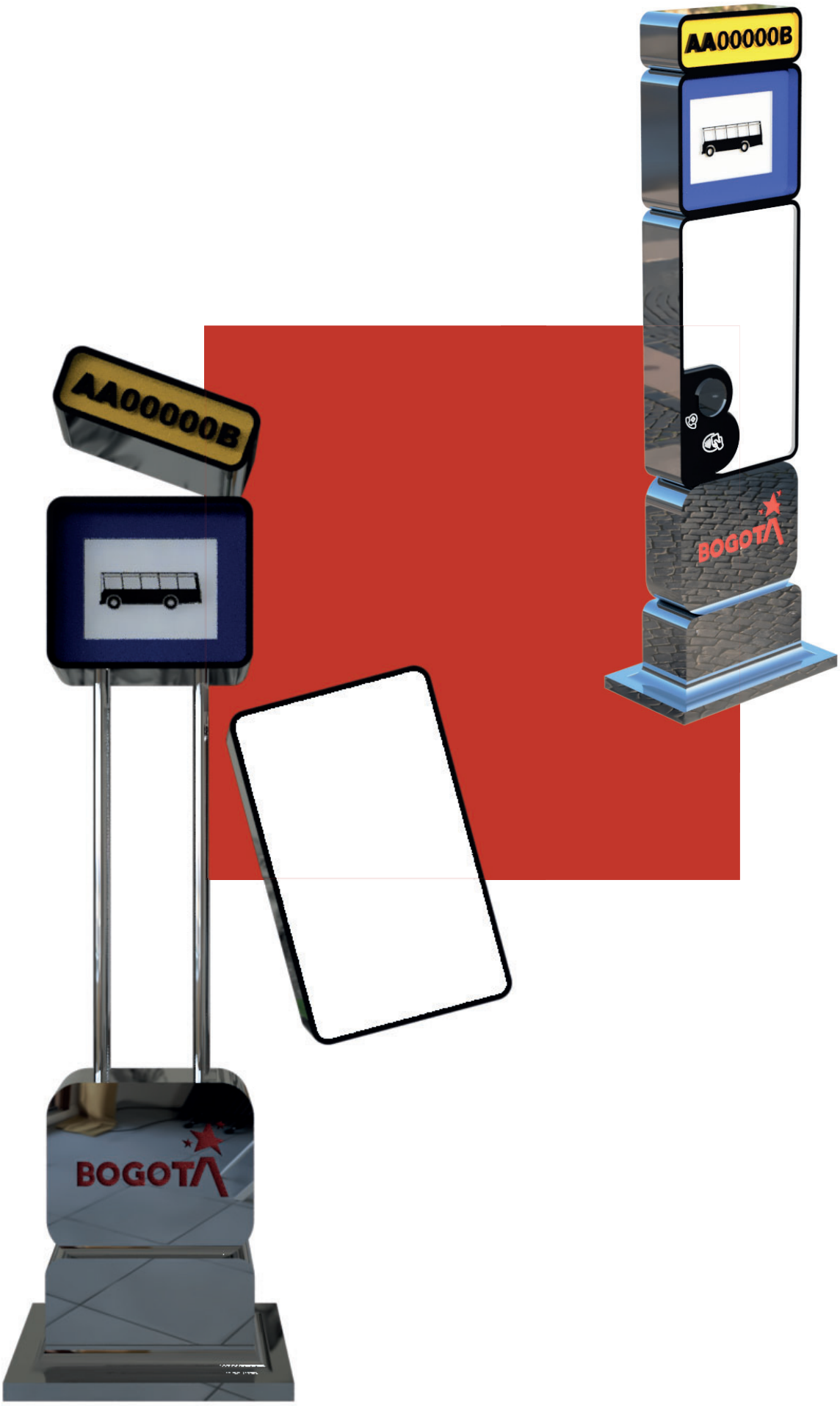
There are two ways to set up the information module. The first and easiest way is to use a modular flag or totem-type stop.

In the first version, all important system information is organized vertically and compactly, allowing for clear, direct, and accessible reading for users. It shows the route, the stop numbers, and other important information to help passengers know where to go.

This design is inspired by the concept of "bento boxes," which are known for being practical and flexible. Like a bento box, you can add, move, or remove modules to suit your needs. This flexibility allows the stop to be adapted to different urban contexts while maintaining a coherent and functional structure.

The design includes a touchscreen LED display that allows direct interaction with the user. This facilitates the consultation of schedules, arrival times, connection maps, and real-time system alerts. The Bogotá logo is displayed at the bottom of the totem, right where the base is.

The module also has an NFC reader. This allows users to check their card balance or add money to their card before entering the system. This makes the process more efficient and reduces waiting times at the station entrance. The stop has a sensor that can detect when a bus arrives. It sends this information to the next stops right away. This system lets passengers track buses more accurately, so they can plan their trips better, decide whether to wait or take a different route, and so on.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Key components.

The second configuration of the information module builds on the Totem configuration, but it takes a more integrated and expansive approach by putting the digital display directly onto the main structure of the bus stop. This change makes it so that the shelter can have a bigger screen. This will make it so that people waiting under the shelter can see better, get to it more easily, and use it more easily. The display is part of the main structure of the bus stop, which makes the bus stop look and work better as a whole. This combination of architecture and technology makes it easier for passengers to use.

In this setup, the Totem element stays in place and shows the stop number, route list, and important signs. This helps people recognize and use the system the same way across the city. However, the main touchscreen LED display is now part of the structural module itself. It provides real-time route updates, arrival predictions, safety alerts, and service announcements. Its larger size makes it easy to read from far away and lets many people use it at the same time without getting stuck.
This setup also puts the NFC reader inside the main part of the stop. This lets passengers check their balance or activate their recharge travel card right away. This feature makes it easier for passengers to move through the airport and helps them get on the right train more quickly. Additionally, a smart sensor embedded in the structure detects when a bus arrives at the stop and transmits live data to subsequent stops along the route. This creates a real-time information chain that keeps users informed of the bus's location. This helps them plan their trip more easily or decide whether to wait or switch to another way to get around.

Key components.

The safety module is a key part of the bus stop system. It is designed to ensure safety, prevent incidents, and facilitate communication in public transportation. It combines technology and space to make it safer and more reliable, especially in places where people feel unsafe.

Lighting is one of the most important parts of the module. High-efficiency LEDs and solar energy ensure that the stop is well lit at night. This improves visibility, discourages antisocial behavior, and increases the feeling of safety and comfort for users.

The module also includes a communicator or emergency telephone. This provides a direct line of contact with the city's response network or the transport operator. This makes sure that people without smartphones or internet can get help right away.

The building has surveillance cameras all over it. These cameras can see in the dark and have wide coverage. These cameras can monitor the environment at all times, which improves security and provides useful information for managing the system and investigating incidents.

The panic button is the most important part of the module. It activates all the other functions. By pressing it, the user can talk directly to the authorities, turn on audible and visual alarms, and tell the security system to intervene according to how urgent the situation is. This button has two types of interaction:
Press and hold for 10 seconds to activate a direct call to the CAI. This allows the authorities to assess the situation and coordinate assistance immediately. The bus stop has a microphone and speakers built in, so they can communicate with you.

Press it five times in a row. This will make an urgent alert that activates visible and audible alarms. It will attract the attention of people passing by. It will also notify the authorities to send a patrol right away.

In both cases, the system sends live images to the CAI, which helps them decide if the button was pressed by accident or if it's a real emergency. These images also give more information to help decide how to keep the user safe.


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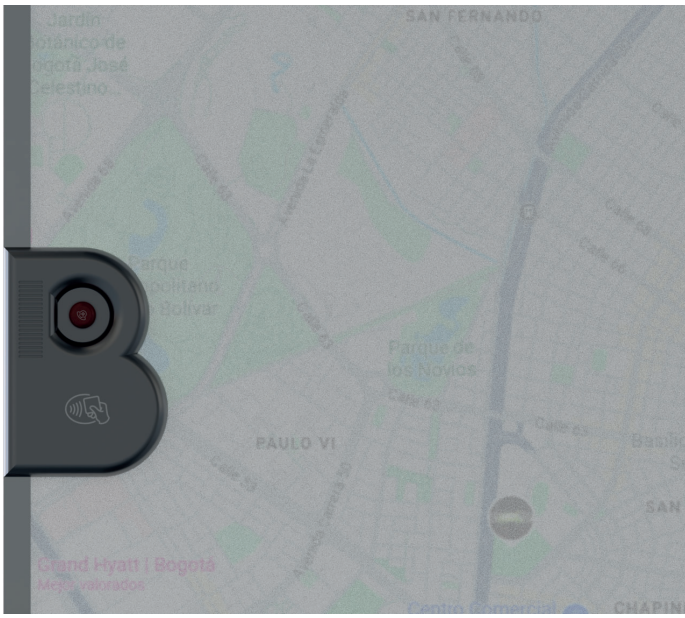
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Key components.

Advertising

The advertising module is an extra part of the bus stop that is designed to make money and look nice without getting in the way of how the bus stop works and keeps people safe. This module allows for the installation of advertising panels, which can be either static or digital, and which can be harmoniously integrated into the structure of the bus stop.

The advertising panel has many benefits. It can share commercial or institutional information, which can help pay for the upkeep of the infrastructure. It can also be used to communicate with citizens, provide transportation alerts, or share educational messages about mobility and safety.

It was designed using the same modular logic as the bus stop. This module can be added, removed, or rearranged according to the needs of the location, the flow of people, and the opportunities for advertising. It's designed to fit in with other elements on the bus, like signs, information screens, and safety features. This helps keep the bus running smoothly, while also making sure it's easy for riders to get to where they need to go.

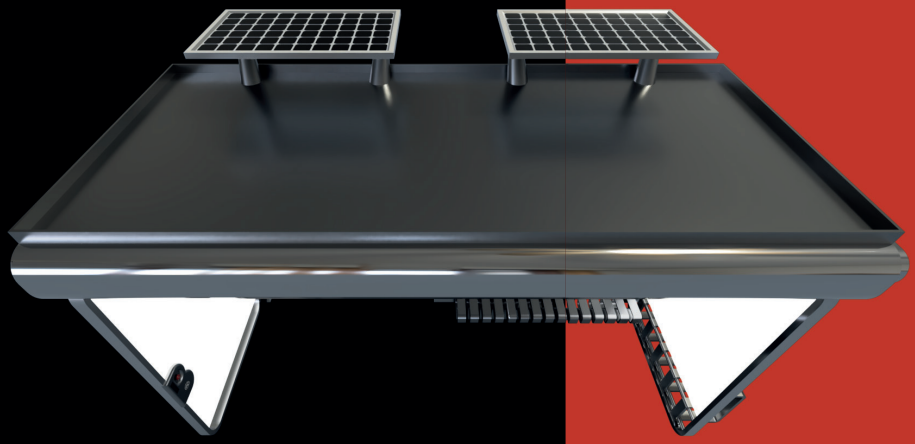

TRANSMILENIO

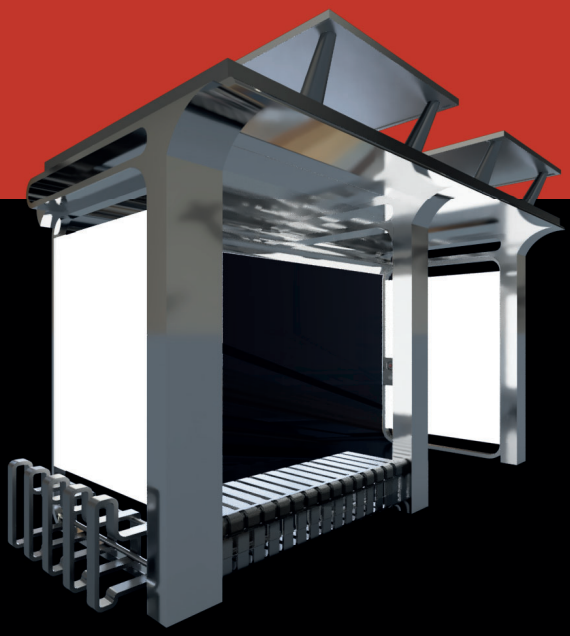
Key components.

Complementary

The extra parts are designed to add more features and comfort to the stop, making it a more attractive, sustainable space that works well with the city and its different ways of getting around. You can add or remove each of these modules as needed, following the system's modular logic.
Internet connection and charging ports: This module lets users access the internet and charge their mobile devices while waiting for transportation. Having public Wi-Fi and charging ports makes it easier for users to plan trips, talk to each other, and use travel apps.
Green spaces and plants: Having plants around makes the area look better, is better for the environment, and makes people feel better. It can reduce stress, improve the air quality, and make the area more pleasant. The plants are added to the structure in pieces, which can be changed to fit the size of the stop and the light and space conditions of each location.
Solar panels: This module uses solar energy to power lights, digital screens, and other systems at the stop. This helps to use energy more sustainably and use less energy from the public grid.
Bicycle parking/Tembici station: This component allows users to securely leave their bicycles or take shared bicycles directly from the stop. Integration with systems such as Tembici strengthens the urban mobility network and makes it easier to combine public transportation and active transportation.

Together, these modules change the stop into a useful, lasting, and connected space. They will offer comfort, safety, and other services that improve the user experience and encourage different kinds of transportation, inclusion, and city sustainability.





Conclusion.

Bogotá presents itself as a landscape of parallel realities, where each sector fights its own battles without engaging in dialogue with others. This fragmentation has created a city that expands in isolation, where state and citizen initiatives operate on divergent paths, missing the opportunity to build substantial collective value together.

However, this thesis concludes that the greatest opportunities for transformation lie within the very fissures of this fragmentation. Current campaigns hold immense potential, yet their success relies radically on inter-institutional and collaborative management. It is imperative to shift our focus toward those invisibilized actors—those who, operating at the margins of the State, have sustained their own dynamics of organization and survival.

By widening our lens to a more holistic and general perspective, we find that integrating these "peripheral" actors with formal institutions is not merely an option, but a fundamental prerequisite for generating profound change. Bogotá's true strength lies not in its isolated components, but in its capacity to recognize and integrate itself as a diverse, unified whole.

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