Sustainable Urban Transport in Latin America

Assessment and recommendations for mobility policies

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Sustainable Urban Transport in Latin America

Assessment and recommendations for mobility policies


Banco de Chile
Joie infanti

Contents

Introduction

As the central importance of mobility to issues such as equity, climate impact and health is increasingly recognised, sustainable urban transport is becoming ever more relevant throughout the world. In Latin America and the Caribbean in particular, there are multiple urban mobility challenges to be addressed, requiring implementation of effective policies and innovative ideas. This publication will explore challenges and opportunities specific to the Latin American context, with the aim of providing guidance on how to improve mobility conditions for the region's urban residents and contribute to sustainability targets.

The importance of sustainable transport has been established in numerous global agreements. The Sustainable Development Goals, established in 2015 as part of Agenda 2030, include target 11.2; which states the need to *"provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons"*. The Paris Agreement, reached on the same year, centres on the need to ensure that the increase in temperature is *"well below 2°C"*, an objective for which low-carbon transport plays a crucial role. Finally, the New Urban Agenda, defined in Quito in 2016, specifies issues on road safety, walkability, cycling and ensuring access to the city. Policies that advance sustainable mobility can therefore count on global support, which includes access to development funds, expertise and the backing of binding agreements.

For a start, promoting sustainable modes such as public transport, cycling and walking, significantly mitigates the environmental impacts of daily transport. Not only are greenhouse gas emissions (GHG) reduced, but other atmospheric pollutants as well, such as particulate matter or nitrous oxides which have serious impacts on public health. Prioritising these more efficient modes helps reduce congestion and improves travel times, with positive effects on the stress and anxiety levels of commuters. Additionally, once again from a health perspective, sustainable modes encourage physical activity, even when it is just walking to the nearest public transport stop, with various benefits to long-term health. Finally, prioritising sustainable modes is a matter of equity, as public transport, walking and cycling are depended on the most by low income groups. An overarching goal of sustainable mobility should be to ensure equitable access to the city.

In this context, mobility scholars and practitioners have proposed and supported measures aimed at improving sustainability and equity in urban transport. These generally range from making sustainable modes more attractive by, for example, implementing dedicated infrastructure (often called "pull" measures) to discouraging the use of private vehicles by increasing costs and reducing space dedicated to them (or "push" measures). Nevertheless, the implementation of these policies has proved more difficult than theory would suggest, especially in contexts of restricted budgets, limited political will and a history of car-centric planning, all of which are common in Latin America. Thus, the aim of this publication is to go beyond theory and traditional recommendations and address these issues in the specific Latin American context, seeking to identify the gaps in knowledge and implementation and proposing ways to overcome them.

This publication explores different subjects related to sustainable urban transport in Latin America, analysing challenges and opportunities for improvement, as well as the way new technological evolutions can impact mobility and access in the region. **Chapter 2** presents a brief overview of **the current state of urban mobility** in Latin America and the Caribbean; **Chapter 3** focuses on **access in cities**, using Bogotá, Colombia as a case study; **Chapter 4** evaluates the issue of **public transport provision** – one of the issues considered critical in the region – and specifically analyses the case of BRT systems. **Chapter 5** addresses **road safety issues** and explores best practices to reduce traffic injuries and fatalities; **Chapter 6** explores **the evolution of active mobility** across Latin American cities, especially regarding the case of cycling. **Chapter 7** evaluates **experiences and opportunities related to the implementation of Mobility as a Service** in the region; finally, **Chapter 8** explores **how to bridge the gap between discourse and reality** that is often found in Latin American cities.

There are, however, many topics of great relevance to Latin American sustainable mobility, which could not be included in this publication due to scope limitations. The first is the topic of transport demand management, which is key in order to advance the promotion of sustainable urban transport, but has seen very little progress in the region. The other is the recent introduction of micromobility modes in cities and the still unanswered question of how these impact the mobility system. We find these topics are changing the landscape of mobility in the region and will need to be researched further and included in future publications.


GAS

The state of urban transport in Latin America

Lina Marcela Quiñones and *Thomas van Laake*

The 21st century has been declared the urban century, and nowhere is this as true as in Latin America and the Caribbean, the most urbanised region in the world. Over 80% of the region's population lives in cities and urban centres (UN Habitat, 2012), which range from small and intermediate cities to the five 'megacities' with populations exceeding 10 million people: São Paulo, Mexico City, Buenos Aires, Rio de Janeiro and Lima, to be joined by Bogotá before 2030 (UN Habitat, 2016). Though urban population growth has slowed, the region's urbanized societies have come to face a series of typically urban problems, including crime and lack of housing, of which urban mobility is one of the most pressing and widespread.

Latin America and the Caribbean is not only the most urbanized, but also the most unequal region in the world (Oxfam, 2017), and transport is no exception. While the new middle classes join the rich in private motorized mobility, heavily contributing to congestion and pollution, the majority of the region's residents depend on public transport and active mobility, often under very poor conditions. Increased use of motorcycles, partly a response to the state of public transport and active travel, threatens to reverse improvements to road safety and further marginalizes cyclists and pedestrians (Rodríguez, Santana & Pardo, 2015). Meanwhile, with poor air quality affecting health and liveability and transport emissions continuing to increase, urban sustainability issues have become a matter of public concern. It is clear that the region faces major challenges in the provision of access and inclusive urban transport, with serious impacts on urban liveability and sustainability, including issues such as equity, public health, spatial and social segregation, security, informality, poverty and gender equality.

CITY POPULATION DENSITY AND TRANSPORT-RELATED ENERGY CONSUMPTION

Comparison of cities per region.

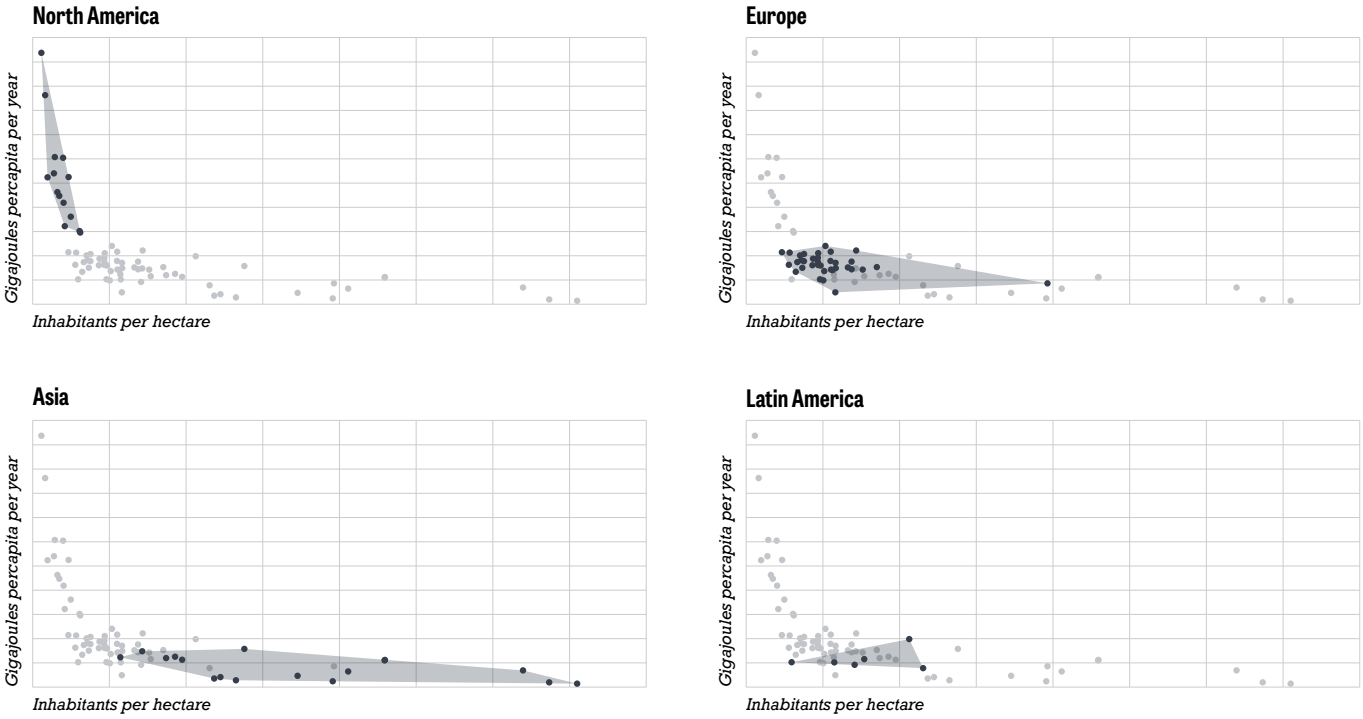

Figure 1. *Population density and transport-related energy consumption. Source: Pardo and Calderón, 2014*

The urban age in Latin America

Due to the diversity of Latin American urban areas in terms of size, geographic setting, urban form and mobility patterns, each of the region's cities faces unique challenges regarding the provision of sustainable urban mobility. Nevertheless, it is useful to examine common features and identify shared challenges that can be tackled by a regional policy approach. This document will focus on such common challenges, including: access, public transport, road safety, active transport, new mobility solutions and the gap between discourse and policy.

Compared to their North American counterparts, cities in Latin America and the Caribbean are relatively compact and dense, which is an advantage when planning for sustainable urban transport. In general, the shorter travel distances lead to energy consumption for travel being relatively low (see Figure 1). Compact cities and shorter travel distances facilitate walking and cycling, simplify provision of public transport and other forms of shared motorized travel, and reduce the need for private motorised transport (see Chapter 5).

Nevertheless, the easy access associated with compact cities is undermined by the high levels of segregation and fragmentation characteristic of the region's cities (see Borsdorf & Hidalgo, 2010; Caldeira, 2000), which create urban barriers and increase travel time between residential areas and centres of employment, particularly affecting the mobility of low-income populations (see Chapter 3). This issue is connected to the high levels of inequality seen across Latin America and the Caribbean, which is classified as the most unequal region in the world (Oxfam, 2017). Poverty and inequality are also related to informality in labour markets, housing and transport, a phenomenon observed commonly in Latin American cities and which has a great impact on access and public transport provision. In turn, these factors heavily influence mobility patterns and urban modal share: most cities have low – albeit increasing – motorisation rates (see Figure 2) and high modal shares for sustainable modes (see Figure 3), although these are probably due to high numbers of captive users (Vasconcellos, 2012). Women are the most dependent on public transport and walking, and this is especially true for low-income women who are the ones that walk the most (Levy, 2013, 2016).

Despite the high modal share of sustainable transport, motorization rates have continued to steadily increase throughout the region (Figure 2), due to rising incomes and cheap credit.

Automobiles per 1000 inhabitants

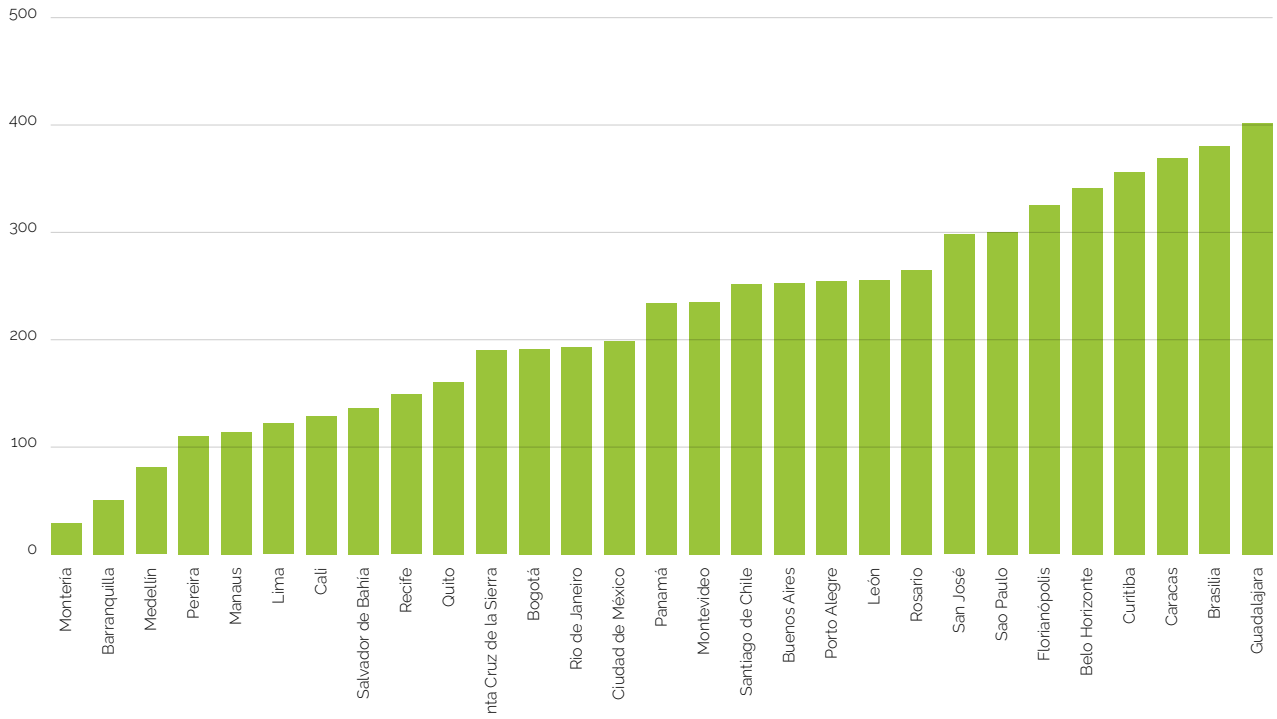

Figure 2. *Motorization rates in selected cities in Latin America. Source: CAF, 2016*

Traditionally a problem of the largest cities in the region, increasing levels of road congestion are now commonplace, and some major cities rank among the worst in the world for automobile travel delays (see INRIX, 2019[1]). The region's overcrowded and unreliable public transport systems fail to offer an attractive alternative, and improvement is urgently needed to improve equity and sustainability. Furthermore, another pressing issue is reducing the negative health impacts associated with urban transport – namely poor air quality and road traffic fatalities – as well as promoting active modes. All of these issues will be explored in detail in the chapters that make up this volume.

While these issues are complex and deeply ingrained, there is reason to be optimistic. The region's cities have featured several transport innovations that have resulted in improved access and provide new solutions to urban mobility problems – not only in the region, but worldwide. A paradigmatic case is that of BRT, explored in depth in Chapter 4, which was popularized in certain Latin American cities before spreading to other continents (Hidalgo & Carrigan, 2008; Mejía-Dugand, et al., 2013). Though certain European cities remain the main points of reference for active mobility, the region is a leader in promoting and developing active mobility infrastructure in a developing-world context (see Chapter 6). Meanwhile, new technologies and innovations are being successfully adapted to the the Latin American context, including new startups which aim to provide better quality transport and encourage modal shift from private vehicles to shared modes (see Chapter 7). In sum, while Latin America features numerous challenges pertaining to the provision of safe, inclusive and affordable urban mobility, there is also potential for providing innovative solutions to these challenges and to ensure better access for city dwellers across the region.

1 This index exclusively represents travel delay for private automobiles, and does not reflect travel times by other modes.

MODAL SHARE FOR SELECTED LATIN AMERICAN CITIES

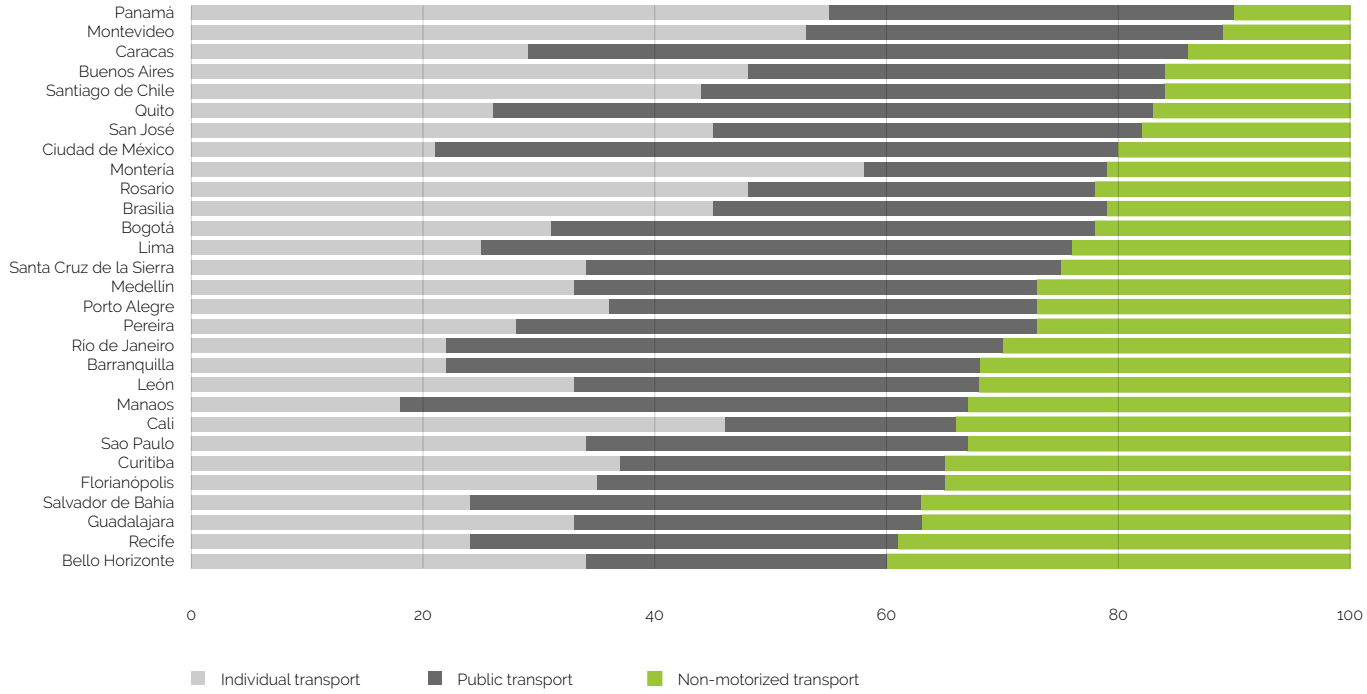

Figure 3. *Modal share for selected Latin American cities. Source: CAF (2016)*

An overview of urban transport

As has been discussed, while there are some issues common to most cities in Latin America and the Caribbean, mobility conditions differ across the region's urban areas. For instance, as shown in Figure 3, while the majority of cities have low modal share for individual transport, there are a few in which this proportion exceeds 50% of all trips.

The case of Montería, Colombia is particularly interesting, and exemplifies a phenomenon that is occurring in various small and mid-size cities in the region. Here, the high proportion of individual trips reflects astonishingly high levels of motorcycle usage and ownership (Quiñones, Pardo, & López, 2018). This trend has significant consequences, such as an increase in transport related emissions and informality (Rodríguez et al., 2015), and has an important negative impact on public transport ridership in these cities. Moreover, the increase in motorcycle usage has a very strong impact on road safety, which is one of the major challenges for the region as a whole. This issue will be explored in further detail in Chapter 5, but it is necessary to mention that countries in Latin America and the Caribbean exhibit very high rates of road traffic deaths. This issue is especially pressing in Caribbean countries (see Figure 4).

ESTIMATED ROAD TRAFFIC DEATHS RATE IN LATIN AMERICA AND THE CARIBBEAN

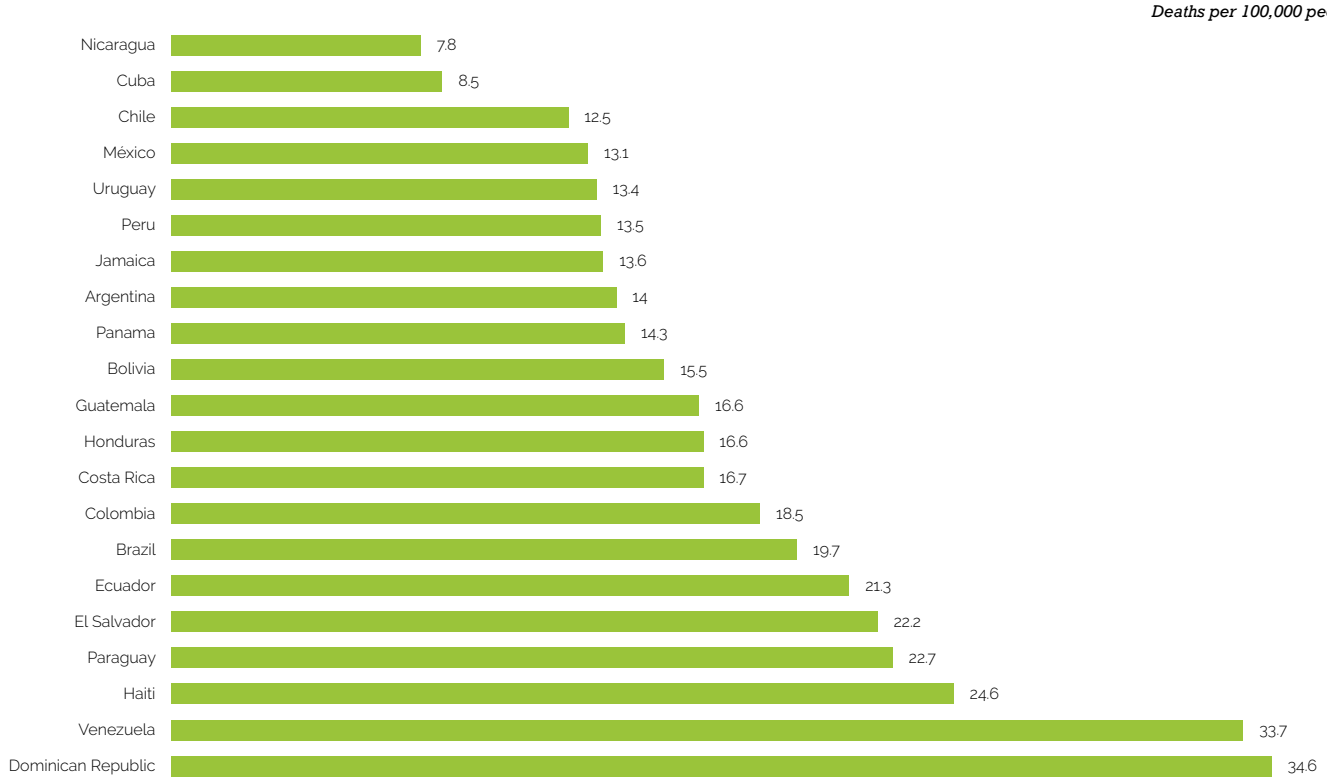

Figure 4. *Estimated road traffic deaths per 100,000 people for countries in Latin America and the Caribbean. Source: Own elaboration based on WHO (2019)*

Very high rates of road injuries and deaths have been identified as a major problem for developing countries. Indeed, 90% of road fatalities occur in low- and middle-income countries (WHO, 2019) despite low motorization rates. A considerable factor contributing to this is road design (see Chapter 5), and specifically the fact that Latin American cities have been traditionally designed to facilitate motorized travel, while the needs of low-income communities that depend on walking, cycling and/or public transport are not taken into account (see Chapters 6 and 8). Nevertheless, there are reasons for hope: initiatives such as "Vision Zero" have been implemented in a number of cities, and the importance of regulating speed and ensuring safe designs is increasingly recognised throughout the region.

Another major challenge related to public health is the poor air quality in urban areas in Latin America and the Caribbean (see Figure 5). Considering that many cities in the region still do not enforce emission or fuel quality standards as strict as those in the Global North (SUTP, 2016) and operate informal public transport systems with buses that are past their operational age, this issue is of paramount importance for transport planning in the region.

Finally, countries in the region also share the global challenge of mitigating climate change by reducing and controlling greenhouse gas (GHG) emissions. This is especially relevant as the 2020 deadline, which marks the first five-year cycle for the Paris Agreement, is rapidly approaching. The region needs to be far more ambitious in mitigation actions (Quiñones, Martínez, & Pardo, 2016), considering that transport-related GHG emissions have risen by 50% in the region between 2000 and 2016 (SLoCaT, 2018). While some countries, such as Mexico, are stabilising, others – e.g. Ecuador – continue to increase their emissions (see Figure 6)

MEAN ANNUAL LEVELS OF FINE PARTICULATE MATTER IN CITIES

MG per M²

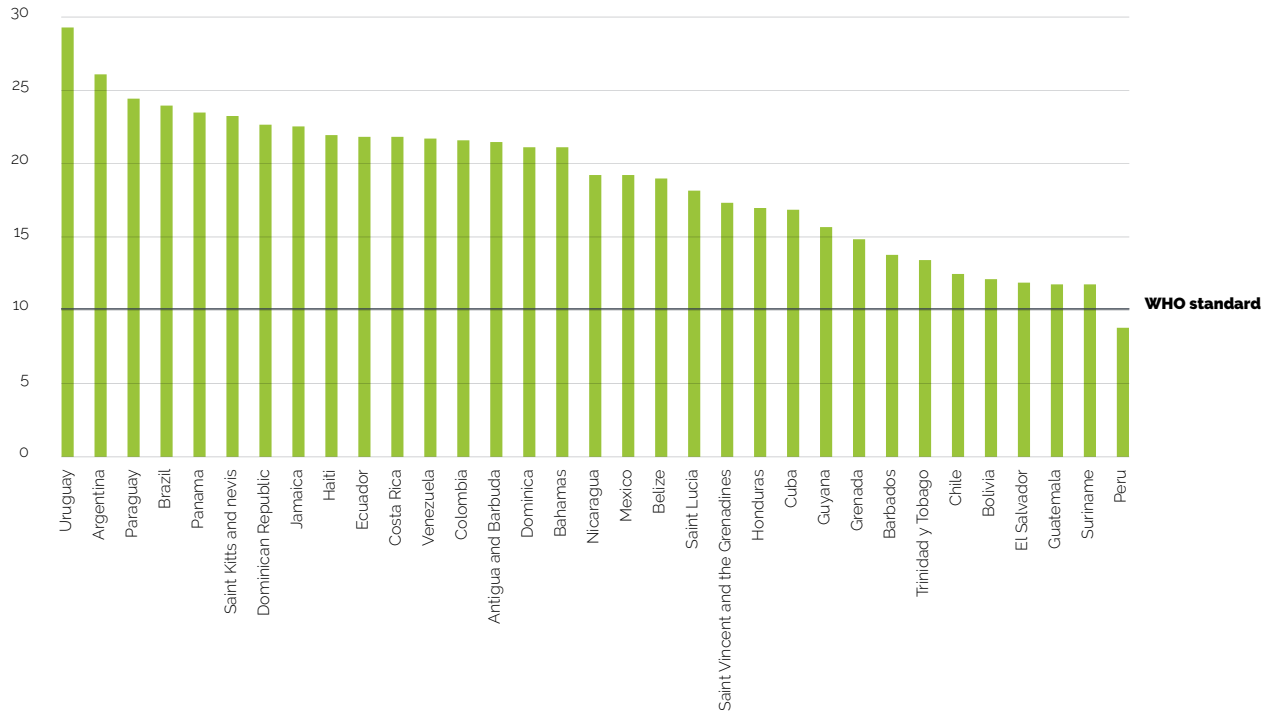

Figure 5. *Air pollution in urban areas, figures for 2016. Source: UN Stats (2019)*

CO_2 EMISSIONS RELATED TO TRANSPORT

Tons of CO_2 emissions per capita from 2000 to 2014

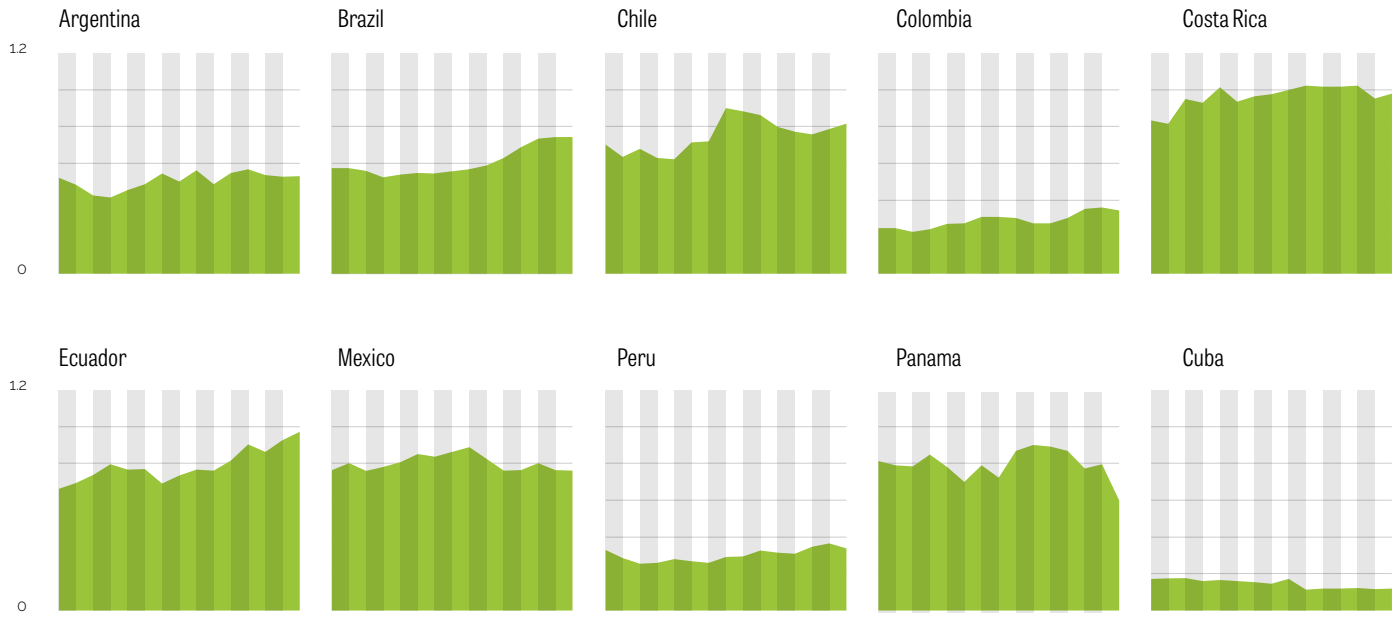

Figure 6. *$C0_2$ emissions per capita related to transport for selected countries. Source: The authors, based on World Bank (2019).*

Moving towards sustainable mobility

The region's mobility policy has started to see change, as policy-makers innovate and adopt best practices and new paradigms which focus more on access and sustainable transport, and partnerships develop and pay off – for instance, the different initiatives under the IDB's regional public goods programme or those supported by C40[2]. Indeed, some of the region's cities have come to be seen as models for achieving sustainable transport in the developing world, due to the success of innovations such as BRT, car-free days, and cable car transport (see Dávila, 2013; ICLEI, 2016; Montero, 2018), which have travelled to other parts of the world (Montero, 2017; Wood, 2014). Though their real impact should not be overstated, such advances highlight the ability of mobility policy and interventions to quickly demonstrate positive effects, put cities on the map, and reward forward-thinking governance.

However, interventions have generally focused on certain issues while ignoring or bypassing others. For example, the most significant improvements – and the most publicized – have been to public transport, including implementation of large mass transit systems, formalization of bus operations and renewal of fleets (see Chapter 3). More recently, cycling has received greater attention, and initiatives aimed at its promotion from both government and advocacy groups have been praised as examples for other developing countries (see Chapter 6). Meanwhile, there are few measures oriented at transport demand management (TDM) in the region, in fact, policies and subsidies that promote the use of private vehicles continue to be common (Despacio & ITDP, 2013). In some cases, partial advances serve to mask underlying weaknesses; for instance, with few exceptions, the region's public transport systems do not offer integrated payment, with multiple fares and inefficient routes discouraging transport use. Furthermore, transformative action is yet to be delivered and, as explored in Chapter 8, there are significant gaps between discourse and reality of urban mobility policies.

Nonetheless, the first steps have been taken and it is a matter of taking these discourses into action to witness actual change and deliver innovative transport solutions that improve access, address inequality and provide better, safer, cleaner and more inclusive urban mobility.

2 For a list of past projects implemented by the IDB, see https://www.iadb.org/es/sectores/comercio/bienes-publicos-regionales/past-projects. For an example of C40's work, see https://www.c40.org/blog_posts/10-ways-that-latin-america-is-driving-global-climate-action.

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2

Access, equity and gender in transport

Looking at the future through the case of Bogotá

Daniel Oviedo *and* ***Camilo Urbano***

Traditionally, the design, construction and operation of urban public transport systems has responded to criteria and planning strategies focused on the average user. These traditional transport planning principles tend to homogenize users, based on high-demand periods and zones, assuming that observable mobility patterns reflect the travel needs of the entire population. This has led to the standardization of characteristics and necessities, resulting in transport systems designed for users with specific characteristics: working-age men with an average capacity to pay, and physically and cognitively able. However, this perspective fails to recognize that many urban residents do not find themselves in a similar social, physical and/or economic position to take advantage of available transport systems. This has resulted in transport systems creating exclusionary effects for specific groups, differentiated by the intersection of social identities, including race, gender, age, class, and physical and cognitive capacity.

This chapter approaches mobility and the planning of transport systems from the perspective of socially vulnerable users. Thereby, it suggests reflections for professionals in planning and public policy areas, decision makers in various of the public and private sector, and NGOs. The considerations discussed here are aimed at empowering these actors to question certain tenets and conceptions of the design of public transport systems and mobility policies.

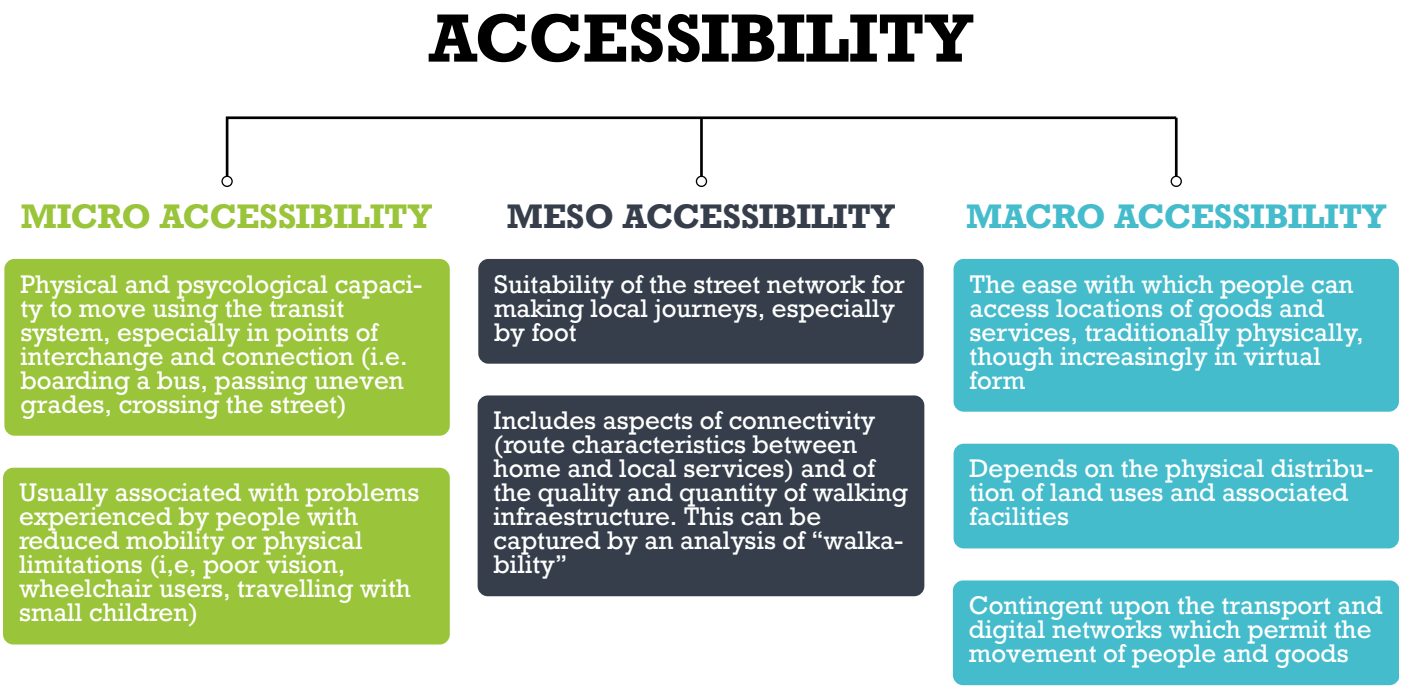

Figure 1. *Scales and types of accessibility. Source: developed based on Jones et al. (2019).*

Defining accessibility and its relations with equity and inclusion

Accessibility can be defined as the *'ability to reach desired destinations, given the available opportunities and impedance – understood as the associated difficulty or cost – intrinsic of the resources utilized to travel between the origin and destination'* (translated from Bocarejo & Oviedo, 2012, p. 143). This reflects the central nature of the concepts of accessibility and access in urban transport planning, incorporating aspects of the city such as social and economic structure and urban form.

The opportunities and impedances considered through the lens of accessibility are directly related to the social position of transport users, urban development trajectories, planning and infrastructure provision practices that allow individuals or social groups to access and carry out necessary or desired activities. Therefore, accessibility is narrowly related to equity, as it is a function of the spatial and social distribution of available opportunities for access to goods, services and employment.

Access can be achieved in various ways, including: physical movement between origin and destination points, receiving goods or services at home, use of utilities such as water or electricity, or the use of communication technologies that connect people with each other and with goods and services. In this sense, we make a distinction between *accessibility* and *access*, the former defined as the potentially achievable opportunities and the latter as the realization of this potential through different mechanisms, infrastructures and technologies.

Accessibility is materialized at different scales, leading to differing interpretations of the concept in the literature. These range from the provision of facilities for mobility-reduced individuals to use infrastructure, to wider definitions related to the design and connectivity of streets and the relationship between infrastructure networks and opportunities in the city. One way to reconcile these interpretations is by recognizing that the scales of accessibility are interrelated and correspond to different necessities in society, contributing to the collective potential to guarantee access to opportunities for economic and social development. As Figure 1 shows, it is possible to differentiate between three complementary types of accessibility: Macro, Meso and Micro accessibility (Jones et al., 2019).

Transport as the generating agent of urban access and equity

The spatial, social and economic configuration of a city can determine, facilitate or limit access to opportunities, goods, and services that people can enjoy. Transport, particularly public transport, allows people to take advantage of these opportunities. As Kenyon et al. (2002, pp. 210–211) suggest, limited access to these prevents people "from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility".

Adequate transport –that is to say, in optimal operational and infrastructural conditions– allows people to access goods, services and opportunities, so that they are able to participate more fully in urban life and enjoy a better quality of life and relationships. On the other hand, inadequate transport can negatively affect people's quality of life and satisfaction. In this sense, transport improves the ability of people to obtain their essential needs as well as to maintain their social interactions. These improvements can lead to a better experience of transport, which permits wider mobility and a more positive attitude to transport (Urry, 2007).

The previously mentioned concepts are distinct from the conventional approach to transport planning, which has also influenced urban planning more generally. Conventional approaches, especially in the Global South, stipulate that infrastructure investments should respond to increases in trip numbers, usually of motorized modes, seeking to stimulate economic growth. However, these investments have generated increases in land prices, as well as multiple negative effects in cities, including social exclusion, spatial segregation, and gentrification processes (i.e. displacement of housing and small businesses due to market forces and/or forced removal).

In this sense, the conventional approach to transport planning has influenced our understanding of it. However, it is necessary to understand that transport is a change agent or factor, which impacts access in cities. Therefore, it is important to consider different approaches that include the idea of access, which have not been taken into account in conventional ones. Among these ideas, it is key to consider that access is not only limited by the inherent restrictions of class, social position and income – but that, in Latin American cities, these are intrinsically related to socio-spatial segregation and larger travel distances to work.

For instance, data shows that transport is one of the main spending item of household economies, as between 8% and 16% of household income is spent on transport (World Bank, 2002). This amount can increase to over 25% for the poorest households in larger cities (World Bank, 2002; Bocarejo & Oviedo, 2012). Beyond this economic burden for low-income populations, the adverse conditions for access are exacerbated by increased distances, congestion, and decreasing quality of public transport systems, resulting in an increase in daily travel time – which can reach extremes of up to 2-3 hours for work travel in some cities (Bocarejo & Oviedo, 2012).

Additionally, the conventional transport planning (which fits comfortably in economic growth models) does not recognize the structural factors and power relations that underpin the connections between mobility and urban development. Likewise, traditional transport planning generally does not recognize the social and political importance of public space in mobility (Levy, 2013). Accordingly, conventional approaches have been found to be deficient in many ways, including:

- Little consideration of the relationship between urban transport provision and unequal access to adequate land, which is evidenced by housing conditions, access to public space and services such as water and sanitation, as well as the occurrence of environmental contamination in areas where lower-income populations live;
- Little recognition of invisible factors that generate travel patterns, which include social position of transport users (such as class, gender, race, ethnicity, age, and sexuality), and access to diverse modes of transport rather than just one, whether due to affordability, infrastructure or service quality;
- Little emphasis on exploring environmental injustice and its interaction with the planning and operation of transport and the city;
- Lack of an integrated approach to informality in public transport provision, especially in the attention to mobility needs of vulnerable and spatially segregated low-income populations;
- No recognition of the diverse relations between public and private space. Similarly to conventional urban planning, transport planning has treated space as a 'container', and not as something relational (Massey, 2012). This implies a systematic exclusion of the distinct processes and relationships that act in and upon the city, and therefore, the social construction of public and private space;
- No exploration of citizen participation in decision-making in transport planning, especially with a gender approach and/or for populations with handicaps and reduced mobility.

The case of Bogotá

Bogotá can be an example of the formulations that were presented in the last section. As the capital of Colombia and one of the most populated cities in Latin America, it has become a paradigmatic case of transport planning, partially due to the successful implementation of the TransMilenio bus rapid transit (BRT) system. During the past decade, a considerable amount of academic research in transport and urban studies have examined Bogotá from an accessibility perspective (Bocarejo et al., 2016; Bocarejo & Oviedo, 2012; Guzman, Oviedo, & Cardona, 2018; Guzman, & Oviedo, 2018; Guzman, Oviedo, & Rivera, 2017; Munoz-Raskin, 2010; Rodriguez & Targa, 2004). These studies have emphasized the multiple social and spatial imbalances that result from the city's urban and transport structure.

For many years, the city expanded along well-defined transport axes, which were consolidated following investment in (mass) public transport infrastructure on high-demand corridors. This dynamic has contributed to a phenomenon of high spatial concentration of opportunities in work, education, recreation, culture, etc. Concurrently, this development has generated radial single-direction transport demand between peripheral residential areas and the extended downtown area, where most of the city's opportunities are concentrated.

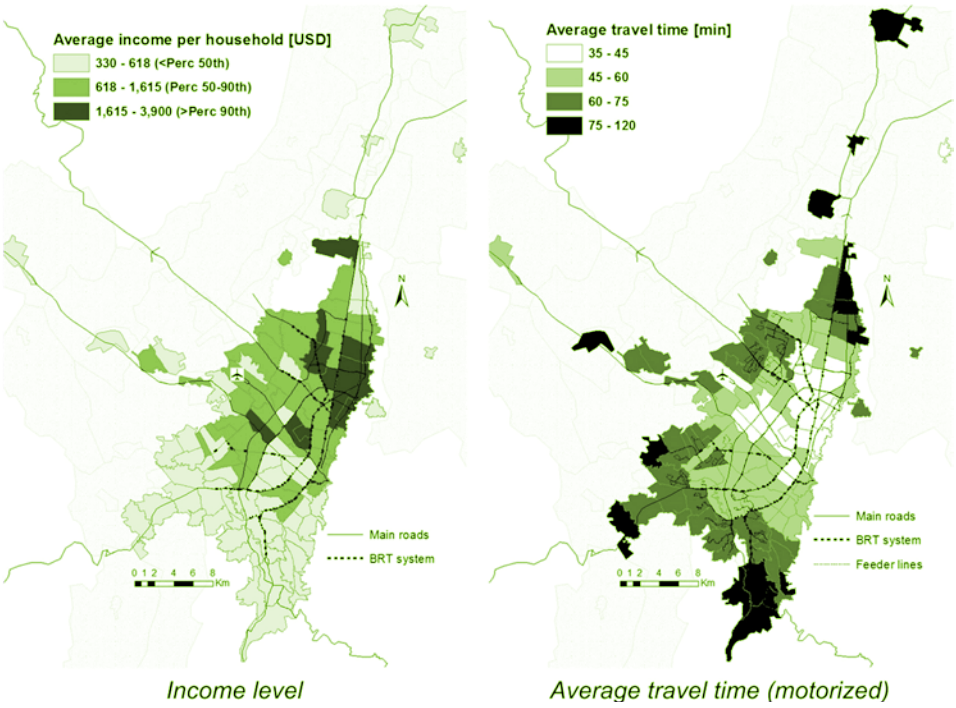

Figure 2. *Distribution of income and average travel time in motorized modes in Bogotá. Source: Guzman, Oviedo, Rivera (2017).*

Bogotá shares common characteristics with other Latin American cities in regards to its socioeconomic and productive structure. From its historic downtown, the city has expanded along transport corridors used for trade and logistics, as well as emerging public transport systems, firstly rail and followed by buses. This tendency was replicated for decades, resulting in the expansion of the urban footprint and conurbation (both planned and organic) with nearby municipalities, creating a functional metropolitan area. In Bogotá, new high-income housing is concentrated in the northeast of the city, middle-income housing in the west, and low-income housing in the south and neighbouring municipalities like Soacha (see Guzman, Oviedo & Rivera, 2017). Despite the fact that the phenomenon of conurbation and suburbanization of neighbouring municipalities is nothing new, the improvement and expansion of infrastructure and a growing vision of metropolitan development have resulted in dynamics of access to transport and employment which exceed the administrative limits of Bogotá (Bocarejo, Escobar, Oviedo & Galarza, 2016; Guzman, Oviedo & Rivera, 2017).

Due to this historic development pattern, most of the productive activities have been concentrated close to the historic downtown area, creating an expanded downtown along the northeast and downtown-airport axes. This has resulted in a higher density of investment in infrastructure and connectivity within and to the most attractive zones in terms of employment, commercial potential, social opportunities, and key infrastructure such as educational and health institutions and public space (Guzman, Oviedo & Rivera, 2017).

These tendencies in urban planning result in a phenomenon of 'splintering urbanism' (Graham y Marvin, 2001), which involves higher investment in the connectivity of the more attractive zones, to the detriment of peripheral and less attractive areas, generally of lower income, reducing their accessibility to the rest of the city (Bocarejo, Escobar, Oviedo & Galarza, 2016).

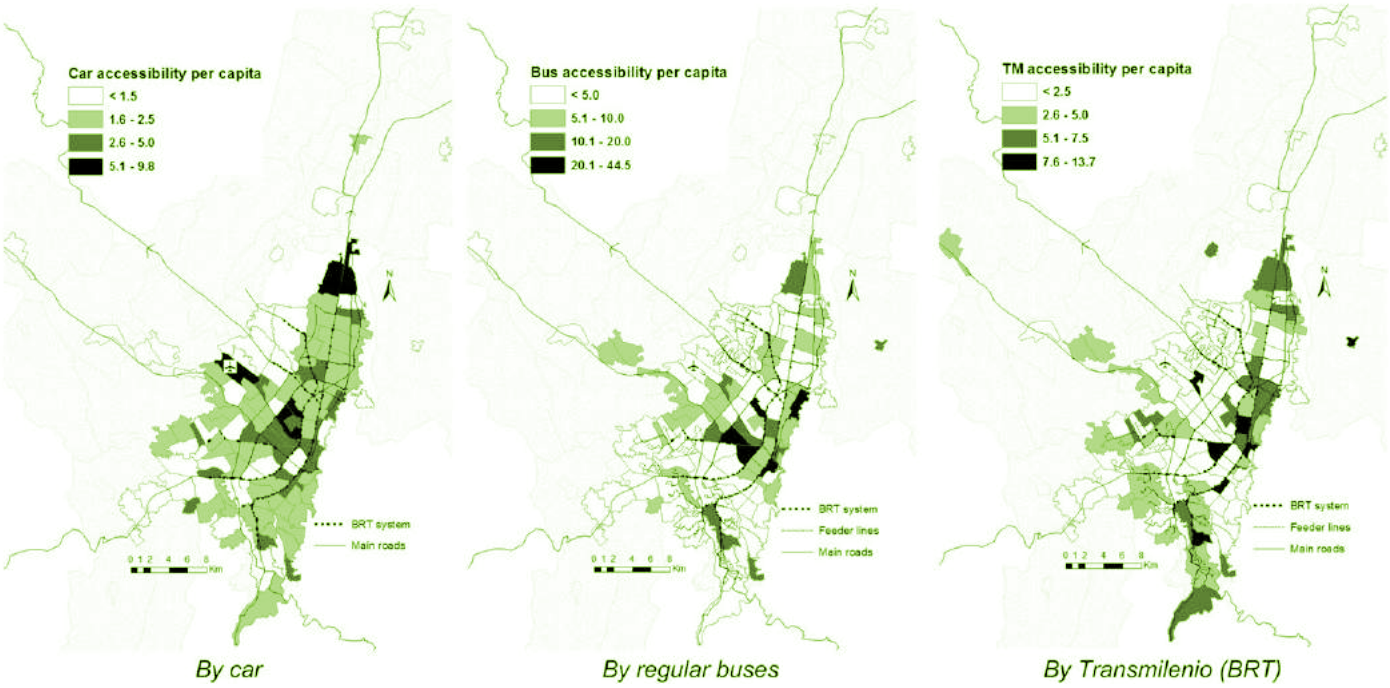

Figure 3. *Potential access to employment and educational opportunities by travel mode. Source: Guzman, Oviedo, & Rivera, (2017)*

Moreover, the higher attractiveness and accessibility of central zones directly affects the prices of land and real estate. The urban and economic consolidation of the central areas of Bogotá has resulted in rapid increases of the prices of land close to areas of concentrated opportunities, accompanied by the progressive displacement of lower and lower-middle income social groups to peripheral areas and neighbouring municipalities. The aforementioned factors have defined this cycle of constant segregation and differing access to the city's goods and services, affirmed and reflected in Figure 2. The clear consequence in terms of transport is the long average duration of motorized trips originating in peripheral areas.

Based on this, the spatial pattern of Bogotá, including economic, social and transport distribution, has effects on the potential accessibility to opportunities and the access of different users to jobs.

Figure 3 expresses the spatial indicator of accessibility for Bogotá for different transport modes[1]. The accessibility indicator considers land use and available employment, as well as a spatial decay function depending on the characteristics of each zone of origin and the costs associated with travel between origins and destinations for each travel mode, using the estimated value of time calculated by TransMilenio for each socio-economic group (Guzman, Oviedo & Rivera, 2017). Lower accessibility levels can be observed for conventional public transport, as well as the recently implemented Integrated Transit System (SITP), demonstrating that the highest positive effects on potential accessibility are found in lower-income and peripheral areas served by BRT feeder systems, as well in the central areas with the largest concentration of opportunities. The results also suggest a positive effect of the TransMilenio BRT on the areas furthest from the expanded central area. An interesting result shown by the data in Figure 3 is the higher comparative value of accessibility per capita (number of accessible employment and educational opportunities per population) in public transport compared to private vehicle. Given the higher travel costs and lower motorization rates of lower-income areas, the accessibility values for automobiles are lower than the other modes, although the distribution is more uniform over the urban area.

1 The results of this study are presented and discussed in detail in Guzmán, Oviedo and Rivera (2016), who estimate accessibility indicators for three travel modes: automobile, bus, and BRT. These results were initially explored by Bocarejo and Oviedo (2012) and have been recently updated by Guzmán and Oviedo (2018) for the city's public transport system.

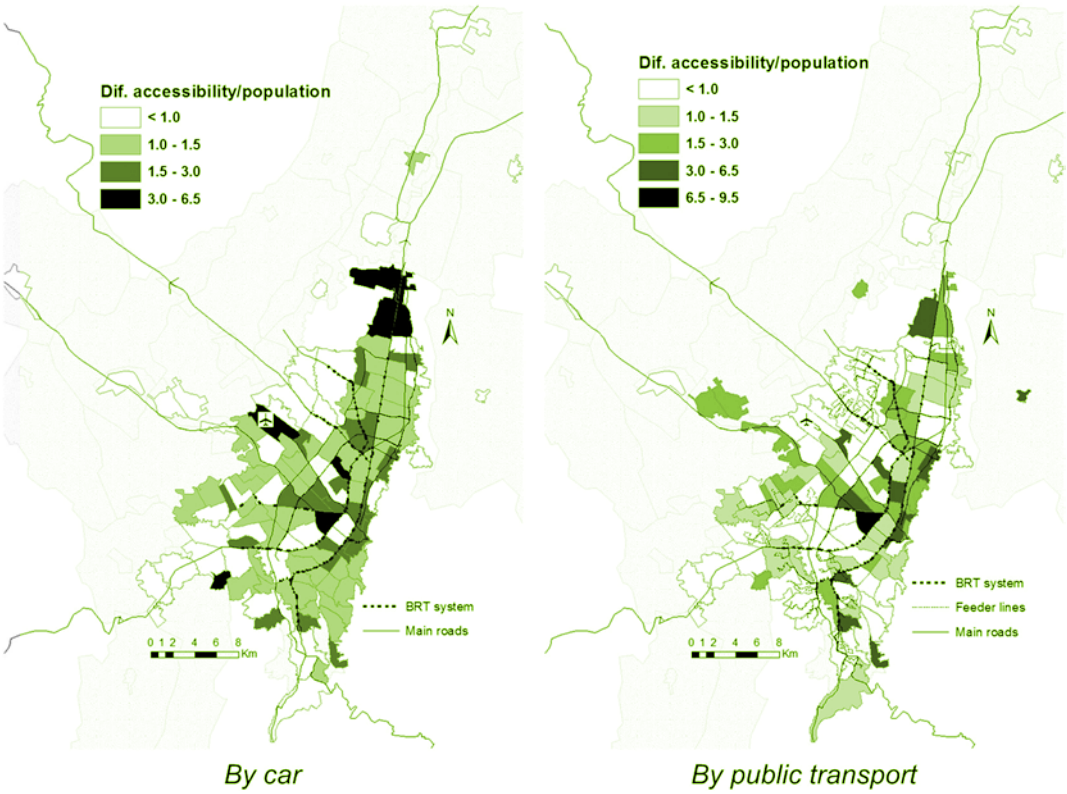

Figure 4. *Potential accessibility to employment and education per zone. Source: Guzman, Oviedo & Rivera, 2017*

If accessibility is understood as a quantity of opportunities, and looking solely at automobile users, 50% of the population of the Bogotá region has access to only 32% of the opportunities. Comparing accessibility levels by travel mode with the density of places of residence, employment and education, the distribution of accessibility by automobile is less equitable (-8%), while a better relationship is observed for public transport (+6%) (Guzman, Oviedo & Rivera, 2017). The spatial, physical and social distribution of accessibility by mode suggests that the central zones of Bogotá have better conditions for access, and that the distribution of access per capita is less unequal in zones identified as middle or high-income zones.

Consequently, the differences between the accessibility indicator and the amount of population in each zone, as presented in Figure 4, allow for clearer identification of the accessibility imbalances in the city. The zones where this indicator is lower than 1.0 reflect a mismatch between population and accessibility, that is to say, the number of residents exceeds the potential accessibility to employment opportunities in the area. This has clear implications for equity as it means that there are areas of the city where the supply of transport does not match potential demand, since residents have access to less than one job opportunity per person. As discussed below, disaggregating results of differences at a macro level by social indicators such as gender allows identification of inequalities associated to specific user profiles, highlighting not only geographic areas but social groups as well, that could be targeted by policies and interventions to improve access.

WHY INCLUDE A GENDER PERSPECTIVE IN TRANSPORT?

Marina Moscoso *and* ***José Segundo López***

Gender is one of the social indicators that impact the access of populations to the city's goods and services. Understanding the way it works and the consequences for women is crucial when planning an inclusive and efficient transport system.

Gender is understood as the differences that are socially constructed between men and women. Gender roles differentiate and define the activities that women and men are expected to fulfil and generate relations of power and subordination. Adopting gender as an analytical category involves identifying the social, cultural and economic implications of specific patterns of behaviour related to genders, and adopting a multidisciplinary and intersectional outlook on apparently neutral themes such as mobility and transport (Fainstein, 2005; GIZ, 2007; ITDP India, 2017; Sandercock, 1998).

In Colombia, as in all of Latin America, gender gaps persist in differences in access of women to health, employment, political participation, culture, and their bodily autonomy (UN Women, UNFPA, & PNUD, 2017). Restricted access to the city's opportunities due to the transport system can exacerbate the urban poverty of women, and has serious consequences for their accumulation of human and financial capital, and consequently their autonomy and quality of life (Chant, 2013; Levy, 2013; Sheller & Urry, 2006).

There are key factors that restrict women's access to the city, which affects them disproportionately. These include gender-based violence, which generates fear and emotional stress (CAF & FIA Foundation, 2018; FIA Foundation, 2017); roles and stereotypes associated to gender, which transfers care responsibilities to women, generating differentiated mobility patterns; and restricted access to individual and motorized transport modes due to economic position and the priority given to male travel in most households (Chant & McIlwaine, 2016).

There are various consequences of these factors for the mobility and access of women to the city. Time poverty due to multiple responsibilities, affecting their ability to meet their individual human needs; larger distances and travel times associated to trip-chaining to fulfil such responsibilities; and the dependency on lower-efficiency modes, given that the most efficient transport is that planned for high-demand trips and associated with utilitarian or commuter travel (GIZ, 2007; Moser, 1993). Additionally, the situation of generalized violence has consequences in terms of change of routes, travel times, behaviour, or even avoidance of travel altogether, which limits access to opportunities.

Data that sketches the scale of the differences in accessibility of women includes, for instance, the difference between modal distribution of men and women. In Bogotá, women make 16% more trips by public transport than men, which can be attributed mostly to travel on conventional buses by low-income women. Although public transport is supposedly planned to have a neutral impact on the population/all groups, it is low-income women who spend most time on travel: 70% more than high-income women, and 15% more than low-income men. Similarly, between 2011 and 2015, despite overall growth of cycling in the city, the proportion of trips by bicycle made by women declined from 25% to 21%, implying that this modal shift was dominated by men (Moscoso et al., 2019).

On the other hand, road safety data shows that women, in general, are in fact the safest road users. For each trip made, irrespective of transport mode, men are 5 times more likely to be victims of a crash. Meanwhile, female bus drivers are 60% less likely to be involved in a crash with victims than male drivers. Similarly, female drivers of motorcycles and cars are respectively 80% and 85% less likely to be involved in road incidents per trip (Moscoso et al., 2019).

Finally, regarding sexual harassment in transport, 92% of female cyclists, 91% of female conventional bus users, and 86% of female TransMilenio users report having suffered some form of it. This is reflected by disaggregating the percentage of women who report harassment by socioeconomic group, where 87% of low-income women have reported some form of sexual harassment, compared to 76% of high-income women (Quiñones, 2018). This can be associated with the fact that lower-income women are more likely to use modes where they are more likely to be harassed.

Conclusion

Concepts of accessibility, access and equity allow for examination and differentiation of the capacity of social groups and individuals in specific areas to take advantage of the opportunities offered by cities. Such analysis contributes to the critical study of the role of transport as an intermediate good in the accumulation of capital in the urban context, and recognizes the complex interaction between the provision of infrastructure and transport services, economic development, land use, and demographic change.

Similarly, by studying aspects such as equity and access at different scales, it is possible to understand the power relations that support the social construction of space – including public transport – and examine the experience of different social groups in public spaces created and formed by modes and corridors of urban transport.

On the one hand, transport can permit access to material goods and opportunities that help build human and social capital, directly contributing to social mobility and inclusive economic development. On the other hand, in many Latin American cities, transport often still facilitates conditions for the production and reproduction of inequalities with regard to cultural identities, violence and insecurity, which in turn restrict the access of people to transport modes and physical connections. This is made explicit when studying gender or class differences in mobility and access. In this sense, access to opportunities, services and goods can also be looked at through the lens of modern concerns in transport planning, including health, universal mobility and the quality of the environment.

Studies of accessibility also allow examination of the distribution of material benefits and charges associated with urban mobility in the context of environmental sustainability. One of the main objectives of urban accessibility policy is equal access to city activities that ensure a dignified life in a locally and globally sustainable way. Therefore, sustainable mobility must assure that citizens can exercise freedom of movement without social control or restrictions from the built or natural environment resulting from privileging certain groups.

The analyses of accessibility illustrated for cities such as Bogotá show the recognition of those transport users excluded due to their social position – for instance, class, gender, age, ethnicity, etc. – and of communities negatively impacted by the operation of transport systems, due to their spatial location among other factors (Levy, 2013). Analysis of access and its implications for equity can inform egalitarian political participation in decision-making by transport users and providers, as well as by those affected by transport systems, without discrimination based on social identities.

Studying accessibility also provides arguments for giving up planning based on tendencies (as in, 'predict and provide') and contributes to the construction of future development scenarios, making comparisons between areas and socio-economic groups, and the development of social studies of transport in contexts of limited data availability.

An accessibility perspective also allows the connection of urban development and land use planning with transport planning, by not only evaluating the effects of changes in infrastructure on the access to opportunities, but also the effects of the redistribution of land uses and real estate developments on the benefits of access offered by transport systems.

In conclusion, analysis of accessibility can be the basis for prioritizing urban transport policies and projects with specific objectives regarding the closing of access gaps between social groups. By reinterpreting urban mobility in terms of potential and effective accessibility to fundamental opportunities for social and economic development, it is possible to rethink the objectives and impacts of urban transport and look beyond traditional measures focused on travel time savings. Instead, it forces us to consider common benefits and costs of urban and transport planning on the access to opportunities.

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Overcoming constraints to improve BRT in Latin America

Darío Hidalgo, ***Thomas van Laake*** *and* ***Lina Marcela Quiñones***

Public transport remains the main mode of transport in Latin American cities, which makes its improvement a priority on the path to sustainable mobility. Traditionally, the sector has been dominated by under-regulated private bus operations, that deliver poor service and efficiency, albeit at no cost to governments. Limited by financial and institutional constraints, recent efforts to improve and formalize public transport in the region have focused on the implementation of bus rapid transit (BRT) systems, which have proliferated throughout the region. BRT has been considered a 'miracle cure' (Gilbert, 2008) for the region's public transport challenges: it combines the scrapping of older buses with increased control over operations, improves efficiency and speed, and bears reasonable implementation costs. However, there have been serious barriers and misunderstandings in the planning and operations of these systems.

With many BRT systems facing declining user satisfaction, faltering political support, and operational problems, the role of BRT in improving public transport has come under doubt. This is cause for concern, given the potential to improve public transport service, transform road and public space and contribute to sustainability goals. To move forward, a critical revision of the principal constraints in BRT planning and operations is necessary. To this end, this chapter evaluates the expansion of these systems across Latin America and considers the different challenges and constraints present today. Finally, it outlines possible solutions and lessons for future improvements.

MODAL SHARE FOR PUBLIC TRANSPORT MODES IN CITIES IN LATIN AMERICA

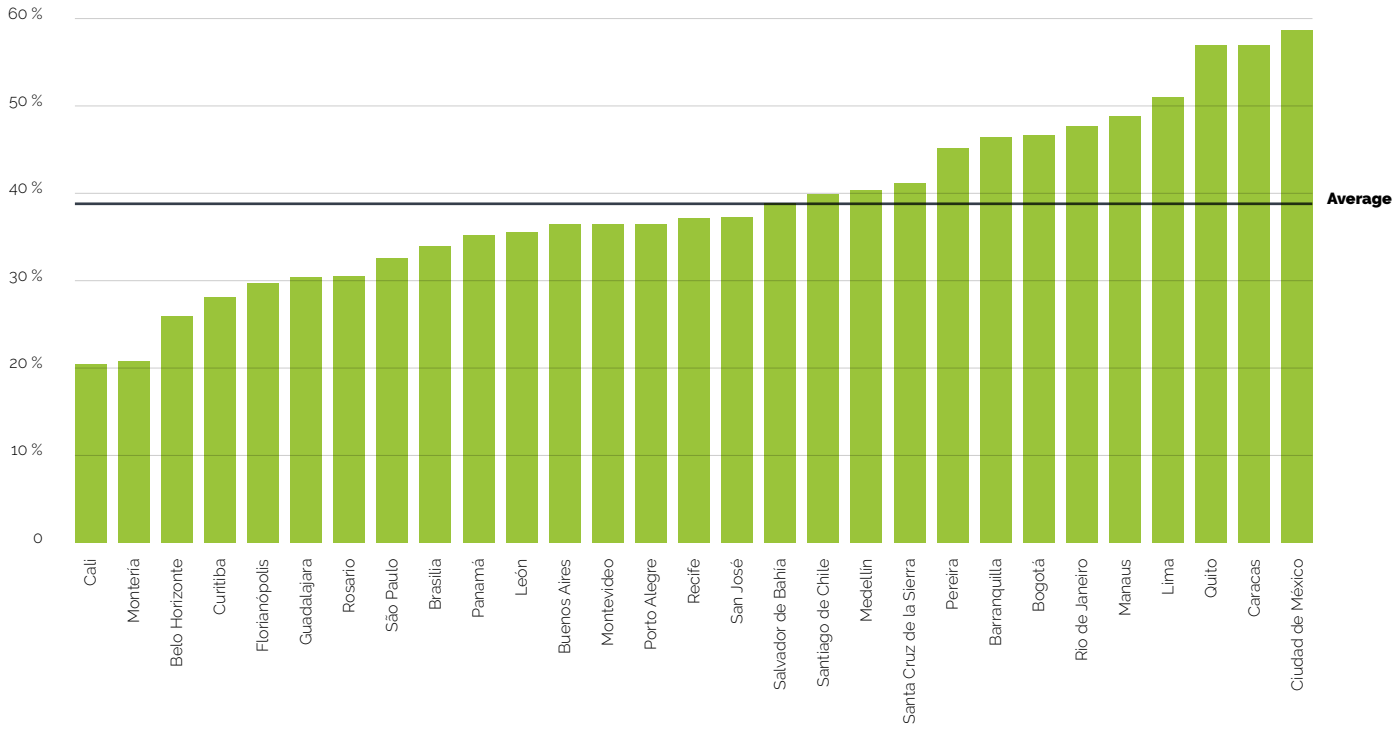

Figure 1. *Modal share for public transport modes in cities in Latin America. Prepared by the authors, based on data from CAF UMO (CAF, 2016).*

The state of public transport in Latin America

Despite soaring motorization, people in Latin American cities continue to depend on public transport, which remains the main transport mode in terms of trips. The average modal share for public transport across 29 cities in the region is 38.8%, rising to 58.6% in Mexico City (see Figure 1).

Public transport is particularly important to low-income people living on the peripheries, as they – and especially women – rely mostly on public transport for their daily trips. To date, however, over 20% of people living in Latin American cities do not have access to formal public transport within 10 minutes of their homes, while 15% of residents in informal settlements do not have access to public transport at all (CAF, 2018).

Traditionally, public transport service has been provided informally by private operators, with little or no regulation from local authorities. In Bogotá, for example, private operators started in the 1930s, serving peripheral regions in the expanding city and taking over all services in the 1990s, after the public operating company was shut down (Rodriguez Baquero, Nuñez Cetina, & Rodríguez, 2003). While there have been efforts to regulate and formalize the provision of public transport – such as Transantiago in Santiago and SITP in Bogotá – informal buses, combis, micros and busetas are still an important mode of transport for urban dwellers throughout the region (see 'Combi/Vans' and 'Microbus' below in Figure 2).

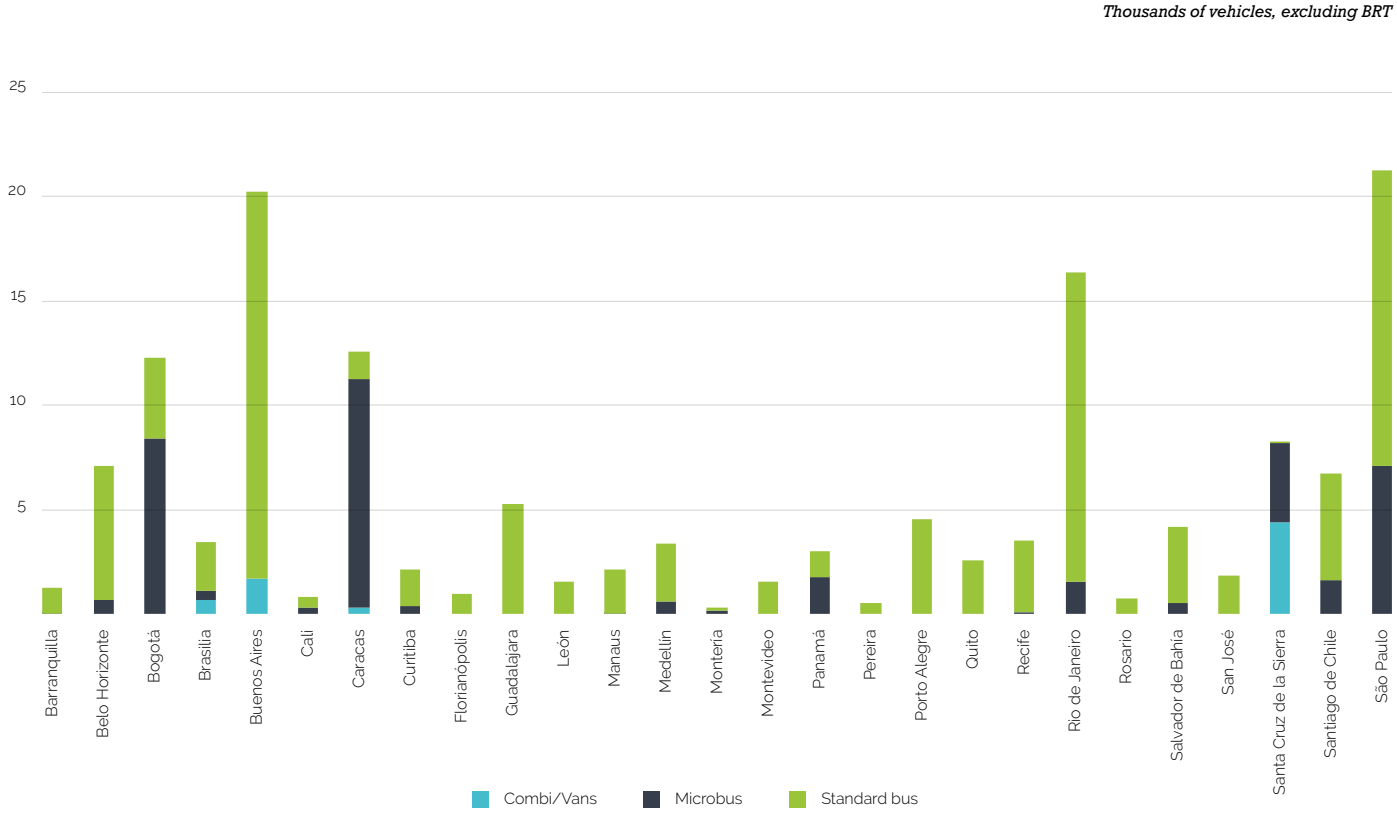

Figure 2. *Motorized public transport fleet (excluding BRT) for cities in Latin America. Prepared by the authors based on data from CAF UMO (CAF, 2016).*

Formalization of transport and the spread of BRT

Aside from efforts to formalize bus services, there have also been large-scale projects to implement mass transit systems. The earliest of these projects was the Buenos Aires metro system. The Subte opened in 1913 and currently serves around 1.2 million passengers per day, which represent 8.9% of trips in the city (INDEC, 2017). As of today, 19 cities in the region have implemented metro systems, totalling 943 km of tracks and moving 5.9 billion passengers per year (UITP, 2018). Nonetheless, in Latin America, mass transit is most associated with Bus Rapid Transit (BRT) systems. These systems first emerged in Curitiba in 1972 and took off (see Figure 3) after Bogotá implemented TransMilenio in 2000 (Mejía-Dugand et al., 2013). Currently, 55 cities in Latin America have BRT systems, out of over 100 in the developing world.

These 55 cities have a total of 1,816 km of BRT corridors, which transport over 20 million passengers every day (BRT Data, 2019). Worldwide leaders in BRT, Latin American cities are also highly dependent on these systems. Latin American BRT passengers represent over 60% of the worldwide total and per-km demand is significantly higher than in other regions (BRT Data, 2019). From a technical perspective, the spread of BRT systems across Latin America can be explained by the high capacity and improved performance achieved by these systems, with limited costs and implementation times (Hidalgo & Carrigan, 2008; ITDP, 2018). In a context of budget restraints and a search for better mobility policies, BRT became the right innovation for the right time (Mejía-Dugand et al., 2013). Moreover, BRT implementation benefited from financing through national programs in countries like Brazil, Mexico and Colombia (Diaz & Bongardt, 2013).

NUMBER OF CITIES IN LATIN AMERICA WITH BRT SYSTEMS

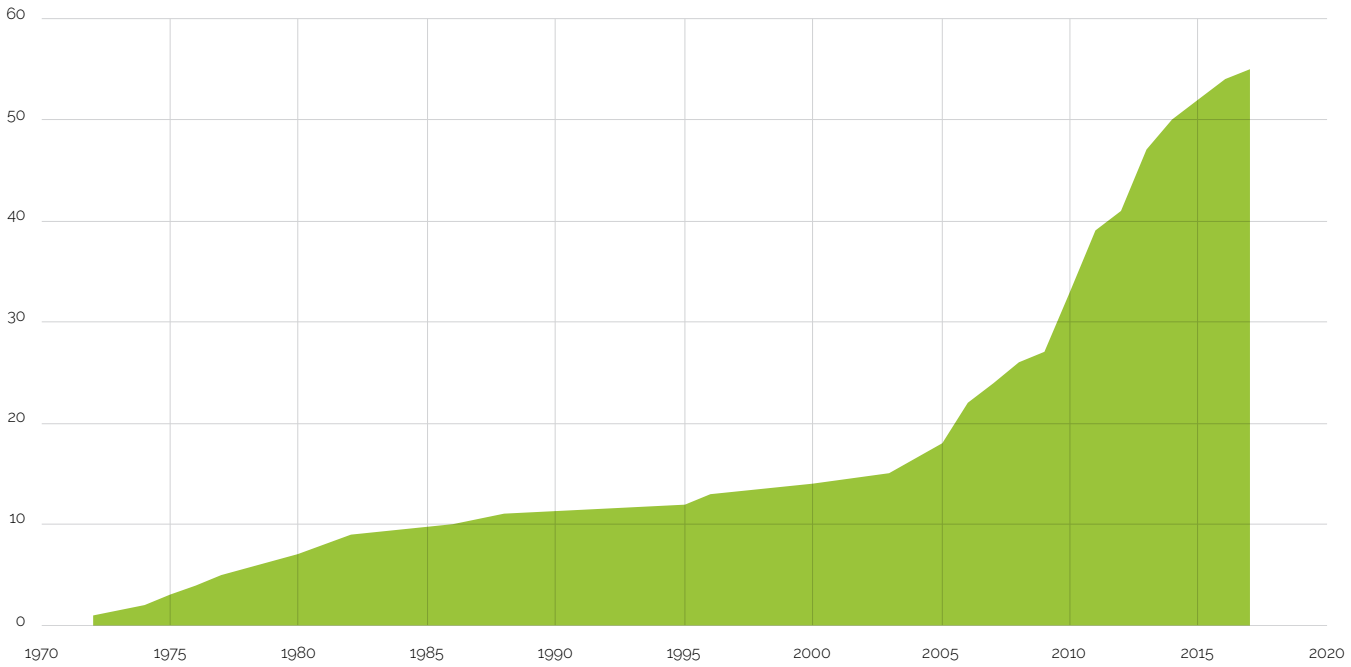

Figure 3. *Number of cities in Latin America with BRT systems. Source: brtdata.org*

BRT systems have significantly improved public transport in Latin America, particularly operating speeds and ridership (Hidalgo & Carrigan, 2008). These successes are highly significant in a context of severe mobility challenges and recurrent policy failures (Gilbert, 2008). Serious problems, however, have impacted most of the region's BRT networks, gravely affecting the image of formal public transport systems in general. Overcrowding and lack of investment have reduced user satisfaction, sometimes below levels common for traditional, informal systems (see Figure 4). Initial issues during implementation (Hidalgo & Graftieaux, 2008), persistent congestion and low user ratings among users of large BRT systems have left planners doubting BRT's potential for meeting mobility needs, and many cities have shifted focus to metro implementation.

Another pressing issue is that of passenger safety and security, especially women's. This is critical, given that the three cities classified as having the most dangerous transport systems for women – Bogotá, Mexico City and Lima – are all in Latin America (Thomson Reuters Foundation, 2014). Research from Santiago, Quito and Buenos Aires confirms the gravity of this problem, underlining that even low-income women avoid public transport wherever possible and, moreover, teach their children, particularly their daughters, that it is highly risky and should be avoided (Allen et al., 2018).

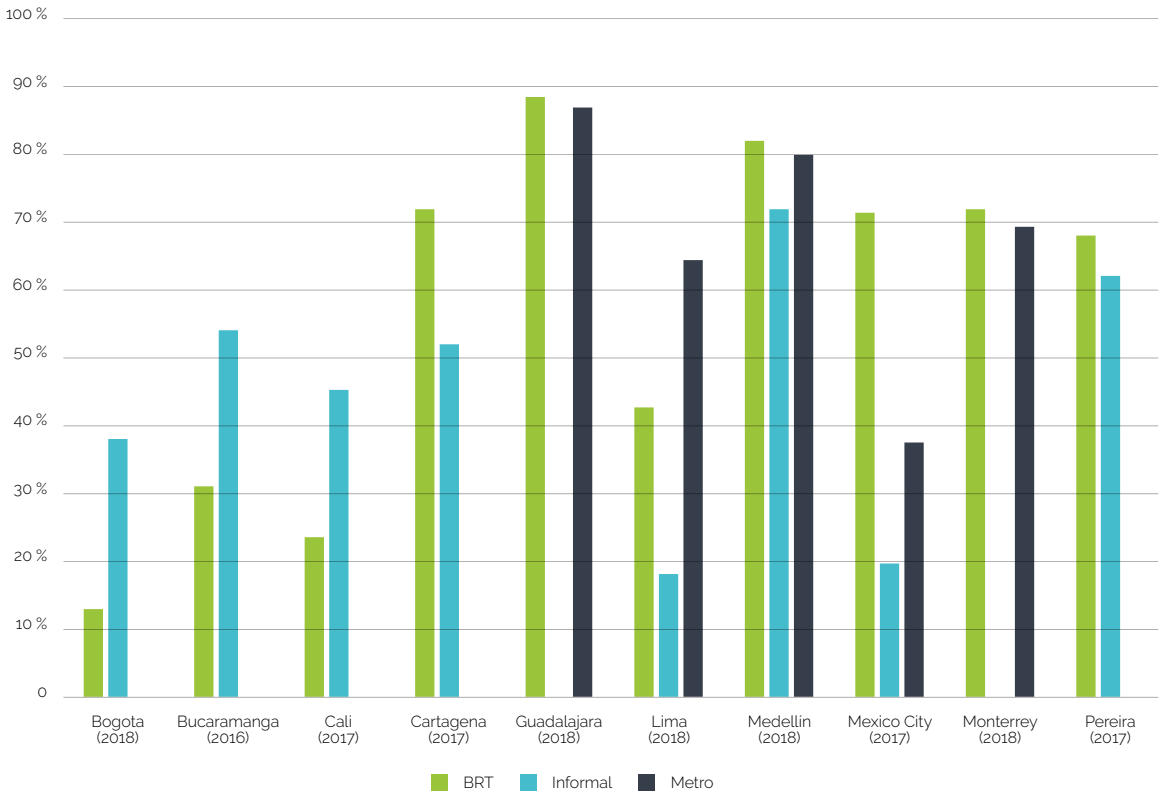

Figure 4. *Satisfaction rates for public transport systems. Prepared by the authors based on local perception surveys.*

Constraints in BRT implementation and management

Implementation and management of BRT systems occur within a complex institutional and operational context. These constraining factors shape and limit the possibilities and results of BRT and are key to understanding the current situation of systems in Latin America. Some aspects have worked very well, while others have been neglected, creating barriers to successful operations. The following section highlights specific issues of road space, urban planning and transit-oriented development (TOD), financing, level of service, emissions, city image, and citizen appropriation and participation.

Road space and corridor design

With few exceptions, and unlike rail-based mass transit, implementation of exclusive lanes for BRT systems requires substantial changes to road layout, particularly, the reduction of mixed traffic lanes. BRT competes for space with existing vehicle traffic and creates visual and physical barriers, with considerable implications for the politics and technicalities of implementation. Controversy regarding the usage of general traffic lanes has prevented many cities from implementing or, as is often the case, expanding systems as planned, as opposition mobilizes against reductions in road space[1]. Such opposition often chooses to ignore the fact that the BRT lanes are much more efficient in moving people, and that traditional buses are removed from mixed traffic. Nevertheless, perceived negative effect on traffic flow undermines the political feasibility of certain projects, especially in comparison with metro systems (see Chapter 8). Meanwhile, the disturbances to pedestrian flow and accessibility created by BRT infrastructure have often been neglected by planners, who thereby create worse conditions for neighbours and users of the system.

From a technical perspective, the road space allocation for BRT corridors is primarily a trade-off between space, cost and capacity. The first BRT systems, such as those in Curitiba and Quito, used little space (with one lane per direction and very

1 For example, in Bogotá, the long-running political battle for expansion of the Transmilenio system along a major avenue has the dubious distinction of having been developed into a study case at Harvard Business School (https://case.hks.harvard.edu/transmilenio-the-battle-over-avenida-septima/).

small stations), which resulted in limited capacity (up to 13,000 passengers per hour per direction, see Lindau et al., 2013). Bogotá's Transmilenio system heralded a major shift, as planners' intent on introducing a very high capacity system (able to handle up to 48,000 passengers per hour each way, see Sandoval & Hidalgo, 2004) required space for dual BRT lanes and wider stations. Bogotá benefited from having relatively generous road space and medians on many main arterials, which facilitated implementation of the first phase. As the system expanded, however, traffic planners were concerned with maintaining the level of service of mixed traffic lanes, which required land acquisition and resulted in much higher implementation costs. Such difficult choices can result in trade-offs that lower the level of service of the BRT system, while increasing costs.

Compared to informal transit systems, a key advantage of BRT's fixed infrastructure requirements is the ability to implement urban designs that improve accessibility and road safety around public transport infrastructure. However, BRT infrastructure also creates specific challenges that have not been suitably addressed. In particular, corridor implementation can create significant visual and physical barriers that interrupt pedestrian flow, change streetscapes, and reduce the connectivity of the street network (Díaz-Osorio & Marroquín, 2016). This can result in lower-quality urban environments and reduced accessibility. At the same time, BRT systems intensify travel demand to and from key stations by concentrating large amounts of passenger demand into certain corridors. This means that adequate access planning is required to provide for high foot traffic, feeder services and potentially bicycles (which require parking facilities), as well as for vulnerable users. However, investment in such 'additional' urban interventions has been limited, with costs and project scope in mind. On the other hand, the implementation of BRT corridors has been shown to substantially improve road safety, both through improved bus operations and road design. BRT systems in Latin America have proved to reduce road injuries and fatalities by rates up to 70% (Duduta et al., 2015).

Urban planning and Transit Oriented Development

Implementation of mass transit corridors has a strong effect on urban land use patterns (Estupiñan, 2011). Efforts to integrate land use and transport planning to channel and harness impacts on urban development largely fall under Transit Oriented Development (TOD) strategies. As the name suggests, these seek to give priority to development (particularly at higher densities) at locations accessible by public transport (Suzuki, Cervero, & Luchi, 2013). These approaches promote sustainable urban growth and boost ridership, and development along transit corridors creates opportunities for Land Value Capture (LVC) that can be used to (partly) recover investment in transit (Suzuki et al., 2015). Although the most successful examples of TOD and LVC are associated with rail-based transit in developed Asian cities, some argue that BRT systems generate comparable land use impacts (Cervero & Dai, 2016). Indeed, studies of land use impacts of BRT have shown that densification occurs whether TOD policies are in place or not (Bocarejo, Portilla, & Pérez, 2013; Rodriguez, Vergel-Tovar, & Camargo, 2016). Latin American cities have not taken full advantage of BRT's potential to foster compact, dense, and well-connected urban development, nor have they reaped potential financial benefits. Instead, BRT has been considered solely as a mobility solution, and many of the largest systems do not integrate TOD or LVC at all.

Interestingly, Curitiba, considered the original model for BRT (Mejía-Dugand et al., 2013) is famous worldwide as a model of TOD as well. From the 1970s on, Curitiba's innovative planning approach led to the first BRT system with dedicated bus lanes and concentrated urban density along these corridors using planning controls. This planning model promotes use of the public transport system and helps to balance the direction of passenger flows (Suzuki et al., 2013, pp. 82–84). Crucially, the Curitiba experience underlines the importance of combining transport and land use planning within a single, relatively autonomous planning body with a long-term vision. Such policies should be geared toward pro-active planning of stations and their areas of influence in order to create favourable conditions for urban development and ridership growth.

Financing and operations

A crosscutting constraint that influences the quality of BRT is the level of investment cities are willing to make and, once implemented, the financial model used to operate the system. BRT is generally presented as having a relatively low cost of implementation, especially compared to rail-based mass transit (Pulido et al., 2018). Despite this, cities have trouble finding sufficient funding for investing in BRT, and trade-offs and cost-cutting on 'non-essential' elements[2] of the system affect system quality and user experience. Indeed, the focus on low implementation costs rather than the level of service achievable through higher investment has arguably created an image of BRT as an easily implemented and cheap solution. Whereas metro systems can command enormous investment and political commitment, BRT's low-cost image restricts investment and undermines its potential.

Although providing the public service of mass transit, BRT operations generally attempt to achieve financial sustainability without government subsidy. While national transport finance programs provided significant capital investment in BRT in Mexico, Brazil and Colombia, they have left operational funding to be sorted out by local governments (Diaz & Bongardt, 2013). This creates stark trade-offs between service levels and financial sustainability; for instance, it encourages higher passenger occupation, fewer buses, and implementation solely along the highest-demand corridors – resulting in lower levels of service and overcrowding (see section 4.4.4 below). This has also resulted in high fares, undermining potential equity impacts (Venter et al., 2017). These incentivizes lower service quality, while favouring profit-seeking private operators (who often enjoy generous returns, see Gilbert, 2008). As Paget-Seekins (2015) argues, this makes BRT a 'neoliberal contradiction' – by providing a public good that replaces an existing privately-run transport system, it increases public spending and government oversight of transportation, and yet, daily operations and profits remain private.

Level of service

Improving the level of service of public transport provision in the city is an explicit goal of BRT systems. According to this reasoning, replacing informal and/or conventional bus service with BRT significantly improves travel time, reliability, comfort and safety, especially in the case of 'high-end' BRT (or 'Gold Standard', see ITDP, 2018). While systems with dedicated rights-of-way, frequent services, off-board fare collection, and high operating speeds represent a major improvement in terms of speed and reliability over informal systems (Hidalgo & Carrigan, 2008), there are trade-offs, especially in regards to flexibility and demand responsiveness. In contrast to conventional bus operations, BRT systems concentrate passenger traffic along corridors with fixed infrastructure in a trunk-and-feeder system. Where trunk lines are further from origin and destination points, more transfers become necessary, in contrast to pre-existing informal transit, which operates more direct routes (Ferro & Behrens, 2015).

For instance, in Santiago, the wide-scale implementation of the Transantiago BRT and formalized bus route system increased transfers without reducing overall travel time, resulting in very negative perceptions of the system (Gómez-Lobo, 2012). Here, the impetus to modernize and formalize transport provision without consulting users (despite consistent demands from several leading citizen organizations), meant planners failed to consider key service aspects, and accessibility declined in some low-income areas (Ferro & Behrens, 2015). Indeed, although BRT can improve transport provision along existing high transport demand corridors, this alone is insufficient, as many continue to rely on more flexible and local routes, particularly in low-income and/or peripheral areas of the city.

2 That is to say, not related directly to the capacity, speed and frequency of bus operations.

Environment and emissions

Another major objective of BRT implementation is to improve the sustainability of the public transport system, mainly by reducing emissions and improving air quality. Introducing BRT can achieve this in two main ways: first, higher capacity and efficiency in bus operations reduces vehicle miles travelled; second, by replacing obsolete informal buses with modern buses with improved emission standards. In high-demand corridors, replacing existing bus operations with BRT can significantly reduce toxic emissions (Cervero, 2013, pp. 23–24). Achieving full environmental benefits requires a rigorous scrapping program that ensures obsolete buses do not simply shift to other routes. Likewise, buses operating in new corridors must meet significantly improved emissions standards to benefit air quality. However, the continued use of conventional diesel buses, particularly when electric options are available, has led to public rejection of BRT in various cities. In contrast to rail-based mass transit systems, high volumes of diesel buses passing through BRT corridors result in locally concentrated emissions, most seriously affecting the system users themselves. Though objectively, per passenger emissions are low – and are substantially better than informal buses –the high volumes and visibility of BRT leads to negative public perceptions. Noise pollution is another factor in public rejection of BRT, as loud bus traffic reduces the quality of corridor environments.

City image

Although public transport systems are framed as responding to tangible needs such as travel demand, accessibility and pollution reduction, large-scale infrastructure projects generally have intangible objectives as well (Higgins & Kanaroglou, 2016). For instance, public transport systems can become part of city branding, and well-functioning systems a source of civic pride. In Latin America, where BRT systems tend to replace informal transport, implementation often comes with a formalization process explicitly intended to introduce order and control into transport operations. Formalization also provides opportunities for branding and marketing campaigns, which can improve the image of the city and the system simultaneously. Such imagery can be projected externally, as a recognizable city brand, as well as internally, to foster civic pride and care for the system (Higgins & Kanaroglou, 2016). Indeed, if private motorized modes are supported by billion-dollar advertising campaigns, in order to compete, public transport could be promoted and marketed as well (Carrigan, Arpi, & Weber, 2011). Similarly, the improvement of urban quality through corridor implementation not only improves accessibility and user experience, but it also boosts the image of the system.

However, BRT systems suffer from persistent perceptions of buses as a lower-quality transport mode, compared to rail-based systems. Users and non-users alike perceive buses to be slow, unreliable and less comfortable, while tailpipe emissions detract from their environmental credentials. Political opposition to BRT in Latin America has often proposed LRT or metro as more attractive alternatives, focusing the debate on the modal image, rather than the real potential and costs of either system (see Hensher & Mulley, 2014). This is partly due to a more modern image associated with rail systems, with major examples in world capitals. However, it should also be considered that the implementation of BRT as a low-cost mode has been a major barrier to achieving a better image for the systems (Hodgson et al., 2013). Higher levels of investment and operating subsidies could improve its image, while remaining competitive cost-wise with rail systems. On the other hand, there has been a clear failure to communicate the benefits of BRT to the wider public, and top-down planning has alienated natural constituencies of support.

Citizen appropriation and participation

A crosscutting issue that affects the viability of BRT planning and operations is the lack of citizen support for these systems. This is despite the real and potential benefits of these systems, which are minimized as detractors focus on implementation and operation failures, or simply reject the model outright in favour of metro systems or even prioritizing automobiles. Some systems that initially enjoyed excellent ratings have since seen user satisfaction drop precipitously. User dissatisfaction has political and operational consequences that can range from lack of political will for investment and expansion to increased fare evasion by contemptuous users. Crucially, the lack of public uptake and perception of public transport systems as 'second class' or a necessary evil means that the acquisition of means of private mobility – cars and motorcycles in particular – remains an aspirational target for captive users.

While some of the region's most successful transport systems have been able to create and maintain public support and pride (for instance, Medellín's 'Cultura Metro'), BRT systems across the region have failed to capture the hearts and minds of their users. To a certain extent, there has been a lack of effort to promote proper use and the benefits of BRT to the public. The creation of a strong brand, user identification and citizen education campaigns can contribute to the appropriation of the system by users (Carrigan et al., 2011). Similarly, listening to rider feedback can be crucial to improve perception and system quality. Much more so than planners, system users can identify emerging needs and improvements. A clear communication strategy would target key stakeholders and interest groups and include elements of informing, soliciting feedback, building support and understanding, and mitigating risks to the system (ITDP, 2018). However, the focus on getting infrastructure and operations right in a context of limited budgets and implementation times has meant that educational and promotional aspects have been neglected (Sagaris, 2016, p. 119).

While communication is vital, an exclusively one-way dynamic is unlikely to bring positive results. In order to create long-term constituencies of support for BRT, continuous processes of citizen engagement are necessary (Sagaris, 2016). Although such collaboration has proven to be effective in shaping bicycle infrastructure planning (Jensen, 2015; Sagaris & Ortuzar, 2015), participation in BRT system planning has generally been limited to informative, top-down communication rather than real engagement. The case of Transantiago is characteristic: rapid implementation of a city-wide system did not allow for citizen participation in planning processes, impeding public uptake and facilitating controversy and opposition to the project (Sagaris, 2016). Citizen feedback might have avoided many of the planning failures that plagued the project and resulted in major problems at launch and years of poor service (Gómez-Lobo, 2012). Policymakers have learned from these mistakes and the entity has now launched participatory processes. However, to have real effects, participation processes must be long-term and extensive, involve serious engagement with citizen concerns, and result in decision-making adjustments.

Moving forward with BRT

Latin American cities face serious mobility challenges, ranging from increasing congestion and air pollution to issues of equity and accessibility. Despite high mode shares for public transport, transit provision is suboptimal and many users continue to rely on inefficient and unreliable informal services. In this context, BRT has been a significant and influential innovation with positive results. More recently, however, experiences reveal friction between the systems' potential and the way they have been implemented and operated. Institutional and financial constraints combined with imaging and planning challenges limit the effectiveness of BRT, undermining the public acceptance central to improving implementation and operations in many cities. At the same time, systems have not expanded due to changing government priorities and financial constraints, resulting in reduced quality and eroding public support, which in turn affects political commitment to improvement. Below are four key arguments to consider when planning, implementing, and operating new and existing BRT systems.

First, BRT cannot be considered as a 'cheap' response to budget constraints. As Ferbrache (2018) has pointed out, a 'developed/developing' dichotomy pervades the BRT literature. This risks implying that certain interventions are 'good enough' for poorer nations or cities, especially when technical discourse emphasizes the city is 'too poor' for a metro and should therefore settle for BRT. Costs actually vary widely, depending on system characteristics, and lower levels of investment are likely to reduce quality. Projects limiting investment to corridors and operations alone forfeit opportunities to improve conditions in surrounding communities and successfully integrate community participation mechanisms. Similarly, expecting BRT operations to break even necessarily means charging higher fares and reducing space per passenger and bus frequencies (Paget-Seekins, 2015). Although providing higher-quality service and better system environments requires substantial public investment and subsidies, the fundamental cost-efficiency of BRT compared to rail-based transit still applies (Hidalgo, 2005).

Second, BRT planning and operations should be considered within broader urban planning strategies. An exclusive focus on planning transport operations to minimize costs and increase operators' profits risks damaging the quality of urban environments around corridors and stations, and overlooks the potential for financing systems through land value capture (Suzuki et al., 2015). Persistent neglect of this proven potential for integral transit-oriented development along corridors is particularly discouraging. This is arguably the result of focus on costs and operations, rather than institutional and governance issues, which are understudied and underappreciated. Similarly, while the modern stations of many systems have guaranteed universal accessibility, the surrounding urban environment is typically neglected, which may impede access. This has occurred despite the inspiring example set by Curitiba, the first dedicated BRT system, and a return to these original principles is highly overdue. Strengthening municipal planning institutions and integrating BRT in wider urban planning processes would be important steps in this regard.

Thirdly, community support, political will and policy continuity are necessary to defend the gains of BRT and continue to expand systems. The political backlash faced by many systems can be attributed to the lack of communication and involvement of key stakeholders, which has left systems without powerful political constituencies. In particular, the road space interventions required for BRT implementation demand principled defence as part of a wider push for more sustainable transport. The reservation of lanes for high-capacity transport is logical, equitable and efficient, yet political opposition can be fierce. While improved implementation and operations are key to improving the image of BRT, without successfully building community support these systems will fail to gain durable political backing. To this end, achievements such as reduced travel times and road safety impacts can and should be drawn upon to justify continuing interventions in favour of public transport.

Finally, technological improvements to BRT are necessary to improve the impact and image of the system. In particular, the electrification of the bus fleet should be a short to medium term goal for all systems, as localized emissions from diesel buses result in dangerous levels of pollution and detract from the system's image. In the short term, existing and cost-efficient low emissions technology can be implemented across all systems, for immediate improvements. BRT systems can also benefit from real time operations management to reduce bus bunching and improve dispatch (Hernández et al., 2015).

Conclusion

From a technical perspective, BRT remains an ideal mass transit system for many cities struggling to improve their public transport systems. In terms of speed, volume and cost, the system has many advantages over other mass transit modes, particularly rail-based systems, and it is especially suitable to intermediate cities without existing rail networks. Evaluation of transport alternatives according to technical criteria is likely to continue to recommend some form of BRT. The major risk to continued expansion is currently the damaged image of the system, paradoxically resulting from problems in the highest-profile systems that once served as models for expansion. However, as has been pointed out, such problems are not intrinsic to BRT itself; rather, they result from constraints in implementation and operations. It is encouraging to realize that in its spread across the continent, BRT was continually evolved and reinvented. Certain 'models' of practice have inspired generations of systems by demonstrating the potential and suitability of BRT (Mejía-Dugand et al., 2013). A brighter future will depend on new models being developed, through both gradual improvement and bold innovation. Policymakers, local communities, the academia, and system operators all have a role to play in this process of improvement and relearning; the first step is a realistic appraisal of the failures and insufficiencies of current practices and the institutional constraints that generate them.

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4

Improvements and challenges in road safety

Natalia Lleras, ***Darío Hidalgo*** and ***Claudia Adriazola-Steil***

The number of deaths and injuries due to traffic crashes continues to rise. According to World Health Organization (WHO) estimates, the number of fatal victims in traffic has increased from 1.25 million in 2013 to 1.35 million in 2016. Globally, crashes are the main cause of death for children, youth and young adults – people between 5 and 29 years of age – particularly affecting low and middle income countries (WHO 2018). In Latin America and the Caribbean, there are more than 100,000 deaths in road crashes annually, most of which are attributed to human error (Adriazola-Steil et al. 2018).

Efforts to improve road safety have been characterized by a traditional focus on changing the behaviour of road users, using educational campaigns and training. The supposed merits of this approach have not been reflected in a reduction of crashes and victims (Adriazola-Steil et al. 2018). Contrary to global tendencies, in the majority of European Union countries that have focused on reducing the number of victims in crashes, the number of incidents has gone down (ERSO 2018). Countries that have adopted a safe system approach have achieved the most rapid and significant reductions in the rate of fatalities due to road crashes (Welle et al. 2018).

Unsafe roads have a negative impact on the quality of life and the economy of Latin American countries, which makes it more difficult to implement and promote sustainable transport modes (walking, cycling, and public transport). Our cities are oriented around motorized transport, predominantly individual, and those who walk or use the bicycle for daily travel are exposed to higher risk. Infrastructure – such as the distance between safe crossings, turn radii, road width, etc. – prioritizes motorized vehicles. Meanwhile, pedestrians and cyclists are more vulnerable in a crash, as impact directly affects their body, while automobile drivers are protected by a metal shell. Similarly, the risk for public transport passengers is lower inside buses and the implementation of mass transit projects has shown to have a positive impact on road safety, due to changes in infrastructure made during such projects (Duduta et al. 2015).

If road safety conditions for pedestrians, cyclists and public transport users do not improve, people will continue to choose automobiles rather than more sustainable modes. Improving the safety conditions for pedestrians and cyclists has the potential to increase the modal share for active transport.

The objective of this chapter is to evaluate the advances as well as challenges of some of the road safety measures that have been implemented in Latin America based on a safe system approach.

Safe system approach

The countries with the lowest crash rates, such as Norway, Switzerland, Sweden, the United Kingdom and the Netherlands, have adopted a safe system approach to road safety (ITF, 2016). These approaches integrate human failure and vulnerability to error in the design, construction and operation of mobility systems, taking the view that these should focus on preventing human error from resulting in serious injury or death. Countries that have adopted a Safe System Approach have not only have the lowest incidence of traffic fatalities, they have also been most succesful in reducing the fatality rate. (Welle et al. 2018).

The safe system approach has been given different names, including 'Towards Zero' in Australia, 'Sustainable Safety' in the Netherlands, and 'Vision Zero' in Sweden, among others. These approaches are based on five principles (Welle et al. 2018):

1. No death or serious injury in traffic is acceptable;
2. Humans make mistakes;
3. Humans are vulnerable to crash impacts;
4. Responsibility for road safety is shared amongst those who design, build and operate transport systems, rather than users;
5. Actions to improve road safety should be proactive rather than reactive; crashes should be anticipated, rather than waiting for them to happen before taking action.

These approaches feature various common elements that maximize their impact. Amongst those, the following should be highlighted: use of economic analysis to approximate the benefits of improvements; planning based on prioritization of actions by cost and benefit; evaluation and monitoring of policy and programs to ensure their development and evaluate the process according to results; existence of government agencies that integrally manage road safety; and decision-making processes based on targets and data, to allow detection of where problems exist, and develop and prioritize tailored solutions (Welle et al. 2018).

It is important to state that the implementation of a safe system approach generates a cycle of environmental benefits. The reduction of the number of deaths and serious injuries on the roads results in safer environments, which incentivizes an increase of pedestrians and cyclists, thereby reducing the number of trips in motorized vehicles, thus reducing emissions and air pollution (see Figure 2). Improving road safety for pedestrians and cyclists, as well as providing high quality public transport, would not only reduce the number of victims of crashes, but it would also incentivize the use of such modes. In turn, this would reduce the total of vehicle kilometers travelled, lowering the exposure to risk of crash and collision. Ultimately, this would lead to more pleasant and inclusive environments, environmental improvements, and higher quality of life for citizens (Welle et al. 2018). The implementation of a safe system approach is therefore key to achieve urban sustainability.

ENVIRONMENTAL AND HEALTH BENEFITS OF A SAFE SYSTEM APPROACH

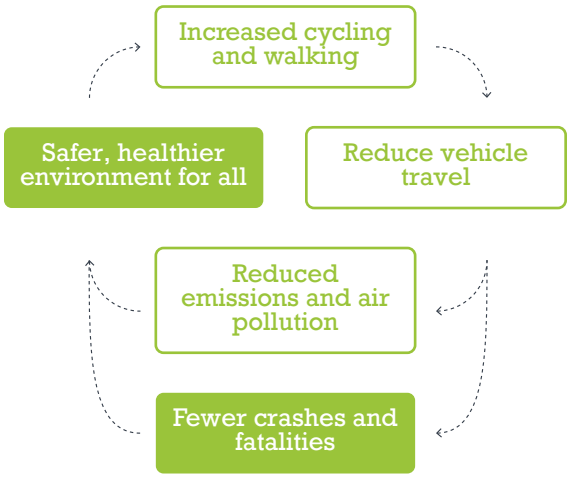

Figure 1. *Environmental and health benefits of a safe system approach. Source: Welle et al. (2018)*

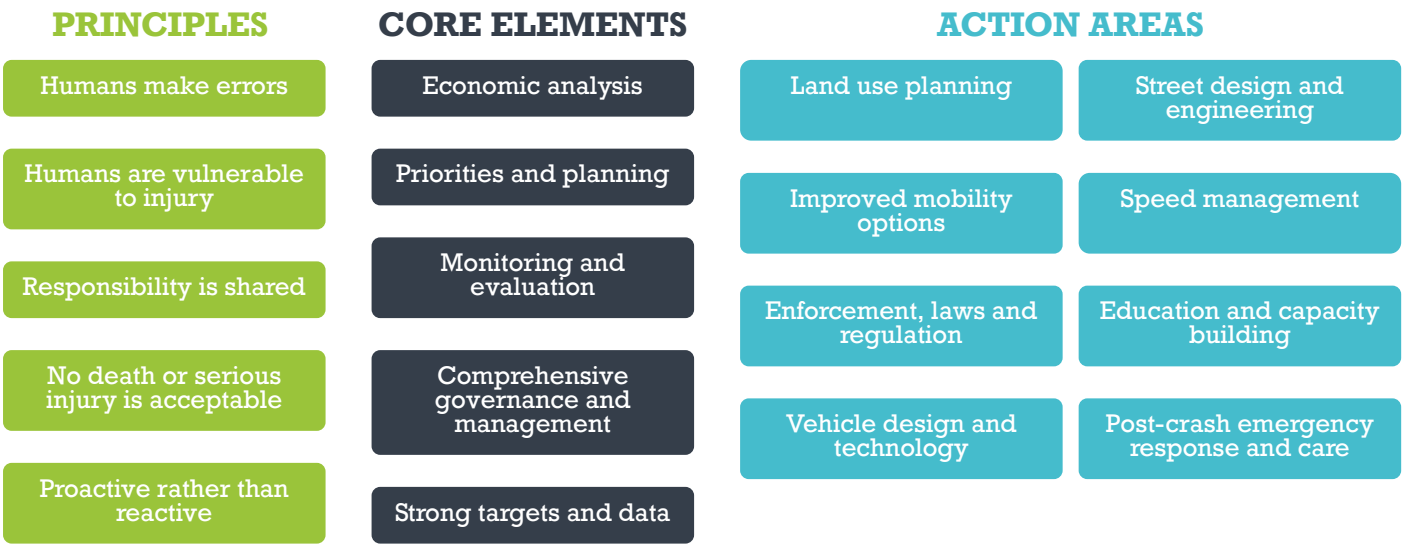

Figure 2. *Principles, core elements and action areas of a safe system approach, Welle et al. (2018).*

Vision Zero

In Sweden, deaths caused by road crashes were growing in line with increasing vehicle ownership and use. The reaction was to apply traditional concepts of engineering, education and control to the practice of road safety. That resulted in notable advances until the end of the 80's, when scholars and decision makers started to study ways to continue to achieve changes. Meanwhile, they interchanged knowledge with experts from other countries, especially the Netherlands, the United Kingdom and Australia, which had started to talk of a 'systematic approach' to road safety, including the inevitability of human errors, the vulnerability of people to impact, and shared responsibility, which resulted in the adoption of a safe system approach (Tingvall, 1998).

In 1997, the Swedish government adopted Vision Zero as a national road safety policy, stipulating that no one should die or be seriously injured during travel. Vision Zero approaches road safety as a system, and rather than placing the responsibility on road users, it accepts their errors and blames the system, which is changed by prioritized actions in order to make impacts non-fatal (Belin, Tillgren, & Vedung 2012). Every link of the road safety chain should be taken into account, with one ultimate goal: that nobody is killed or seriously injured in a crash or collision.

The key element of safe systems is shifting the responsibility from the weakest link (humans) to the more solid elements: infrastructure, vehicles, and operation. Rather than marking out human error and irresponsibility as causes of road deaths, Vision Zero indicates that when someone makes a mistake on the road it should not result in a death or injury. Ideally, a system can be designed that accounts for all possible human errors to avoid deaths and serious injury on roads, by way of safe infrastructure, norms, police control, safe vehicles, protective elements, etc.

Figure 3. *Poor coordination between the speed limit and the infrastructure. Photo: Natalia Lleras*

Areas of action in a safe system approach

Safe system approaches propose actions that tackle road safety in a systematic manner. According to the World Resources Institute (WRI), these actions include: land use planning to reduce the number of trips and guarantee a road hierarchy according to the function and context of roadways; design and road engineering to reduce conflicts between road users; improved mobility options to reduce the number of trips by motorized transport; development and control of regulations to reduce unsafe behaviours; education and capacity development to generate knowledge and awareness regarding traffic norms; road design and technology to guarantee protection of drivers and passengers; emergency response mechanisms to reduce the consequences of injuries in case of collision; and speed management to coordinate limits and operating speeds according to the function and context of roads (Welle et al. 2018).

Among the above-mentioned actions, the most effective measure used to reduce the number of deaths and serious injuries is speed management. The World Health Organization estimates that one third of deaths on the roads in high-income countries are caused by excessive speeds; in lower and middle-income countries, it estimates that this proportion is likely more than half (WHO 2017). Speed increases the probability of collision as well as the severity of the consequences, given that higher velocity of impact will cause more force (kinetic energy is calculated as mass multiplied by velocity squared). A one-ton car has 144% more force of impact at 60 km/h than at 50 km/h, even though speed is merely 20% higher.

At higher speeds, the risk of death increases. A pedestrian is at 5% risk of death when hit by a vehicle travelling at 30 km/h, but as speed increases, so does the risk of death: at 50 km/h, the risk of death is 29% (Qinaat et al. 2019). Approximately half of pedestrians killed on roads were impacted at speeds between 50 km/h and 80 km/h (Rosén and Sander 2009). Therefore, the WHO recommends establishing a max speed of 50 km/h in urban areas; however, only 29% of countries have this urban speed limit (WHO 2011).

The vulnerability of the human body and the number of victims in traffic crashes have led the majority of OECD countries to adopt urban speed limits of 50 km/h. Although certain roads permit higher speeds, those roads are completely segregated without level intersections and restrict access to vulnerable users. Managing speed means establishing appropriate speeds for each context and taking infrastructure, communications and control measures to ensure speed limits are followed.

Figure 4. *Traffic calming measures implemented for speed limit compliance in Bogota. Photo: Natalia Lleras*

PEDESTRIAN FATALITY RISK BY IMPACT SPEED

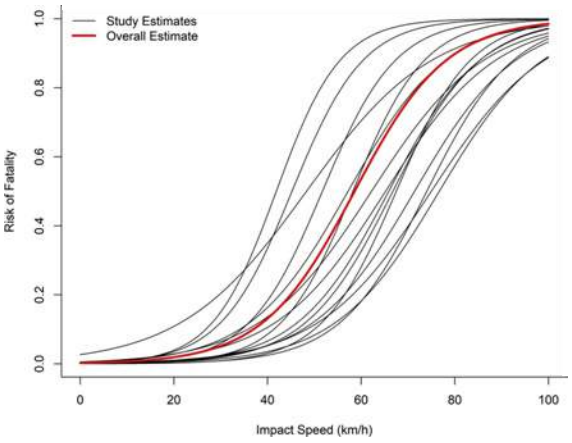

Figure 5. *Pedestrian fatality risk by impact speed, Hussain et al. (2019)*

Appropriate speed limits take the function and surroundings of a road into account. An arterial road with adjacent vacant lots should not have the same speed limit as an arterial with commercial land uses. When considering an arterial road with level intersections and presence of pedestrians and cyclists, the maximum speed should be 50 km/h. For a local road with educational and health facilities close by, the maximum recommended speed is 30 km/h. For surrounding parks and places where children play, recommended speeds are no higher than 20 km/h. However, the designation and signage of a speed limit does not by itself guarantee that it will be respected. There is also a need for enforcement measures such as infrastructure, regulation and police control, that guarantee that operating speeds do not exceed established limits (Alcaldía Mayor de Bogotá 2019a).

Infrastructure also conditions speed. In Latin American cities, many roads have a safe speed limit that is adequate for its function and context. Nevertheless, the design of the infrastructure is suitable for higher speeds. One can find 30 km/h limits in wide 3-lane roads that feature generous turns and no speed reduction measures, leading to operational speeds over double the limit. What stands out is that wide roads with many lanes invite drivers to accelerate, irrespective of signage, while roads with few and/or narrow lanes and tight turns force drivers to slow down. Traffic calming measures can also guarantee speeds that correspond to the speed limit. Speed bumps, width reductions, chicanes, raised pedestrian crossings, sidewalk extensions, sidewalk level intersections, traffic circles, and other similar elements, can ensure constant and controlled operating speeds at or below the limit (Welle et al. 2015).

Measures for the enforcement of regulations include the designation of 30 km/h zones, reduction of speed limits, implementation of parking zones that reduce roadway width, use of dynamic signals that indicate vehicle speed to drivers, and the synchronization of traffic signals so drivers who follow the speed limit have continuous flow, in contrast to speeding drivers who would have to stop at every signal.

In other cases, particularly in arterial roads designed for 50 km/h or more, it is necessary to have enforcement mechanisms such as police control points, radar-controlled areas, and mobile and fixed electronic speed detection devices or 'lifesaving cameras'. These elements for control of infractions stimulate compliance of the posted speed limit.

Infrastructure, regulation and control measures should be accompanied by a communications strategy, as in the majority of cases, the excess of speed is not identified as a danger by the community. Communication strategies should inform the community of the benefits of managing speeds, which aside from improving the security conditions for all road users also prioritizes and promotes sustainable transport, and reduces noise and pollution as well as traffic delays resulting from crashes (Alcaldía Mayor de Bogotá 2019b).

Finally, it must be highlighted that the reduction of speed limits does not have a significant impact on vehicle congestion or travel times, even though perceptions may differ (Soriguera et al. 2017). The speed of movement is more affected by vehicle volumes and traffic signal phases than by maximum speed limits. For this reason, in most cities maximum speeds are not reached during the day, due to the high volume of traffic. This changes at night, when volumes drop and the highest speeds are reached. In any case, the 'loss' of time is small, for instance, when the limit drops from 60 to 50 km/h, travel time increases 12 seconds per kilometre, which amounts to 2 minutes over 10 kilometres, if travelling constantly at the speed limit.

Safe system approaches in Latin America

The examples set by Sweden, the Netherlands and Australia, as precursors of a systemic approach, have led the majority of OECD countries to adopt similar policies to achieve continuous reductions in the rate of deaths in traffic (ITF 2016). In Latin America, these approaches have been taken up by Chile and the cities of Mexico, Fortaleza, São Paulo and Bogotá, among others.

Regarding excess speeds, many countries in Latin America feature inappropriate urban speed limits (see Figure 7). However, some cities and countries are implementing recommended limits in urban zones. Chile is a good example of the adoption of safe limits, as it established the 50 km/h limit recommended by the WHO. This was done by the Law of Road Conviviality, and was achieved through a broad process of debate in which more than 100 civil society organizations participated, conforming the Citizen's Network for Road Conviviality #60mata.

In São Paulo, there has been a gradual process of road safety improvement, which has included multiple actions regarding control and reduction of speeds in main transport corridors. The number of traffic deaths in São Paulo declined from 2,981 in 1987 to 854 in 2016 (a 71% reduction over 29 years). Between 2015 and 2016, the establishment of a maximum speed limit of 50 km/h in main roads resulted in a 14% decline in deaths, yet the measure generated a debate about speed limits, which influenced local elections. This led to increases in the limit in the peripheral urban highways Pinheiros and Tietê, although the 50 km/h limit was maintained on arterial roads in 2017 (G1 2017) and implementation of low speed zones (40 km/h) continued. In 2017, São Paulo achieved the lowest crash rate registered since 1979, with 6.6 fatal victims per 100,000 inhabitants (Tanscheit 2018)

In Mexico City, the government of the Federal District adopted a new Mobility Law in 2015, which includes multiple Vision Zero principles and speed management (Administración Pública del Distrito Federal de México, 2015). This Law gives "priority to the utilization of road space according to the following hierarchy:

a) Pedestrians, in particular persons with disabilities and limited mobility;
b) Cyclists;
c) Users of passenger public transport services;
d) Providers of passenger public transport services;
e) Providers of freight transport and logistical services;
f) Users of individual transport by motor car and motorcyclists." (Administración Pública del Distrito Federal de México, 2015)

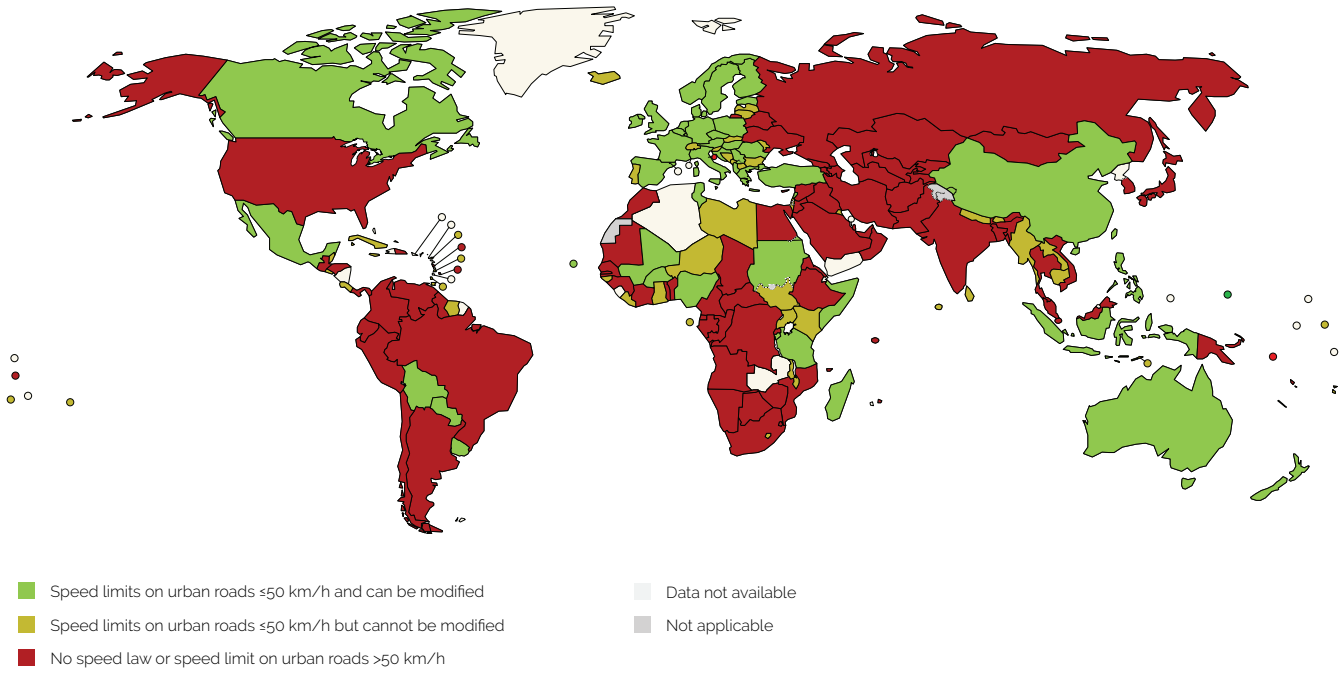

Figure 6. *Country compliance with best practices on urban speed limits in 2017. Source: WHO. (2018).*

It also includes multiple provisions about the circulation of every road actor, increases fines for contraventions, reforms signage and road hierarchy, and establishes a maximum speed of 50 km/h for arterial roads and lower limits for secondary and local roads. For zones with schools, hospitals, asylums, hotels and residences, a maximum speed of 20 km/h is established. The peripheral ring, with restricted access, allows a maximum speed of 80 km/h (Secretaría de Seguridad Ciudadana Ciudad de México, 2019). To ensure compliance, the city implemented an electronic detection system of '*fotomultas*' – photo fines.

The result of applying the traffic regulation was notable. While in 2015, 622 investigations of cases of culpable homicide in traffic accidents were opened, during 2016 only 498 were registered (20% reduction compared to 2015); in 2017, 463 (26% reduction compared to 2015), and until October of 2018, 442 (equivalent to a 15% reduction compared to the same period in 2015, see Excélsior 2018).

Nevertheless, in 2019 the administration decided to modify the *fotomultas* program, changing its name to *fotocívicas* and eliminating economic sanctions, which were replaced by a points system and community work (Secretaría de Movilidad de la Ciudad de México, 2019). This decision, which runs against the achieved advances, could result in a rise of the number of victims in crashes linked to lower compliance with speed limits. For this reason, this decision should be further studied to assess its impact on road safety.

On the other hand, Bogotá is a good example of a safe system and speed management approach. The safe system focus, called 'Visión Cero', was adopted in 2017 and it updated the District Road Safety Plan (PDSV). This adjustment to the plan defined the principles of Vision Zero, the areas, programs, and actions to follow to improve road safety in Bogotá for the next 10 years. One of the main actions of the PDSV is the development and implementation of a Speed Management Program (PGV), aimed at coordinating speeds with the environment and function of roads, to achieve a safer and more pleasant city with optimized mobility, reduce the number of fatal victims and serious injuries, and to promote sustainable transport (Alcaldía Mayor de Bogotá 2019a).

The PGV was a response to the problems identified during the data analysis of the PDSV, which identified that 70% of fatal victims and the critical points for vulnerable users were registered in arterial roads, where the highest speeds are registered. Similarly, it was found that risk was higher between 1 and 6 a.m., coinciding with a higher percentage of vehicles surpassing the speed limit (60 km/h). During this time there is also a higher percentage of fatalities compared to total victims, indicating that there is a higher risk of becoming the victim of a road crash (Hidalgo et al. 2018).

EVOLUTION OF THE TOTAL NUMBER OF ROAD DEATHS IN SÃO PAULO

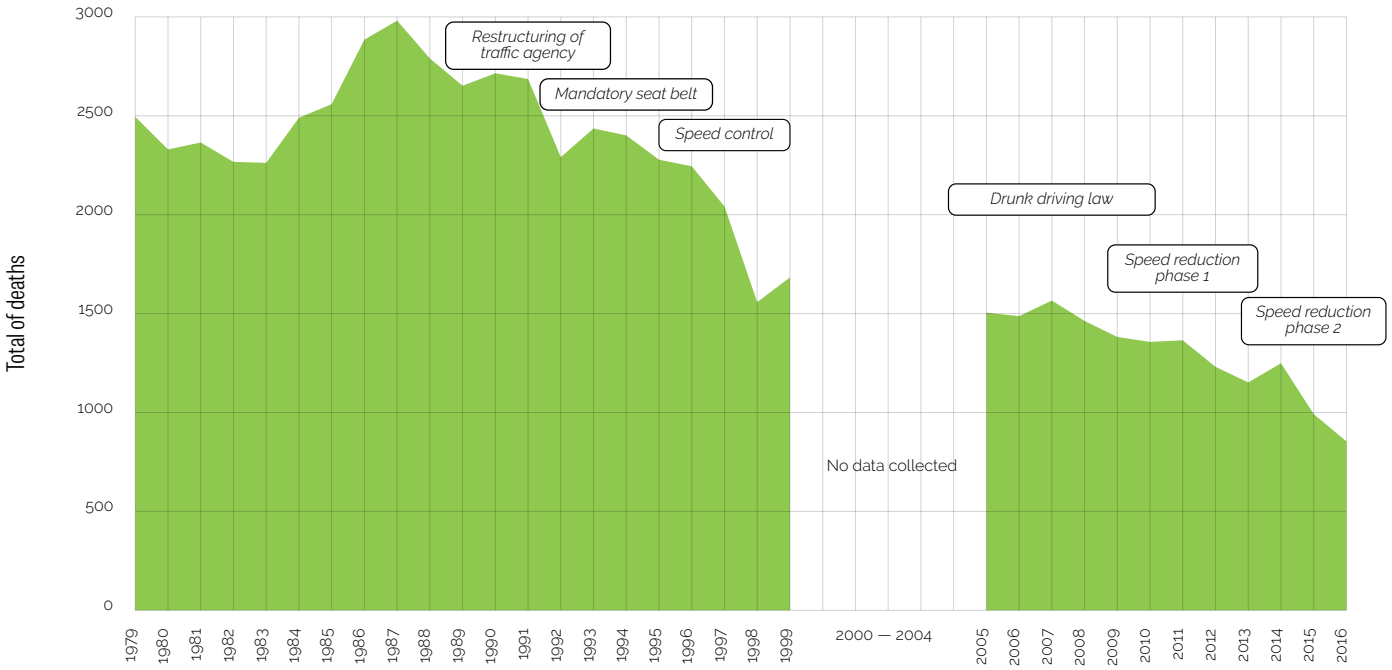

Figure 7. *Evolution of the total number of road deaths in the municipality of São Paulo. Source: City Hall of Sao Paulo (2019)*

Similarly, in critical points in residential and educational areas, where speed limits were 30 km/h, only 3 out of 10 drivers respected the speed limit, as the roads were designed for higher speeds and did not feature any traffic calming measures (López et al. 2017). The PGV was a response to these problems identified in the city, a tool to evaluate the current speed limits and operational speeds, and to implement compliance measures as needed.

The PGV includes an action plan to work in the areas were the largest impact can be achieved. During the development of the plan, critical areas were identified for implementation of 30 km/h zones and commercial zones, as well as the 5 most critical arteries, which registered 25% of all crash deaths in the city (approximately 150 fatal victims per year) and where speed limits should be reduced from 60 to 50 km/h to improve safety conditions (WRI Ross Center 2017). In 2018, the District Secretary for Mobility of Bogota established a 50 km/h speed limit on these roads and started to enforce the limit with traffic police controls to ensure compliance. It is estimated that this measure could reduce the number of traffic fatalities by 32 to 68% on these roads (López 2018). Between November 2018 and May 2019, a reduction of 17% in the number of road crash deaths was been registered in the 5 arterial corridors.

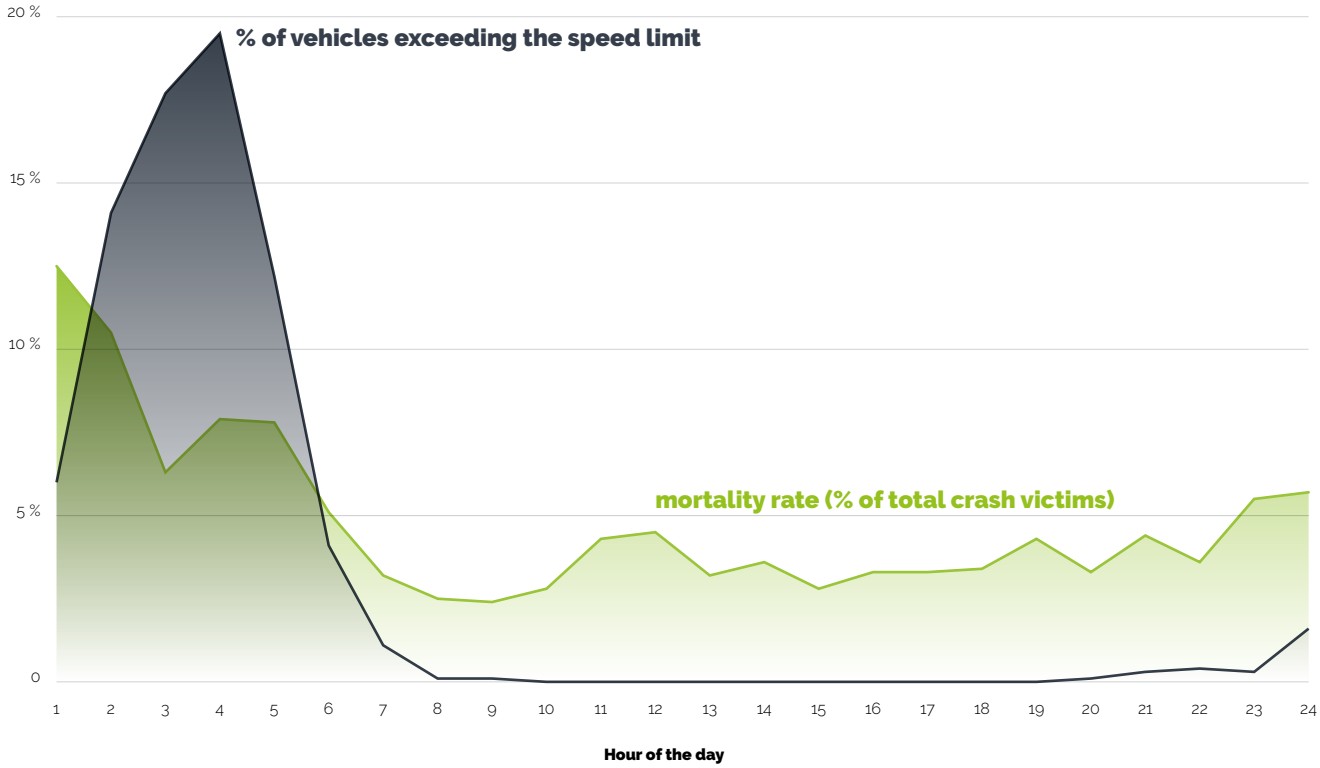

Figure 8. *Severity of crashes and speeds above the limit in Bogotá. Source: Hidalgo et al. (2018)*

Conclusion

The safe system approach represents a paradigmatic change, which has demonstrated that integrating human behaviour into the design, construction and operation of our transport systems saves lives. Additionally, this change of paradigm shifts the responsibility for road safety from the users to the designers and operators of the system. To err is human and the system should be structured so that road users' decisions do not result in a death or serious injury.

Various cities in Latin America are taking steps towards the adoption of a safe system approach. Its focus is comprehensive as it establishes road safety as a crosscutting issue in all government entities and concentrates efforts in key areas to improve road safety. The adoption of a safe system approach is a core step in the reduction of road crash victims, as it has proven to quickly reduce fatality rates and has a great positive impact in public health, the environment, sustainability and equity.

One of the major challenges in Latin American cities is establishing speed limits according to the use and function of the road and enforcing speed limits through infrastructure and police control. It is possible to satisfy mobility needs without affecting the life or health of road users, and in order to do so, tackling excessive speeds achieves the quickest and most substantial results; safe speeds are key to implementation and promotion of sustainable transport.

Bogota is a clear example of the implementation of a safe system approach. Vision Zero BOG has focused government entities on the reduction of road crash victims and the action area with the fastest results has been speed management. Lowering the speed limit from 60 y 50 km/h and enforcing it has yielded great results. The measure has contributed to the reduction in the number of fatalities on these roads and has a potential impact citywide, which is currently being evaluated. The speed management measure was also replicated in 3 more arterial roads and it is planned to over a total of 10 arterial roads by the end of 2019. Bogota's Secretary of Mobility also developed a series of trainings on road safety for journalists, which also generated public support for the road safety measures implemented in the city.

A safe system approach can be adapted to any context. Nevertheless, the reduction of road crash victims in Latin America cannot be achieved without (i) political commitment, in order to ensure the implementation of road safety goals and objectives, and to lead actions and activities; (ii) use of data to help focus efforts where its more needed and gain support by evaluating and presenting the impact of the implemented measures; (iii) managing speeds, speeding and inappropriate speeds, which are key factors in road safety; (iv) support of opinion leaders, since engaging and training them will help gain public support for the implementation of a safe system approach.

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40

Getting active: the promotion of walking and cycling in Latin America

5

Thomas van Laake and *Marina Moscoso*

Though hardly revolutionary or innovative, the most sustainable form of transport is also most central to the human condition; namely, the use of the human body's metabolic energy to travel. Humans have always walked and have continued to do so even as urbanization and motorization has dramatically changed their living environment. A second human-powered travel mode developed in the 19th century – the bicycle – increased the speed, efficiency and ease of human-powered mobility, and ultimately became one of the main forms of personal transport in many parts of the world (Vivanco, 2013). Both active travel modes burn calories rather than fuel, and therefore emit no pollutants, result in numerous health benefits, and carry little to no monetary cost to the user. Moreover, as a fundamentally human-scale form of transport, active modes require small amounts of space and are not a risk to other road users. In today's congested and polluted cities, these benefits seem to indicate an obvious solution to many of the problems of urban mobility.

Across Latin America, cities face the interconnected challenges of increasing motorization, traffic gridlock, preventable road deaths and injuries, and deteriorating air quality (see Chapter 2). While between 10 and 40% of the urban population continue to rely on active travel modes, conditions are not conducive to their use. Infrastructure for walking and cycling is generally poor and often non-existent, and safety concerns discourage potential new users. Since many of those currently walking and cycling are captive users due to poverty, the risk is that rising incomes will continue to drive motorization and worsen the situation. Meanwhile, politicians' and planners' attention to improving the conditions for this travel mode has often been limited to hopeful discourses, rather than action (see Chapter 8). In fact, Latin American cities continue to be designed around private motorized transport, creating ever more barriers to active travel.

However, there is reason for optimism. Academic and public discourses on mobility across the region have begun to strongly favour active mobility, driven by grassroots citizen activism with support of experts and scholars, a recognition that motorization cannot continue unabated. Cycling, in particular, has been rediscovered as an urban transport mode, which has seen cities across the region planning and implementing cycling networks, car free days and public bicycle systems. Internationally, some cities have come to be recognized for promoting and developing active mobility infrastructure in a global south context, with potential lessons for cities worldwide. In this context, this chapter will examine the promotion of active mobility in Latin America, with special attention to how challenges have been overcome and which obstacles remain.

Urban context, motorization and active mobility

Crucially, active travel involves a human-scale interaction with the city and the urban fabric. Users are exposed to road elements, find themselves unprotected from traffic, and more positively, interact with surrounding sights, sounds and activities. Planning for active modes therefore demands a different perspective on mobility, one that considers various objective and subjective factors of human experience, which generally have not been considered in a conventional, functionalist mobility planning approach focused on moving vehicles rapidly and efficiently (see Chapter 3). This means that comprehensively improving conditions for these modes will require looking beyond the act of travel itself to consider wider urban and social issues as well. Walking, in particular, is associated with the quality of public space – where conditions for walking are poor and where public space is likely to be of low quality as well (Gehl, 1996).

Generally speaking, Latin American cities feature significant advantages as well as certain challenges in the promotion of active mobility. In terms of urban structure, the region's cities are relatively dense and feature many mixed-use developments, potentially reducing travel distances and therefore lowering dependence on motorized transport for daily travel (see Chapter 2). However, entrenched inequality and ongoing planning failures mean the poor, who have most to gain from active mobility and currently represent the bulk of active trips, are often furthest away from economic opportunities and have their access to the city's opportunities reduced due to obstacles to travel (see Chapter 3).

In terms of challenges, road safety is a major factor in limiting bicycle use. Understandably, potential users decline to battle cars, motorcycles and buses for space on congested roads, in a context of little to no protected infrastructure and poor driving habits, including aggression towards cyclists. Moreover, personal safety concerns are paramount in the region, which features most of the world's most violent cities, leading many to avoid walking or cycling after dark and/or in certain areas.

From a historic perspective, the current difficulties of active mobility in Latin America can be attributed to decades of neglect by planners. While walking and cycling were once very common, the promotion of motorized transport was a major element of 20th century modernization in Latin America. Grounded in the apparent advantages of automobiles in terms of speed and comfort, and based on Northern models of development, dense and walkable cities (often relying on networks of streetcars or railways) were retrofitted for automobility and cut through by modern urban highways and grand avenues (Niño Murcia & Reina Mendoza, 2010). Here, a process of 'elite projection' (see Walker, 2017) saw decision-makers facilitate the mobility practices of the well-off, operating on the assumption that what is good for those able to purchase and maintain an automobile would be good for the entire urban public as well. Yet even today, only a minority of urban dwellers in Latin America can afford to own and use a car for their daily commute (Vasconcellos & Mendonça, 2016).

The organization of urban transport systems around the private car has had wide-ranging and long-lasting effects on the mobility patterns, urban form and social organization of Latin American cities. Throughout the region, motorization has driven peripheral urbanization, increasing travel distances and residential segregation (Blanco, 2016; Janoschka, 2002); traffic congestion has steadily increased, affecting poor public transport users as well as drivers (INRIX, 2019; Thomson & Bull, 2002); air quality has worsened, and 95 thousand road deaths are reported annually (WHO, 2018). With mobility planning focused principally on moving vehicles quickly and efficiently, it became abstracted from the human scale and the movement of people was forgotten

Figure 1. *Urban highway cutting through Guayaquil, Ecuador. Photo: Carlosfelipe Pardo*

– especially that of the poor and those walking or cycling (see Chapter 3).

Despite the privileging of motorized travel, active modes have remained central to mobility in Latin American cities and are now increasingly recognized as such. Walking is now understood as the most human form of transport as a supplementary mode to nearly all motorized trips. Meanwhile, cycling has improved its image and has come to be taken seriously as an element of urban mobility in many of the region's major cities. At a fundamental level, moving from car-based to people centred cities requires a change of mindset of planners, politicians and citizens alike. A clear guideline for change is making the movement of people, rather than of vehicles, a priority. From this perspective, the inefficiency of private cars becomes obvious and pedestrians and cyclists can be considered upstanding citizens, rather than outcasts.

Active mobility policies in Latin America

A wide range of actions can be taken to promote and improve active mobility. The principles of active mobility policy have been set out clearly in the sustainable mobility policy literature – for instance, the Avoid-Shift-Improve framework (SUTP, 2016) and measuring of road capacity in terms of people moved (rather than number of vehicles, see Chapter 3). However, the practical methodologies employed in successful active mobility projects are necessarily context-dependent and subject to political considerations. With Latin American citizens and governments increasingly aware of the failures of the mobility policies of the last decades, and with the benefits of active mobility ever more apparent and relevant, cities across the region now feature policies specifically oriented at improving and promoting walking and cycling.

To narrow down and categorize the broad spectrum of 'active mobility policy', the cycle-inclusive policy framework developed by the IADB is a useful structure (Ríos et al., 2015). It considers four main aspects of such policies, which should be integrated in comprehensive policies (see Figure 2, Chapter 4).

In the following section, this article will explore the current state of active mobility according to each of the aforementioned policy domains in Latin America. In doing so, we extend the framework, originally developed for cycling, to walking and pedestrian mobility.

Figure 2. *Four aspects of cycling-inclusive policy, as set out by Ríos et al. (2015)*

Infrastructure and services

Like any other form of transport, active mobility requires high-quality infrastructure for comfortable, safe and efficient trips. Nonetheless, infrastructure conditions for walking and cycling in the region are often poor or lacking altogether, forming a significant barrier to higher usage, excluding vulnerable users (such as children, women and older persons), and causing dangerous situations and deadly interactions with motorized traffic. The implementation and improvement of dedicated infrastructure for walking and cycling is therefore a key element of promotion of active mobility in the region. In particular, this means intervening in the automobile-centric road designs typical of urban areas in Latin America and giving priority or protection to active modes.

There is an important distinction to make between walking and cycling infrastructure. For pedestrians, with the exception of peripheral areas, there are generally provisions such as sidewalks and crossings. However, where sidewalks are provided, the quality is often very poor, featuring insufficient and/or erratically changing widths, obstacles such as high curbs, poles or large holes, and poor lighting, among other factors. Moreover, space nominally dedicated to pedestrians is often appropriated for other uses, such as illegal parking or informal vending, creating even more obstacles. A further challenge is the on-going implementation of pedestrian bridges over urban arterials; these are unsafe, increase crossing distances, exclude vulnerable users, prioritize the fluidity of vehicles which increases speeds, and have proved to be ineffective in improving pedestrian safety (Liga Peatonal, 2019).

On the other hand, cycling infrastructure is often lacking altogether in Latin American cities (though there are some important exceptions, see Ríos et al., 2015). Conditions on arterial roadways with high speeds and traffic volumes are not conducive to safe and comfortable cycling. Protected infrastructure is necessary to encourage cycle use and include vulnerable users. Indeed, there is ample international and regional evidence that cycling infrastructure is a prerequisite to increasing cycling rates (Jacobsen et al., 2009; Pucher & Buehler, 2008).

Promisingly, there have been efforts to improve infrastructure for active mobility in the region, resulting from increased recognition of the importance of physical conditions for these modes, and the increased political profile given to such public works (see Chapter 8). Betterment and widening of sidewalks has been carried out in many cities, though usually concentrated in higher-income or commercial zones. Perhaps the road safety approach has been more effective (see Chapter 4), since it has seen pedestrians benefit from level crossings, reduced crossing widths, and lowered vehicle speeds (Tanscheit, 2018; Welle et al., 2018). In addition, tactical urbanism, a low cost and high impact measure, has been used by many cities to test solutions and gain public support.

Pedestrianization of streets has been less widespread, yet perhaps more influential in recovering the position of the pedestrian. The 1970's saw the first of such schemes in Latin America, specifically in the historic centres of capitals, and oriented towards stimulating commerce and retail (Capron, Monnet, & López, 2018). Such projects have continued to a modest degree, with most major cities in the region featuring at least one major pedestrianized street, often in a central retail or tourist district. However, such interventions have not spread to more peripheral areas, where pedestrian-friendly retail environments have generally been indoor and easily accessible by automobile (Dávila, 2016).

In recent years, the region has also seen a boom in cycling infrastructure, in regards to both total kilometres as well as the number of cities featuring it, albeit from a low base (Ríos et al., 2015; see Figure 5 below). The success of cycling infrastructure in certain leading cities has been a key factor in inspiring neighbouring cities to implement similar policies. Perhaps the most impressive example is Bogotá, a large and chaotic metropolis that had less than 1% of trips by bicycle in the 1990's. Here, the implementation of cycling infrastructure (currently over 500 kilometres) was key to multiplying the modal share to more than 6% in little over a decade (Verma, López, & Pardo, 2015). Smaller cities have also been proactive, with Rancagua, Chile, standing out for implementing a network of 56 kilometres of cycling tracks, leading to rapid growth in cycling (Municipalidad de Rancagua, 2019).

However, standards in design have often been lacking, leading to ineffective or substandard infrastructure. In particular, cycling infrastructure often does not form a complete network of direct and comfortable routes, which is the international standard for high-quality cycling infrastructure (see CROW, 2007). In other cases, cities have chosen to construct white elephants that are more useful as tokens of sustainability than actual infrastructure, such as the case of Puebla's elevated cycling tracks (Sosa, 2016; see Chapter 8). Substantial improvement of planning and design practices is necessary if the precarious increases in cycling are to be sustained and amplified.

Figure 3. *Giving space back to pedestrians. Malecón 2000 in Guayaquil, Ecuador. Photo: Carlosfelipe Pardo*

Figure 4. *Tactical urbanism to improve pedestrians' road safety in Bucaramanga, Colombia. Photo: Marina Moscoso*

MODAL SHARE AND KM. OF CYCLING INFRASTRUCTURE

In cities in Latinamerica in 2014

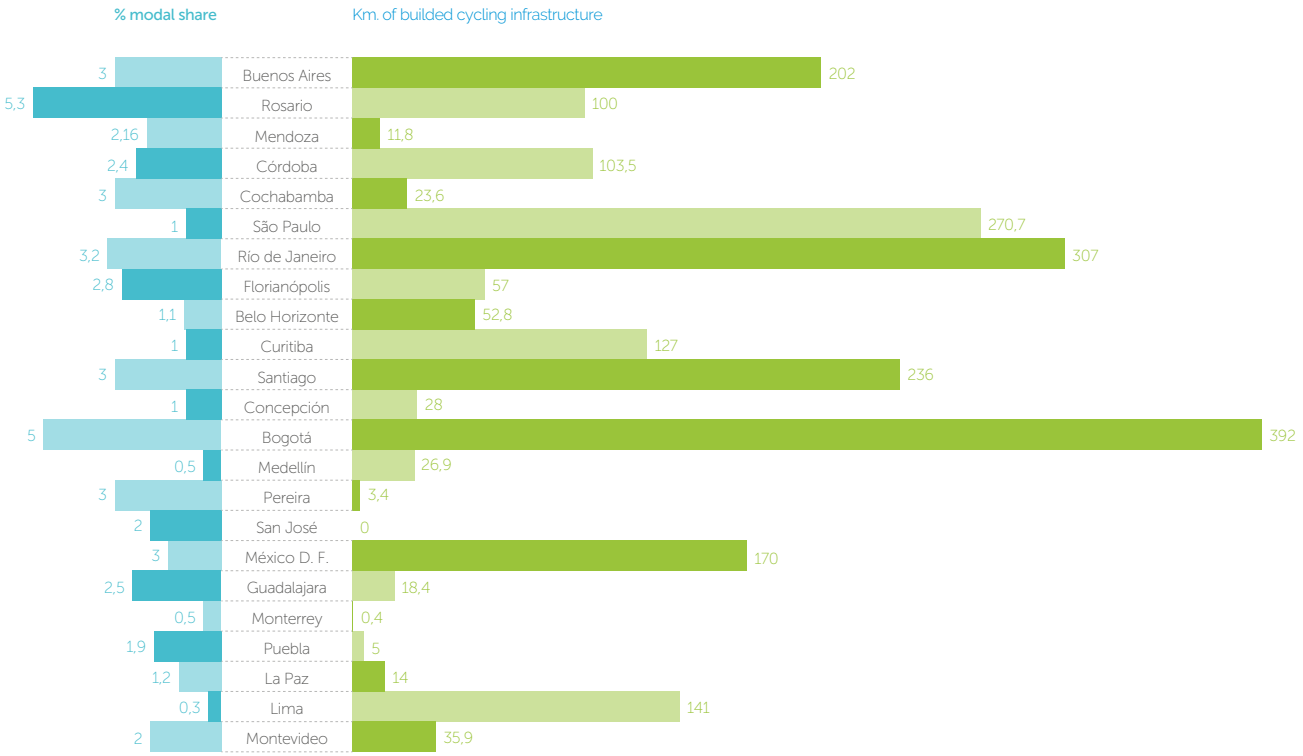

Figure 5. *Modal share and kilometres of cycling infrastructure in various cities in Latin America in 2014. Based on Ríos et al. (2015)*

Norms and regulations

As road users, pedestrians and cyclists need to be included in legal and normative instruments. Due to their vulnerability, they require protection from other modes. The basic principle that underlies regulation of active mobility is their recognition as vulnerable users, reflected by a priority of modes based on the importance of protecting the most sustainable users. While much talked about, this paradigm shift has not yet been widely adopted in legal terms in Latin America. In contrast to the legal protection enjoyed by cyclists in countries like the Netherlands (van Laake & Pardo, 2018), vulnerable road users are generally not well protected legally, and where legal protections exist, they are rarely fulfilled.

Meanwhile, the experience of walking or cycling in Latin American streets indicates that the key challenge is the transformation of social norms. Motorized vehicles often disregard or endanger vulnerable users by not giving priority, passing closely, failing to indicate and other highly threatening manoeuvres. Improving regulations needs to include norms related to vehicle behaviour when overtaking cyclists (maintaining a distance of 1.5 m), circulation and occupation of road space and giving priority at crossings. This is in addition to other normative changes that cities can undertake to improve active mobility, including promotional activities, improving the ability to access public transport, defining norms for vehicular parking and acting against violations, bicycle registry to combat theft, and more.

On the other hand, where regulations focus on self-protection by vulnerable users, rather than on reducing risk factors and improving the quality of infrastructure, they are likely to be counterproductive and may lead to a vicious circle that ends up reducing the use of active modes. An exemplary case is making cycling helmets obligatory, as happened in Chile, despite resistance from cycling activists. There is ample consensus that obligatory helmet use discourages cycling, ultimately undermining efforts to improve safety (Baden Poulsen et al., 1998; Fyhri, Bjornskau, & Backer-Grondahl, 2012). Moreover, a study in Bogota by Quiñones & Pardo (2017) showed that helmet use does not reduce the risk of serious injuries in the case of traffic crashes.

A key necessity for improvement is design guides and manuals that are adapted to local contexts and which support local municipalities in implementing high quality infrastructure. In the absence of such documents, cities often 'reinvent the wheel' and may implement varying types of infrastructure without clear criteria. Luckily, there are many positive developments. Brazil has a cycling planning manual (Ministerio dos Transportes, 2001), Mexico has Ciclociudades – a complete guide on cycling promotion (ITDP México & I-CE, 2011), Colombia has a design manual for cycling infrastructure (Ministerio de Transporte de Colombia, 2016), and Chile has a design guide (Ministerio de Vivienda y Urbanismo,

Figure 6. *Cycle paths in the central lane may generate access and safety issues, example from Bogotá (Carrera 24). Photo: Carlosfelipe Pardo*

2013, 2015), as does Lima (Programa Metropolitano de Transporte no Motorizado, 1994), which was recently updated (Municipalidad Metropolitana de Lima, 2017).

There have also been advances in terms of policy. Different cities in the region have adopted sustainable urban mobility plans that include cycling. Even more encouraging are bicycle strategies that go beyond the implementation of infrastructure and aim to increase bicycle use in a holistic manner. Moreover, setting targets and indicators allows for continuity and public appropriation and surpass government terms; as for instance in Santiago de Chile (Ilustre Municipalidad de Santiago, 2015), Metropolitan Area of Valle de Aburrá (Área Metropolitana del Valle de Aburrá, Elejalde López, & Martínez Ruíz, 2015), and Bucaramanga (Área Metropolitana de Bucaramanga, Alcaldía de Bucaramanga, & UN-Habitat, 2018), to mention a few.

At the institutional level, a key measure implemented in different cities is to have an active mobility office, or even one person who is responsible for centralizing efforts and advancing the agenda. Defining such an office or position sends a clear message of commitment, establishes a contact point for inter-institutional and public dialogue, and helps ensure that new policies, projects and norms take active mobility into account. Cities that have a department or personnel in charge of active mobility include, among others, Buenos Aires, Mexico City, Bogotá, Bucaramanga, Manizales and Lima.

Citizen participation

Citizen participation is a key aspect of promoting active mobility, as it has the potential to strengthen the design and implementation of policies and projects. Where active mobility projects such as cycling paths are prone to be opposed by interest groups, participation in the projects bestows legitimacy and is likely to lead to more acceptance of the end result. The quality of projects and policies can also be improved through participation, as citizens are often more aware of local situations and needs than planners and engineers. Moreover, as international experiences have shown (van Laake & Pardo, 2018), citizens are the driving force behind active mobility policies, by articulating demands, creating actions and maintaining pressure on politicians and policymakers to deliver real change.

Governments and planners have various tools at their disposal to generate citizen participation in their projects. However, the political dynamics of Latin American cities mean governments can be reluctant to involve potential opposition and risk delaying projects, and therefore limit citizen engage-

ment to informative processes. Whereas getting participation right is crucial for moving projects forward, it can also be the most difficult part, as many practical barriers to comprehensive participation need to be overcome. For instance, it is currently common practice to outsource design studies and engineering work to consultants, who have little interest in time-consuming and potentially complicated participation processes. Legal requirements, especially regarding technical expertise, can also prove difficult and water down the scope of participation (Sagaris & Ortuzar, 2015).

Formal participatory institutions, such as a roundtable or committees, have been more common, and can be highly useful to involve key citizen actors and steer policy. Many cities feature such programs, including some with poor track records on sustainable mobility, such as Guayaquil. Some of these processes have achieved notable results: in Santiago, Chile, a citizen-government roundtable involved over 1500 people, building broad support for cycling policies and achieving practical results including funding and revision of road design standards (Sagaris & Ortuzar, 2015). For citizens, however, the experience can be frustrating and ineffectual, and in some cases, participatory forums have collapsed or devolved into clientelistic exercises.

Citizen activism on active mobility in Latin America includes various types of groups, motivations and objectives. Some activism is focused on protest, for instance against highway projects (Sagaris & Landon, 2017) and campaigns for removal of pedestrian bridges (Liga Peatonal, 2019). Others are broader, including cycling collectives, which have been instrumental in mobilizing cycling activism, influencing policy formulation in various cities in the region, and even implementing informal cycling infrastructure which later became permanent (see Jensen, 2015). Events organized by such collectives provide members with affirmative experiences and community, all the while challenging the dominance of motor vehicles (Castañeda, 2016).

Other forms of participation include citizen oversight, which involves civil society organizations producing, analysing and sharing new or existing knowledge on walking and cycling. This includes Despacio's bicycle and pedestrian account series (Verma et al., 2015; Quiñones et al., 2017), which investigates the current state of bicycle use and walking in Bogotá by gathering, organizing and analysing quantitative and qualitative data. Another example is the *Red Cómo Vamos*, which continuously measures different cities' quality of life by way of surveys (Red de Ciudades Cómo Vamos, 1998; 2013). These initiatives have the objective of promoting transparency, opening data and enabling participation by facilitating the understanding of complex urban dynamics.

Operation

The final aspect of active mobility policy examined here is operations, referring to the management and control of these modes by governments, including collection and use of data and interactions with public systems such as bike share and intermodality with public transport (Ríos et al., 2015).

The collection and use of data about pedestrians and cyclists and their behaviour is crucial to visualize their movements and needs, helps to monitor effects of interventions and changes, and provides a key input in planning processes. However, such information is often lacking, in contrast to the extensive information available about public transport users and motorized traffic. For one, many cities lack a profile of pedestrians and cyclists, which means that the potential beneficiaries of pro-active mobility policies are not well understood. Recognizing the need for this information, various civil society organizations have researched and established profiles (mostly of cyclists), in order to contribute to improving policies and interventions (Área Metropolitana de Bucaramanga et al., 2018; ITDP México, 2019; Orellana et al., 2018; Transporte Ativo & LABMOB-UFRJ, 2018). Studies of pedestrian and cyclist flows can prove more challenging, though Latin American researchers have made advances in this regard (Orellana, Hermida, & Osorio, 2017). Recently, the use of GPS apps has proven to be an effective and innovative tool to study cyclist flows in order to evaluate and inform planning decisions (Pardo & Quiñones, 2018). However, the availability of information and data in the region is still very poor, with standardized and comparable data especially scarce (Ríos et al., 2015, pp. 26–27).

In recent years, Latin America has seen a boom in shared mobility systems, with public bicycle sharing systems growing exponentially and now being present in most major cities[1]. Among the region's systems, Mexico City's Ecobici has the largest fleet of bicycles, with 6800 units available, including electric pedelecs, and has reached over 60 million total rides. The system also stands out for the high density of stations, helping to increase usage and connectivity (ITDP, 2018). Other systems, such as Buenos Aires' namesake Ecobici and Medellin's EnCicla, are free to use (for residents), helping amplify usage and accessibility. However, public bicycle systems in the region generally do not cover underprivileged areas of their cities, meaning that the urban poor are not served by these systems. The entry of private shared mobility systems, including bicycles and e-scooters, entrenches these divisions, as the cost per ride can equal or exceed a public transport fare, placing them well out of reach of the poorest citizens. Current challenges include regulation of private systems and expansion of publicly run schemes.

One key area where Latin America leads the world is in open-streets events, where roads are closed off to motorized traffic to permit cyclists and pedestrians to enjoy free circulation. The pioneer of such events, Bogotá's Ciclovía, remains the world's largest open streets event, taking place every Sunday and public holiday and providing over 120 kilometres of closed roads for the use of around 1.5 million users. Though it is of a recreational and temporary nature, the large-scale use of bicycles during the Ciclovía is considered crucial in promoting a bicycle-inclusive urban culture (Pardo, 2013), and has been shown to have significant positive health impacts (Sarmiento et al., 2016; Torres et al., 2013). Based on the successful example of the Ciclovía and popularized through a network of experts, there are now hundreds of similar events throughout the region and worldwide (Montero, 2017).

Finally, a major area for effective change and promotion of active modes is in the strengthening of intermodality with public transport. With most urban Latin Americans depending on public transport (see Chapter 2), first- and last-mile journeys are a key area for improvement and mutual reinforcement of sustainable modes. Sadly, large mass transit projects in the region generally do not improve walking and cycling conditions in a comprehensive way (see Chapter 4). In particular, intermodality between cycling and public transport has immense potential to amplify the range of public transport (Kager, Bertolini, & Te Brömmelstroet, 2016; Pardo & Calderón, 2014; Pucher & Buehler, 2009). To do so requires safe infrastructure connections to the mass transit stations, and above all, the ability to store bicycles for free or at low cost. A regional leader in this regard has been Bogotá, where over 20 stations of the Transmilenio BRT feature free cycle parking, helping reduce the load on the feeder bus system. The implementation of public bicycle sharing systems that connect with mass transit could also develop the potential of intermodality, provided user costs are not excessive and bikes are conveniently located.

1 For an overview of all existing systems in Latin America, see the 'Bike-sharing world map', available on Google Maps: https://bit.ly/32dSBSm

Moving forward with active mobility

Latin America's cities, though featuring different modal shares, contextual developments, and specific factors that stimulate or impede active mobility, face similar challenges and opportunities, and the potential for inter-city learning and inspiration should not be underestimated.

Regarding infrastructure, Latin American cities will need to substantially improve the physical conditions for active mobility. Creating a basic network or 'minimum grid' of cycling routes connecting important living and working areas of the city should be a short-term priority, with more substantial improvement possible in the mid- to long-term. While implementation of infrastructure is key, wider redesign of road environments, including traffic calming and filtered permeability solutions can improve conditions for active mobility more generally.

In terms of norms and regulations, there have been many positive developments in the region, with increasing recognition of the rights of vulnerable modes. However, there is cause for concern when restrictive norms are implemented, as in the case of mandatory helmet laws. These risk blaming vulnerable users for the unsafe conditions of the roadway, shifting responsibility from governments and motorized vehicles to the active modes themselves.

The participatory processes of active mobility are perhaps the weakest link of active mobility policy in the region, with governments failing to consistently engage and involve citizens in policy and projects. While the citizenry has often been key in pressuring institutions and putting walking and cycling on the political agenda, there is great scope for expanding formal participatory processes at different levels.

Finally, in terms of operations, there have been great advances. Many cities in the region now feature public bicycle-sharing systems, and collection of data, though still sporadic and lacking, is picking up with new digital methodologies holding much promise for improved analysis. A final pillar of operations, intermodality, holds great potential as the ease of access to public transportation stations is crucial to attracting and retaining users, improving conditions for walking and cycling can contribute to wider sustainability goals, even when travel distances are too great to be covered by active modes alone. With public transport investment and reform high on the agenda in many cities (see Chapter 4), policymakers should push for inclusion of active mobility elements in these major projects.

However, despite all these efforts, policymakers, citizens, academics and other interested parties much recognize that by itself, the promotion of active mobility will not result in significant or sustainable change. In order for Latin American cities to truly become inclusive for active modes, policymakers must confront motorized transport as the major obstacle, and tackle its privileged position. Understanding active mobility as a challenge to the system of automobility is therefore not a radical, but a realistic position, however difficult it may be politically. From this perspective, intervening in the privileged circulation of motorized vehicles becomes paramount for creating better conditions for alternative modes. These would not only reduce conflicts and stimulate active travel, but they also have the potential to substantially improve the public realm as well, with wider benefits for economy and society.

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MaaS and sustainable transport in Latin America

Lessons from an app-based service in Mexico City

Lina Marcela Quiñones and ***Onésimo Flores***

Information and communication technologies (ICTs) have dramatically transformed the daily lives of urban dwellers around the world, and transport is no exception. One of the clearest impacts of ICTs has been the emergence of Mobility as a Service (MaaS), a concept which, although may be used to describe traditional forms of transport, has now been inextricably linked to technology and mobile applications.

While MaaS has been defined in terms of new technologies, it is ultimately based on the idea that what urban dwellers require is access to the different opportunities the city offers (see Chapter 3). In other words, they do not require a specific asset – for example, a car – rather, they require a service: one that provides them with mobility and suits their specific needs of comfort, security, accessibility, travel time and walking distance from their origins to their destinations. While this perspective can be applied to traditional high-quality public transport systems, the rise of app-based services, the sharing economy and their impact on traditional modes of transport has made it necessary to introduce a new concept that encompasses all these characteristics. Consequently, the concept of MaaS has been defined according to the features of these services, either as 'the integration of various forms of transport services into a single mobility service accessible on demand' (MaaS Alliance, 2017), or in more detail, as 'a user-centric, intelligent mobility management and distribution system, in which an integrator brings together offerings of multiple mobility service providers, and provides end-users access to them through a digital interface, allowing them to seamlessly plan and pay for mobility' (MaaSLab-UCL, 2018).

While the concept is relatively new, over the last two decades there have been several initiatives that have made use of technological platforms to provide mobility services on demand. One of the first examples of this, notably grounded in the sharing economy, was the development of car-sharing services or car clubs, among which is the renowned Zipcar. This initiative was built on three components: excess capacity, a platform for participation and a network of peers (Chase, 2015). Excess capacity – in this case – refers to the fact that the private vehicle fleet is underused, as they are parked 95% of the time (Shoup, 1997) and when they do provide transport, they are often carrying only one passenger. Currently, private cars provide significantly less mobility than would be possible if they were used more efficiently. On the other hand, a network of diverse peers – individuals who require mobility services – can collaborate to manage this excess capacity and maximise the benefits of this mobility option through a platform for participation. By making transactions seamless and more efficient, mobile apps and ICTs have greatly facilitated this last key component, thereby providing the last building block for these new mobility solutions.

Figure 1. *Dockless bike and scooters in Mexico City. Photo: Carlosfelipe Pardo*

Aside from the technological platforms, one of the main characteristics of a MaaS system is integration, for instance in the form of app-based routing services – some of which have taken the next step and started providing their own mobility services. A clear example of this is the Citymapper app, which has been launched in 39 cities across the world, including Mexico City and São Paulo. Citymapper provides real-time information on public transport services, covering real-time waiting and travel times and encompassing all transit services available in a given city. However, it also provides information on alternative transport modes such as shared bicycle systems, e-scooters, taxis or ride-hailing options and their intermodality with the public transport network. Moreover, Citymapper also developed an integrated ticketing option for accessing different mobility options across the city, Citymapper PASS, and even experimented with its own option for mobility service in London – Citymapper Ride – a shared service that was available on demand in central London until mid-2019 (Citymapper, 2019). The PASS feature, in particular, is what has been identified as the new epitome of MaaS: the bundling up of different options in an integrated ticket, which may be purchased through subscription packages and including different modes[1].

These new mobility services and their integration have had great acceptance among users worldwide, and they are expanding rapidly. Nevertheless, their implementation has faced significant challenges. An ever-present issue is that of regulation and political ambivalence or even resistance. As will be explored in detail in the case study below, new services often fall into regulatory gray areas, and local authorities sometimes opt to prohibit them outright. Additionally, these services are frequently perceived to operate as unlawful competition to traditional and established transport services, often controlled by strong associations with great political power. Furthermore, they may face resistance from informal operators – widespread in Latin America – who are reluctant to formalise. Consequently, it is important to evaluate and adapt regulations, not only to allow the introduction of MaaS, but more importantly, to ensure these services contribute to the city's sustainable mobility goals (POLIS, 2017) and negative impacts are minimized.

Another increasingly growing concern is related to data privacy. Privacy issues have risen more widely as a rise in app-based services and mobile technologies has coincided with recent scandals regarding the use of consumer data. Considering that MaaS services inevitably gather data from their users, this is a significant risk that must be tackled properly. It is important to ensure that gathered data is treated ethically and with the greatest privacy standards, and users should be clearly informed of the ways in which their data is being used and for what purposes (Deighton-Smith, 2018; MaaS Alliance, 2018).

1 Whim, a Finnish start-up, is a good example of the bundling up model.

São Paulo (left) and Mexico City (right)

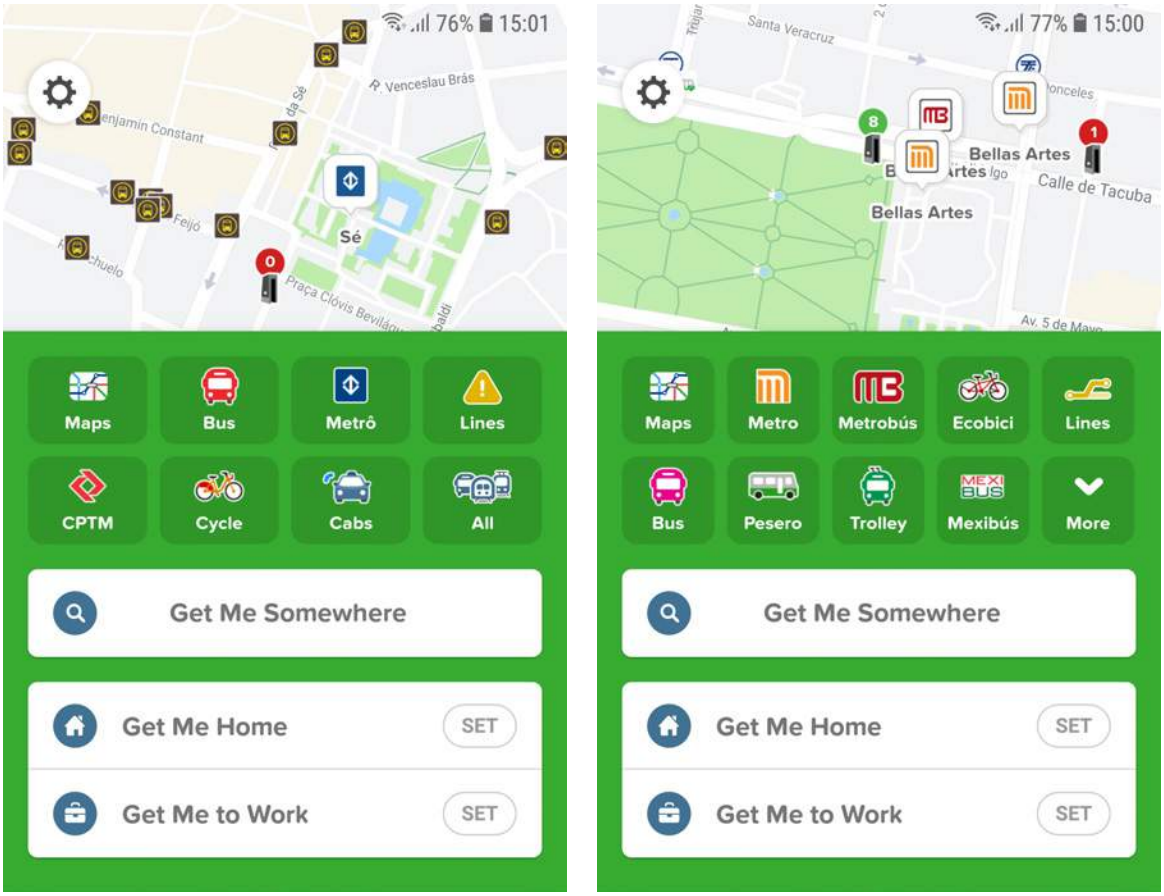

Figure 2. *User interface for Citymapper in São Paulo (left) and Mexico City (right). Screenshot from Citymapper app*

A final concern is that of equity and labour rights. MaaS services are often more expensive than traditional public transport options, so while these services open up a wide variety of mobility options and increase access, they only do so for those with the capacity to pay. This carries significant risk of widening inequities in access as such services become increasingly important in urban mobility. Additionally, MaaS systems often do not employ their drivers directly, raising concerns about labour conditions, for instance, regarding working hours, fair pay and training (Barrios, Hochberg, & Yi, 2018; Rosenblat, 2018). Finally, there have been security concerns as some people fear that a lack of oversight from the state can form a threat for passenger security, which even led to Uber losing its licence to operate in London in late 2017 (BBC News, 2017).

This chapter will explore the state of play for MaaS in Latin America and the Caribbean, particularly focusing on the case study of an app-based collective transport service operating in Mexico City. Drawing from this case study, the chapter will explore lessons learned and potential for improving and expanding MaaS in Latin American cities.

MaaS systems in Latin America

The concepts of shared mobility and MaaS are still new in Latin America and the Caribbean. High rates of informality in public transport operation, lack of real-time data, lower levels of smartphone ownership and reduced access to debit or credit cards have all slowed down the implementation of MaaS systems in cities in the region. Nevertheless, several app-based services and shared mobility initiatives have been launched in different cities, with varying degrees of success.

The most basic type of these services –which faces the least opposition from local authorities and existing transport associations – are routing services. Among others, Google Maps, Moovit and Citymapper are in operation across the region. These services provide information on different mobility options, mostly public transport, but often including walking and cycling as well. While they are still far from MaaS options that allow for planning transport options on demand and mostly do not include payment systems, they are the first steps in integrating information from different services.

Other more controversial app-based products are those which directly provide mobility services to their users. Uber and Cabify operate in many cities in the region, often illegally or informally. Dockless bicycles and scooters – e.g. MoBike, Lime and Grin – have also started proliferating in different cities in Latin America (usually unregulated), as well as some car-sharing initiatives. Unlike the routing services, these applications have integrated payment, but mostly target only one mode of transport, providing either ride-hailing, taxi services, shared bicycles or scooters.

Although services that are integrated and accessible-on-demand are still lacking, there have been some noteworthy initiatives to develop intelligent, user-centred shared mobility solutions to complement the existing transport alternatives in Latin American cities. One of such services is Jetty, a collective transport service operating between Mexico City and its suburbs, which will be explored in detail in the following section.

Case study: app based collective transport service in Mexico City

As discussed throughout this document, Latin America features specific mobility challenges that differ greatly from those in cities in the Global North. In the case of Mexico City – as in many other cities in the region – transit alternatives are ubiquitous and fares are low, but service is perceived as unsafe, insecure, uncomfortable, unreliable and unaccountable (Flores Dewey, 2018). Thus, app-based services fulfil a different role than in car-centric cities lacking transport alternatives or in those cities where relatively safe and high-quality public transport is already available to all. This case study will focus on Jetty, an app-based collective transport platform operating in Mexico City since August 2017. Jetty currently provides service along 54 routes with 7 different operating partners, and has sold 350,000 seats since its launch, with an average of 12,500 distinct users in any given week.

Unlike many other cities in the region, Mexico City decided to create a regulatory framework for app-based services, after Cabify and Uber were launched in the city in 2012 and 2013, respectively. This framework allows for operation throughout the metropolitan area with freedom to charge market prices, but requires operating modern vehicles, submitting drivers to background checks, and contributing 1.5% of their gross fare revenues to a mobility fund (Ciudad de México, 2015). The existence of this regulatory framework has allowed existing ride-hailing services to scale up and has made collective transport alternatives possible, including Jetty.

Jetty started in 2016 and seeks to reduce congestion in Mexico City by providing a transport alternative with high standards of comfort, safety and reliability, which would prevent modal shift towards individual modes. It also aims to standardize the services and increase the profitability of existing transport operators, many of whom operate quasi-informally.

Figure 3. *Jetty vans operating in Mexico City and its metropolitan area. Source: Jetty*

As many new mobility alternatives, the company faced several challenges when launching, namely a) creating a viable app, b) obtaining a permit to operate and c) recruiting transport operators to supply rides. While the first one could be easily solved through software development, as any other technology-based company, the other two proved more difficult. As mentioned before, Mexico has a regulatory framework designed for ride-hailing services. Nevertheless, Jetty provides a different service and, although the service fitted into the existing regulations, there were multiple episodes of conflict and misunderstandings with local authorities both in Mexico City and in the State of Mexico.

Enlisting the support of existing jitney operators – as Jetty does not manage its own rolling stock – proved to be the greatest challenge of the three. As with other app-based initiatives, existing transport services – jitneys, in this case – feared the competition from Jetty would have a significant negative impact on their businesses and argued that it constituted unfair competition. There was concern for the security of drivers and vehicles associated with Jetty who risked attack by jitney operators. Existing jitney operators were also reluctant to partner with Jetty as service operators, as they did not wish to allocate their new fleets and best drivers to a new company with an unproven technology and business model. In the end, a small transport company decided to partner with the start-up to provide the first route connecting the northern suburbs with Mexico City, and operation was launched in August 2017.

Obstacles and how they were overcome

On the day Jetty launched, the fears for security of drivers and vans were proven true. Before picking up the first passengers, a mob of jitney operators attacked two Jetty vans and punctured their tires. The service was suspended pending negotiations with jitney operators. Finally, an agreement was reached: Jetty would operate in a less attractive area, and the company would provide information on ridership and revenue to the jitney operators, which, if promising, would encourage other operators to join.

However, conflicts with existing operators were not the only obstacle for implementing the new service. Regulation in Mexico City was changed and prohibited shared rides served with a single vehicle, which directly targeted Jetty operations in the city. Nevertheless, cross-boundary services were still allowed, and Jetty was able to leverage its State of Mexico license to continue its nascent operation, although with greater constraints to scalability and at permanent risk of suspension. The company was allowed to continue operating while legal proceedings were under review, and it has kept growing, with new operating partners and increased fleet dedicated to the service.

Jetty has built partnerships with traditional operators such as SVBUS, which offers services from the southern tip of the city to the employment centre in Santa Fe. The partnership initially started by incorporating the option of pre-booking through Jetty and eventually evolved to SVBUS dedicating a whole new fleet just to Jetty operations, which does not accept standing passengers and is more comfortable. This has resulted in benefits for both users and operators, as it has provided feedback that SVBUS has used to redesign its routes, moving its stops closer to key destinations, and thus increasing revenue and ridership.

Once again, this partnership has not been without challenges. As recently as March 2019, there have been blockades and violent outbursts from jitney operators, attempting to prevent the buses from arriving to their key destinations in Santa Fe. Even though occasional skirmishes with jitney operators continue, specifically when coverage is expanded to new areas, and Jetty's regulatory position remains under review in Mexico City, the company is growing steadily and rapidly. As of this writing, Jetty has sold over 350,000 seats and the user base is expanding (Flores Dewey, 2018).

The obstacles faced by Jetty in Mexico City represent the typical barriers that app-based services and MaaS options must overcome to be successfully implemented in Latin America, namely inadequate regulation and strong opposition from existing operators.

Results of initial operation

The case of Jetty shows that there is potential to implement and scale app-based shared mobility options in Latin American cities, which can improve access and mobility. While Jetty's operation is growing and it is still too small to have a significant and measurable impact on the mobility of Mexico City and its metropolitan area, there are some noteworthy positive impacts that could be expanded to other app-based services and even traditional public transport operation.

Safety and security: app-based services provide the chance to implement and test technological solutions that improve safety and security for passengers and drivers. For instance, Jetty registered zero collisions and zero criminal incidents in the first year of operation. This was achieved by investing in driver training, paying drivers a fixed salary rather than a commission, equipping vehicles with cameras and monitoring every trip, establishing bidirectional communication with passengers and immediately acting on their reports of unsafe driver behaviour or undesirable pick up or drop off locations.

Improvement of road safety in Latin American cities is urgent and personal security is an important issue in the region. Thus, these initiatives provide a chance for learning from innovations and best practices, and even implementing them in traditional public transport operation.

Access and coverage: new mobility options can reach suburban outposts that lack mass transit connectivity but concentrate millions of homes and jobs. Jetty has more than 150 active pick-up and drop-off points less than two kilometres away from the homes of roughly three million people in the metropolitan area of Mexico City.

On-demand services can complement existing public transport options, improving coverage and access, especially for people in the suburbs and in areas lacking attractive public transport options. These services also have the potential to cover routes that traditional public transport does not.

Modal shift: attractive shared services can reduce incentives to motorize. Between 47% and 54% of respondents in monthly surveys conducted by Jetty have stated they would have travelled by private car, taxi or ride-hailing services if the service were not available.

High-quality shared mobility options reduce the incentives for shifting to private transport and, thus, have the potential of slowing the increase in motorisation rates in the region. As explained in Chapter 2, motorisation rates in Latin America are generally not high and it is important to ensure that they stay that way.

Gender focus: new mobility options can also provide an important alternative for women, as more traditional transport may be unsuited for their needs (see Chapter 3). Moreover, app-based services may be perceived as more secure, and thus be attractive to women who often face sexual harassment and gender-based violence when travelling. This is backed up by Jetty's data, as 55% of its users are female, compared to 42.3% on the metro and 48.4% for the BRT system (Flores Dewey, 2018).

It is important to remember that women are more dependent on public transport than men and face different constraints in their modal choice (Levy, 2013). Consequently, ensuring that there are adequate and secure travel alternatives that suit their needs is an important measure for advancing in gender equity and ensuring women's access to the city

Lessons learned

The Jetty experience in Mexico City provides many lessons for implementing MaaS in Latin American cities. First, with both new app-based services and traditional mobility options, service can be improved by:

a) Properly incentivizing drivers and owners,
b) Enforcing tight standards and
c) Responding to passenger feedback.

Digital platforms are especially important for the latter two conditions. Additionally, the Jetty experience sheds light on how to negotiate with traditional operators. Similarly to what TransMilenio did in the late 90s in Bogotá, it is important to involve operators and existing companies in the new schemes, developing joint solutions and working together instead of competing within the market.

Furthermore, the experience shows it is possible to improve the quality and increase the coverage of public transit without making massive capital investments. As high capital costs are often a major barrier for developing quality mobility solutions in Global South countries, this is a significant advantage provided by MaaS systems. This is also exemplified by bicycle sharing initiatives, where private dockless options may complement an existing public system or even provide the service exclusively, in cities where the implementation of such systems has proved difficult.

Finally, Jetty showed that a significant number of commuters are willing to forego less sustainable, individual transport modes, if a safe, comfortable, fast and reliable shared-ride alternative is available. As this is ultimately one of the goals of access-based transport planning and the A-S-I model (Dalkmann & Brannigan, 2007), it is important to harness these options to slow motorisation rates and encourage modal shift. Crucially, app-based services may act as a stepping-stone between private motorised options and public transport, especially where investments in infrastructure have been slow and motorisation is increasing.

Still, there are some challenges and concerns to be addressed. As mentioned before, one of the main issues to consider when implementing MaaS systems is their impact on equity. Most of these services are costlier than traditional public transport options and, thus, are not accessible for low-income populations. Consequently, it is important to guarantee that affordable and convenient options still exist for those users who cannot afford the new alternatives, and to make sure that the introduction of these new services does not have negative impacts on those who already have difficult access conditions. Additionally, it is necessary to critically evaluate the impact these new solutions are having on congestion and road safety (Barrios et al., 2018), and to continue investing on public transport and infrastructure for walking and cycling. Moreover, it is critical to ensure that subsidies are not diverted from sustainable modes into solutions that increase vehicle activity (Bliss, 2018; Dovey, 2017) and, in the end, may not be beneficial for users.

An additional challenge in Global South cities is the availability of smartphones and credit (or debit) cards, which are often required to access these new mobility options. In the context of Latin American economies, which have high levels of labour informality and where many people do not have access to banking services, the use of alternative payment systems is an issue to consider. This may become an additional barrier for lower income populations to use new services, thus increasing the access gap even more. Some services – such as Uber – have added the option for paying with cash, while in many cities, official transport systems are paid for with an integrated card. Both options should be explored when implementing a MaaS system.

Moreover, it is important to ensure that MaaS services actually tackle congestion and replace less sustainable and efficient modes, instead of replacing public transport (POLIS, 2017). While this is mainly an issue in North America, where ride-hailing services have had negative effects on road safety and congestion (Barrios et al., 2018), there are indications that this could also be the case in Latin America. For instance, Tirachini & del Río (2018) found that for every person that combines ride-hailing with public transport, there are 11 who simply replace the full public-transport journey. Consequently, any legislation put in place to regulate MaaS should prioritise sustainable modes – walking, cycling and public transport over any type of private transport, and even more so over individual modes such as ride-hailing.

Potential for improving MaaS in LAC

As exemplified by this case study, app-based MaaS initiatives in Latin America can improve access for communities in the periphery of cities and reduce car-based mobility from wealthier suburbs. Unlike Global North countries, cities in Latin America and the Caribbean often have significant gaps in transport coverage and a high dependence on informal transit. Though informal providers are necessary to supply transport, they are often unsafe and unreliable. To resolve these issues, local authorities can work in partnership with new start-ups to provide new and better mobility options, while continuing efforts on formalisation and regulation of informal services, and even harness MaaS to regulate these services (Ewert & Toprak, 2018).

There are significant challenges regarding the expansion and consolidation of MaaS options in Latin America and the Caribbean, particularly in terms of existing regulation. While some cities in Mexico and Brazil have opted to regulate these new services (Ciudad de México, 2015; Congresso Nacional do Brasil, 2018), provided they keep certain quality standards and contribute with either data or monetary resources to transport authorities, other countries have decided to outright ban them. Many countries continue to have a gray framework under which services operate illegally or informally, and benefits are not delivered. In some cases, such as in Colombia, even local authority-led initiatives to make existing services – e.g. taxis – smarter and more user-centred have faced bureaucratic and political challenges from other government levels and transport associations (El Espectador, 2018).

These barriers are related to both rapid technological change and political pressure from existing transport associations. For a start, the quick emergence of app-based services, mainly ride-hailing, has disrupted significantly existing markets and, thus, poses a challenge for regulators, even more so where informal markets coexist with these new options (Morán de Romaña, 2018). The same situation is true for any new MaaS services. For the case of ride-hailing, the International Transport Forum (Deighton-Smith, 2018) recommends first evaluating whether there would be separate or unified regimes for taxi and ride-hailing and then implement regulation that avoids distortion of competition. After this is done, governments should establish an efficient framework based on controlling market failures and focusing on business models, while being technologically neutral. As for dockless bicycle sharing or similar, the same organisation highlights the need to address negative externalities – namely, misuse of public space – and protect users. These same principles could be considered when regulating for MaaS.

Aside from regulation, another important challenge, which is especially pressing in the region, is that of equity. Latin America and the Caribbean is already the most unequal region in the world, and poor urban dwellers often face segregation and difficult access conditions. Consequently, the impact of new mobility solutions on access, congestion and road safety is especially important in the context of Latin American cities. New MaaS systems should favour the reduction of existing access gaps by increasing efficiency, safety and sustainability, and not become yet another quality option for privileged groups who already have a range of different mobility options at their disposal.

Furthermore, fair labour conditions are also an important issue to consider when implementing MaaS solutions in Latin America. Many existing public transport systems operate informally and with poor working conditions for their drivers, and MaaS systems present an opportunity to improve conditions for them. Yet, this has not always been the case, as some ride-hailing services do not supervise or regulate working hours, and payment schemes – designed for occasional drivers – may prove insufficient for those who depend on these services as a main source of income.

Therefore, it is important for countries and cities to review the existing rules and standards and seek a way to integrate new mobility solutions, app-based services and shared mobility into the existing regulations. This should be done in a way that harnesses their potential to improve travel experiences and promote modal shift, while ensuring that the benefits they provide are shared among all citizens. Similarly, working conditions should be reviewed closely and the impact of these new mobility services on equity and equality must be considered at all times. For these purposes, it is important to avoid a purely commercial approach to MaaS with little or no involvement from transport authorities, and instead find an adequate public-private sector balance that will allow to deliver the benefits of new mobility solutions (POLIS, 2017). MaaS has great potential for catalysing formalisation, improving access, fostering modal shift, generating income and revenue, and complementing the public sector when adequate high-quality transport services are still not available for all. Now is the time to draw on this potential to deliver the best possible transport solutions for urban dwellers in Latin American cities.

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Sustainable transport in Latin America: from discourse to reality

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Today, the state of Latin American mobility finds itself at a key juncture. It is clear that the region's cities face serious urban mobility challenges, especially as the need to improve accessibility, equity and efficiency is compounded by increasing concern for sustainability goals. While desirable courses of action to promote sustainable mobility have been identified (for instance, Avoid-Shift-Improve), widespread understanding of what must be done has not been translated into concrete and effective mobility policy in a consistent and reliable manner. In contrast to the slow progress in practice, talk of sustainable mobility is widespread in government discourses. The reality is that mobility policy in Latin America is constrained by a series of entrenched, reactionary and highly politicised discourses that classify certain policies and interventions as viable or necessary, while others are perceived to be undesirable or unfeasible.

This chapter calls for attention to the discursive dynamics of mobility in the region and the social power relations underlying them. In order to move from mere talk about sustainable mobility to implementation of effective policy, practitioners and promoters of sustainable transport must be prepared to confront retrogressive mobility discourses and tackle the continuing support for individual and private motorized mobility. In this call for action, this chapter identifies and discusses key discursive obstacles where the gap between official discourse and reality is most apparent. Mobility is deeply social and political, and the role of social power – specifically, socio-economic inequality – in structuring the region's transport realities must be examined critically. Finally, the chapter concludes with several points for moving forward and reconciling the discourses and realities of mobility in Latin America.

Mobility realities and policy discourses

Traffic jams, overcrowded public transport and unsafe conditions for pedestrians are daily realities across urban Latin America. The poor state of urban mobility forms an inescapable reality that all urban dwellers deal with daily in some manner, irrespective of social position – making it something lived, talked about, and debated throughout society. This gives mobility an unparalleled political and discursive importance in Latin American urban politics. Depending on factors such as the city in question, an individual's level of income and mode of transport, and ongoing political issues, mobility talk can range from everyday issues such as the behaviour of road users or the price of a metro ticket, to long-term propositions such as the desirability of a regional rail network or the electrification of the bus fleet. As mobility scholars have argued (Cresswell, 2010; Sheller & Urry, 2006), these discussions are structured by cross-cutting cultural understandings of mobility, under which certain norms and practices are prioritized, privileged, and promoted over others.

From a technical standpoint, urban mobility in Latin America has long been considered a severe and worsening problem that undermines quality of life, in line with perceptions of the region's megacities as dysfunctional cases of urban mismanagement rife with crime, poverty and inequality (see Gilbert, 1996). While the detrimental effects of mobility on quality of life remain most serious in the largest cities, continuing urban growth and motorization in secondary cities have generalized the problem (see Chapter 2). In this view, the mobility problems of Latin American cities are due to a 'lack of planning', with consequences ranging from dramatic densities to excessive sprawl (or even both simultaneously), insufficient space for pedestrians, cyclists, vehicular traffic and transit alike, and the inefficient use of transport systems. Over the last decade, exponentially increasing motorization, partly driven by easy access to credit, has brought the dream of independent and comfortable automobility within reach of the masses, yet the resulting pressure on road space rules such freedom out (Thomson & Bull, 2002). With few exceptions, public transport is not an attractive alternative, as it is perceived as dysfunctional, unsafe and undignified. Its privatized nature means it is run for profit at the expense of the user. Urban transport is a prime cause of worsening air quality, making Lima the city with the highest rate of new childhood asthma cases due to traffic pollution in the world, closely followed by Bogotá in third place (Achakulwisut et al., 2019).

Nonetheless, the transport policies of some of the region's cities have achieved worldwide fame as models of sustainable urban development (Montero, 2017a) and have come to be seen as examples of effective policymaking in a context of limited budgets and complex social problems. In these discourses, transport projects are held to have had positive impacts far beyond their initial scope, particularly regarding socio-economic integration and the democratization of previously segregated public space. Transport systems have sometimes even come to be held as objects of civic pride by citizens or even as a defining element of city identity. As a result, public transport innovations realized in specific urban contexts have spread across the region and travelled to other continents. In particular, BRT (Mejía-Dugand, Hjelm, Baas, & Ríos, 2013; Montero, 2018; Wood, 2014), car-free streets (Montero, 2017b) and cable-car systems (Brand & Dávila, 2011; Dávila, 2013) have been promoted internationally as best practices. Whether the citizens of such 'model' cities concur and buy into such discourses is a matter of debate (Cesafsky, 2017), but it is clear that progressive mobility policies have put Latin American cities in the international spotlight.

Latin American cities face serious challenges in delivering sustainable and inclusive mobility, reversing motorization trends, improving the quality of public transport and creating safe conditions for walking and cycling. Yet, with modal share for non-motorized and public transport remaining high in most of the region's cities, and urban areas featuring relatively high densities (see Chapter 2), the outlook for sustainable mobility seems positive. The question is therefore not what to do, as necessary interventions and best practices are well-known globally (Whitelegg, 2014), but indeed how to do it. Here, the practice of sustainable mobility policy in Latin America confronts pressing realities of daily operations, project planning and political manoeuvring. The planning and formulation of policies and projects takes place in a context of circulating technological expertise and innovation, shifting public opinion and political pressures from powerful interest groups; this has meant that a realistic and results-driven outlook is often lacking. Below, these points are examined in detail, through discussion of three key areas where discourses differ from reality.

Figure 1. *Construction of the autopista Costanera Norte in Santiago, Chile. Photo: Claudio Olivares Medina*

Moving people or vehicles

Transport planning in Latin American cities has been persistently dominated by a focus on improving traffic, or the quantity and speed of vehicle flow, rather than the movement of people or providing access (see Chapter 3). While this paradigm has shifted particularly at the global policy level due to increasing focus on sustainable mobility (Banister, 2011) and the Avoid-Shift-Improve model (Dalkmann & Brannigan, 2007), this has not yet led to policy change in Latin America. It is true that there have been advances in legislation: the transport plans of most countries and many cities now feature references to the promotion of sustainable transport and improving conditions for public transport, cycling and walking. As the negative externalities of motorization become hard to ignore, these sustainable modes have been rehabilitated and considered worth improving – though at least partly in order to reduce pressure on congested road space and improve traffic flow. Nonetheless, the reality of policy implementation remains different, as the quantity and quality of investment does not reflect these new priorities. With few exceptions, recent improvements to sustainable transport have remained of a symbolic and partial nature, while motorization increases unabated and urban highways continue to be constructed across the region.

Consider the case of Santiago, the capital of Chile. As recently as 2018, the Ministry of Public Works announced the construction of the Américo Vespucio Oriente urban highway, with both elevated and underground sections (Castillo, 2018; Ministerio de Obras Públicas, 2017) at a predicted cost of 900 million USD (Proyecto AVO, 2017). The project is the latest in a series of urban highways and tunnels that have been constructed in Santiago since the start of the 21st century, with a total extension of 215 km and a cost of 1.8 billion USD (Greene & Mora, 2005). These aim to tackle congestion and to improve travel times, in response to a dramatic rise of motorization which resulted in an increase of the automobiles' share of trips from 18.5% in 1991 to 42% in 2001 (Cabrera, Díaz, & Sanhueza, 2006), a share that has continued to grow (Herrera & Razmilic, 2016). Although these projects have created significant political opposition and some compromises have been made, planners have pressed ahead, often ignoring local complaints in poorer communities (Sagaris & Landon, 2017). As various scholars have argued, this car-centric infrastructure, built at high cost to the state, not only privileges the minority of private car owners able to pay tolls to use the roads, it also has stimulated peripheral urbanization and increased social exclusion (Greene & Mora, 2005; Mansilla Quiñones, 2011; Sagaris & Landon, 2017). Moreover, as has been discussed extensively by transport researchers and practitioners worldwide, such interventions ultimately do not alleviate congestion due to induced travel demand for private vehicles (Downs, 2005). The fact that Santiago con-

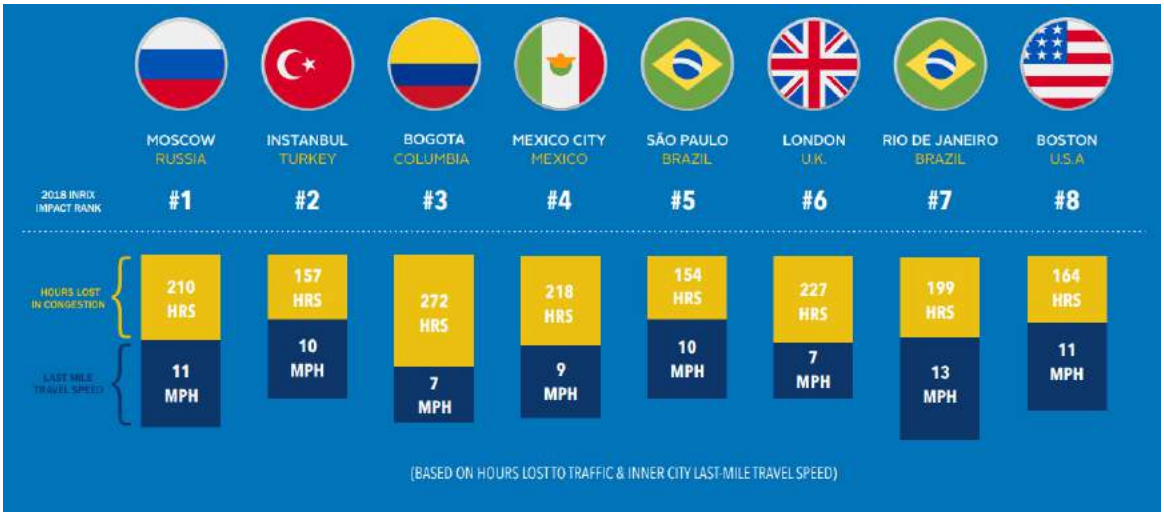

Figure 2. *INRIX infographic depicting the eight cities classified as most congested. Source: INRIX (2019)*

tinues to build these large and expensive projects, seeking to alleviate congestion, is a clear example of how in practice, the idea of moving vehicles is still privileged over that of moving people. These projects are in stark contrast with actions Santiago has taken to promote walking and cycling, albeit mostly in the historical city centre, which even led the city to win the 2017 International Sustainable Transport Award (ITDP, 2016).

It is clear that decision-making at the local authority level is subject to great political pressure from the minority of car-drivers in Latin American cities, who are generally from middle or high-income groups and have both political power and visibility. Consequently, the perceived need to move vehicles more rapidly and efficiently – to address traffic, rather than access – is considered urgent and prioritized. This dynamic is exemplified by the controversy generated in early 2019 following the inclusion of four Latin American cities among the ten most congested in the world, and particularly Bogotá, which was declared as the city in which car drivers lost the largest amount of time in traffic (INRIX, 2019; see Figure 2[1]).

Several newspapers and media outlets highlighted this result as a proof of the failed mobility policies and worsening travel conditions in the city. The backlash was also felt in social media, where it took a political colour and some concerned citizens demanded more roads to be build – without specifying where or how to do so. Nevertheless, what was seldom mentioned was that car drivers in Bogotá only account for approximately 13% of all daily trips (Secretaría Distrital de Movilidad de Bogotá, 2016). While road congestion affects other modes as well – and crucially, logistics and emergency services – the political relevance of a measure based on the experience of a small minority of users highlights the discursive power of private vehicle flow over other modes and forms of mobility.

The higher importance given to certain indicators – such as congestion levels, travel speeds and hours lost in traffic – over others reveals a persistent bias in transport and city planning, which consistently prioritises the speed of individual motorised travel over other modes. As the two examples show, there is still a disproportionate level of attention given to the minority of drivers, to the detriment of the majority of other users. Infrastructure measurements also reflect this bias: most cities have an inventory of roads and know the state of repair or disrepair they are in; yet, while pedestrians are more numerous and face much worse conditions, such measurements for sidewalks rarely exist. These dynamics have prevented an actual shift in focus from moving vehicles to moving people or guaranteeing access. As repeatedly emphasised by researchers and practitioners worldwide, planning for moving vehicles is inefficient and unsustainable, and has many negative externalities, including socio-spatial segregation, road danger and increased inequality, all of which are conditions affecting Latin American cities (see Chapter 2).

Consequently, it is important for the shift in discourse around modal priorities to be translated into policy practice, not only by implementing large infrastructure projects aimed at expanding public transport and cycling infrastructure, but also by changing the way in which transport is evaluated and the indicators that are considered when planning. Prioritising measures of accessibility instead of congestion (see Chapter 3), focusing on road safety indicators (see Chapter 5) and developing measures for pedestrian and cycling infrastructure would be a good place to start.

1 The original INRIX infographic erroneously misspells the name of Colombia as 'Columbia'.

'Constructing' rather than reorganizing

Though sustainable mobility discourses highlight the need for holistic changes to road environments, the reality of urban mobility policy in Latin America shows a strong bias for construction of new infrastructure over reorganization of existing space. On the one hand, decision-makers are reluctant to reduce the space dedicated to vehicle circulation, due to the persistent priority for private vehicles and the political power held by drivers. On the other hand, there are strong political incentives to develop large infrastructure projects that politicians can showcase as tokens of their administrations' success. To underline this point, there is strong evidence that municipal infrastructure spending in Latin America is related to election cycles (for Colombia, see Drazen & Eslava, 2005; for Mexico, Gonzalez, 2002). Reorganising public space to benefit sustainable modes, though highly necessary, runs a high risk of politically damaging resistance, while offering less pay-off in terms of visible and politically marketable impacts.

The bias for 'new' infrastructure limits the options and potential effect of sustainable mobility interventions, increases costs substantially and does not reduce private vehicle travel demand. A superlative example of this practice is found in the *ciclopistas* in Puebla, Mexico. In this city, a series of elevated cycle-tracks were built at a cost of roughly USD 14 million (Velarde, 2016), with the aim of implementing sections of a previously planned cycle network (see Figure 3 in Cap. 4 Improvements and challenges in road safety). That this plan had called for road-level cycle tracks was ignored in favour of costly infrastructure with little impact on existing road conditions.

Indeed, these ciclopistas were significantly more expensive than road-level cycle tracks – with costs per kilometre 4 to 20 times that of road-level cycle tracks implemented in neighbouring Mexico City (Rivas, 2017; Velarde, 2016). This additional investment cannot be justified in terms of level of service for cyclists. The elevated infrastructure results in longer and more uncomfortable trips for cyclists, as they must travel longer distances to reach access or exit points and must climb steep slopes to reach the track. By soaring above the city, this infrastructure removes cyclists from the streetscape, rather than integrating them – with the additional result of making them more prone to robbery. Moreover, the higher costs involved in construction of elevated infrastructure imply that much fewer and shorter cycle tracks can be developed. In sum, rather than creating a citywide cycling network at street level, Puebla was left with a reduced and disconnected network that is not fit for cyclists' purposes. It can be concluded that the real reason for the large investment on infrastructure with a predictably minimal impact on sustainable mobility was the unwillingness to repurpose space dedicated to motorised vehicles, together with the political imperative to showcase a high-profile and visible project regardless of impact or cost-effectiveness.

Figure 3. *Elevated ciclopista in Puebla. Photo: Carlos Felipe Pardo*

Figure 4. *"Public works enter through the eyes" in Cochabamba, Bolivia. Photo: Carlos Felipe Pardo*

ORIGINAL AND PROPOSED DESIGN FOR AN URBAN ARTERIAL

In Cartagena, Colombia

Figure 5. *Original and proposed design for an urban arterial in Cartagena, Colombia. Source: Despacio (unpublished document)*

As scarce as urban space is, it is vital to prioritise the reorganisation and rationalization of space dedicated to inefficient private vehicles, and repurpose it for walking, cycling and public transport. The implementation of exclusive corridors for BRT, priority bus lanes, dedicated cycle lanes and the expansion of sidewalks are examples of effective improvements to sustainable transport that can be put in place by removing lanes for vehicle circulation or reducing the width of such lanes, with the additional benefit of disincentivizing private vehicle use and improving road safety by reducing vehicle speeds. That this is feasible and can actually improve the potential flow of people, is easily demonstrated through an exercise in StreetMix (streetmix.net), where one can compare the current and possible capacities of street layouts (see the example in Figure 5, where the capacities of an existing and proposed design for an arterial are compared).

The reorganisation of public space in order to dedicate it to more efficient and sustainable modes must be a priority for city administrations. Any sustainable mobility policy that does not prioritize the needs of pedestrians, cyclists and public transport users – not only the majority of city dwellers, but also the least privileged socio-economically – by reorganizing road space is destined to fail. The effects of the discursive barriers to reducing road space and the political incentives for infrastructure building only serve to continue privileging minority of private vehicle users.

Subsidies and taxes

Where discourses of sustainable mobility policy are perhaps most removed from reality in Latin American mobility policy is in the matter of fiscal policy. While cities are reluctant or unable to subsidise public transport or implement environmental taxes, subsidies for private vehicles abound, to the benefit of the wealthiest users. For instance, energy subsidies – including those for fuel – represent 0.5% of GDP on average in Latin American countries (see Figure 6) and are mostly leaked to people who are not poor, making it one of the most inefficient and regressive of all state expenditures (Izquierdo, Pessino, & Vuletin, 2018).

TARGETED SPENDING AND LEAKAGES

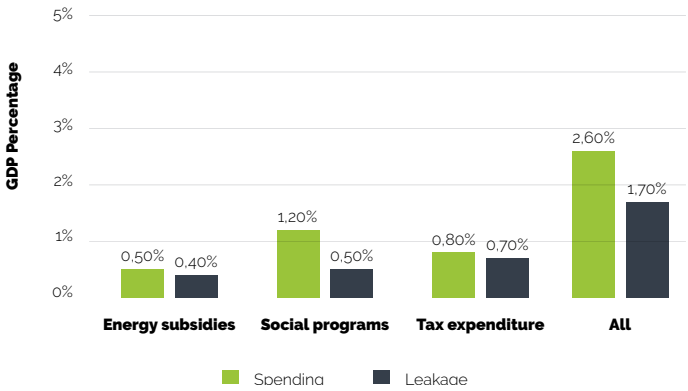

Figure 6. *Targeted spending and leakages. Source: Izquierdo et al. (2018)*

GASOLINE PRICES IN LATIN AMERICA, COMPARED TO KEY WORLD PRICE THRESHOLDS

Prices in USD per Litre in 2016

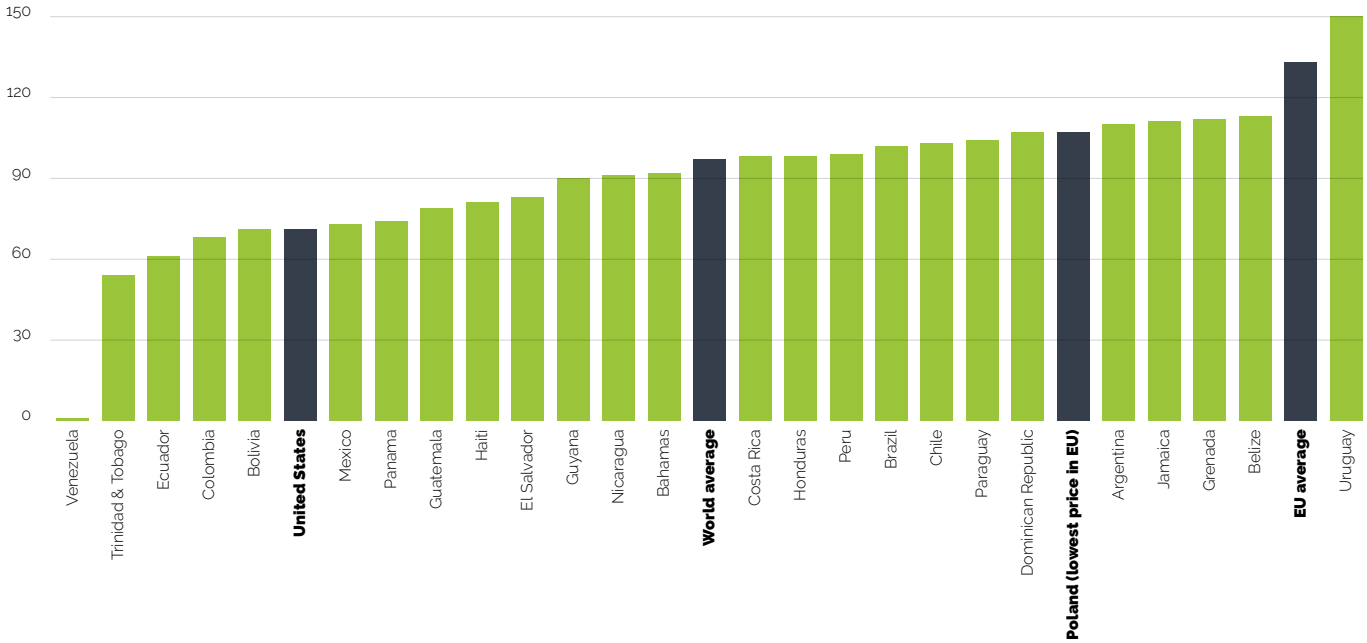

Figure 7. *Prices for gasoline in selected countries compared with international benchmarks. Source: Own elaboration with data from GIZ (2019)*

Subsidies for private motorised travel are not only direct, in the form of capped parking prices and fuel subsidies; they are also indirect, as in the case of extensive built infrastructure dedicated to private vehicles or when further insisting on minimum parking requirements when new residential or commercial buildings are being planned.

The latter subsidy is widespread in Latin American cities, as most of them require parking minimums for new developments (Despacio & ITDP, 2013), which in turn increase the prices of housing and retail, therefore externalising the costs of owning a vehicle (Shoup, 1999)[2]. These requirements also make the provision of social housing more difficult and costlier, thus affecting the equity of land use patterns. This situation, added to other parking subsidies, such as a cap for off-street parking prices, means that drivers pay much less than market price for parking their vehicles – either at home or at other destinations.

Another and often more significant distortion is that of fuel subsidies. Venezuela, Bolivia, Ecuador, Panama, Haiti and Trinidad & Tobago are all classified as having fuel prices below cost-covering level, with Venezuela having the lowest prices in the world, far below international crude oil prices (GIZ, 2019). Only Peru and Uruguay are considered to have fuel prices that actually generate revenue and encourage modal shift (see Figure 7). This situation is especially problematic when considering that energy subsidies are heavily regressive (Izquierdo et al., 2018), and thus privilege those with higher incomes in a region that is already the most unequal in the world.

In contrast, subsidies for public transport and charges aimed at internalising the social externalities of private vehicles – such as congestion charges or environmental surcharges – are often met with resistance by vehicle owners and legislators alike. Furthermore, on some occasions where local authorities may be willing to invest and subsidise sustainable transport, they may be prevented from doing so by regressive legislation. This was the case in Colombia, where existing regulation required public transport systems to be self-sustainable, and thus made improvements to the quality of service provision difficult, as this would have required subsidies. It follows that it is important to evaluate and reconsider legislation at national and local levels to ensure that sustainable transport is always fully prioritised.

Considering the full costs that vehicle drivers impose on society is an important step towards ad-

2 In Mexico City, these minimums have been reversed and parking maximums have been implemented. For further reading about the Mexican case, see Ortiz, Medgenberg, & Arzaba (2014).

dressing equity and access in Latin American cities. It is crucial to revaluate which subsidies – direct or indirect – are in place for private vehicles, and aim to remove them progressively. Furthermore, implementing instruments that support cost covering, such as fuel taxes, parking fees or congestion charges, would also serve as a source of revenue for investing in sustainable modes. Adjusting laws that forbid subsidies for sustainable modes or the implementation of cost covering mechanisms is also necessary.

Social power and mobility in Latin America

As the current policy debates described above have shown, the political power of certain users and modes plays a significant role in shaping mobility decisions in Latin American cities. Conversely, mobility discourses and practices themselves produce relations of power, where certain types of movement and mobility are privileged over others due to the perceived necessity of movements (Cresswell, 2010). For instance, when the time and comfort of poor residents is considered of low value, the efficiency and quality of public transport in peripheral areas is compromised for other goals, for instance, the rapid movement of private vehicles. Even sustainable mobility investments should be critically examined in this way, as high-quality pedestrian or cycling infrastructure often tends to be concentrated in areas with high-value land uses, rather than where need for improvement is highest (Bocarejo & Oviedo, 2012).

Discussions of mobility cannot ignore the fact that Latin American cities are among the most unequal in the world, with important consequences for modal choice and land use patterns. The resulting social fragmentation (Caldeira, 2000; Graham, 2001) is reflected in patterns of mobility, as the degree of access to the city is closely related to social position (see Chapter 3). Lower income groups often reside in the periphery of cities and need to travel longer distances to access work and education. They also suffer from low quality infrastructure, poor road safety records and lack of public transport service. Meanwhile, despite enjoying shorter travel distances and higher quality infrastructure, high-income groups generally choose to use private vehicles. Additionally, the development of suburban or exurban areas in Latin American cities has often followed an automobile-intensive pattern, ensuring exclusivity by privileging the mobility of the well-off over that of the general public (Blanco, 2016).

However, variance in mobility patterns does not necessarily mean discourses on mobility differ between income groups. Poor public transport is lamented by all, though only lower-income groups are dependent on it. Similarly, the symbolic importance of the private vehicle and the value of 'automobility' is widely shared (Urry, 2004). While lower income groups have limited access to such vehicles, they hold a strong aspirational status, which can make restrictions and pricing of externalities unpopular, especially when they entrench differences in access. For instance, '*pico y placa*' alternate-day vehicle use restrictions can be easily circumvented by the rich, who can afford to buy a second car, while the poor cannot. In general, private vehicle owners tend to have much more visibility and political clout than other mobility constituencies, even though they usually represent less than 30% of all trips (see Chapter 2). Though public transport can carry great political importance, public transport users are not similarly organized or represented as a political constituency, and the low quality of service often makes users opponents rather than defenders of these modes (see Chapter 4). Moreover, the production of motorized vehicles is often a key industry with widespread influence at the national level, guaranteeing continued incentives.

Moving from discourse to reality

As this chapter has shown, sustainable mobility policy in Latin America is characterized by a persistent gap between the objectives and directions defined and the investments and actions that are implemented in practice. While official discourses on urban mobility in Latin American cities have followed international trends of prioritising more sustainable and efficient modes, the reality of investments, subsidies and taxes reveals a different reality. Political pressure from privileged and influential groups, the perceived need of improving conditions for private vehicles and the political imperative of showing results in the form of built infrastructure, all weigh against the delivery of adequate and efficient mobility solutions. To move from discourse to reality, policymakers must recognize these gaps and confront politicized discourses of mobility – which are often diametrically opposed to the technical concepts and evaluations of global sustainability discourse.

It is time to directly challenge the discursive primacy of the private automobile in Latin America. The drivers' optic has always been a partial and exclusionary vision of mobility: out of reach of the majority of urban residents, unsuited to the urban form and context, and with dramatic negative impacts on the environment and road safety. Reframing the mobility debate would include action on issues such as sustainability and resilience while highlighting the social impacts of mobility planning, particularly those relating to equity in access and democratic use of public space. The provision of adequate mobility in cities is a continuous and long-term process, and as such, it is vital to move from politically selfish tokenism and short-termism towards ensuring continuity of sustainable mobility policies across administrations.

Decision makers in Latin American cities need to take significant steps to move from discourse to reality. The path is clear: change the way mobility is traditionally measured, prioritize the reorganisation of space dedicated to motorised vehicles, implement adequate subsidies and taxes that allow for the internalisation of social costs, and eliminate hidden subsidies to driving. In this process, the role of communications and participation is vital. Additionally, it must be taken into account that most urban transport planning divisions at municipal and national level are understaffed, and that existing staff is often not adequately trained. Large-scale capacity building efforts are required to improve quality and quantity of efforts for improved transport. Moreover, it is important to include citizens in the decision-making process and highlight how urban mobility policies can impact those who are most vulnerable in a positive way. Crucially, such empowerment and awareness of the majority would counter the traditional discourse that focuses on traffic and the movement of vehicles, and shift focus to providing access to all and leaving no one behind.

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Moving forward with sustainable mobility in Latin America

This publication explored several important issues related to sustainable urban transport in Latin America and the Caribbean. Covering topics from mobility discourses to specific modes such as cycling and BRT, the material is wide-ranging. Nonetheless, the focus of the chapters demonstrated the interconnected nature of efforts to make urban mobility in Latin America and the Caribbean more sustainable and equitable.

To begin with, a central theme in the promotion of sustainable transport is **a renewed focus on human-scale mobility and urban environments**. An effective modal shift towards active mobility and public transport will require redesigning roads in order to make these modes more attractive – and disincentivize the use of individual motorized transport. As Chapter 3 shows, thinking of mobility as the movement of people, rather than of vehicles, means prioritizing accessibility and removing urban barriers, which more often than not are formed by infrastructures dedicated to automobile flow. In this transition, designing road environments that are forgiving to human error and suited to active mobility is key, as the chapters on road safety and active mobility set out in detail (see Chapters 5 and 6). Public transport projects can provide a positive contribution to such environments, provided they are designed with the user in mind (see Chapter 4).

Moving people, rather than vehicles, is a clear example of the importance of striving for equity in transportation. In the most unequal region in the world, **mobility issues cannot be considered as unrelated to socio-economic inequalities**. Improving the mobility conditions for the poor, often captive users of public transport or active mobility, is vital to make sure that currently high use of sustainable modes are maintained and motorization is slowed down. High-quality public transport is necessary, with BRT as an example of a system with high potential, undermined by limited budgets and the current prioritization of automobile use (see Chapter 4). Similarly, the impact of new transport modes and technologies, such as MaaS, will depend on whether they are accessible to the majority of the population.

These chapters have also made clear that any realistic sustainable transport policy must **confront constraints at political, social and technical levels**. While in many cases the best path of action is clear, there are many obstacles to successful implementation, including guaranteeing sufficient political backing, ensuring funding, generating technical capacity at a local level and mobilizing citizen support. As Chapter 8 shows, many governments have adopted a sustainable mobility discourse while lacking real actions, and there is a risk that decisive action is indefinitely postponed. Meanwhile, even projects that do get implemented can have serious problems due to lacking support and compromises on design and operation, as the case of BRT systems illustrates in detail (see Chapter 4).

A clear and crosscutting constraint that limits the possibilities of sustainable mobility is the difficulty of **challenging the dominance of automobiles** in Latin American cities. Promotion of sustainable modes alone will not achieve significant gains if it does not replace the system of automobility that has shaped Latin America's cities to the benefit of a few. The excessive space dedicated to the automobile has created the conditions for poor road safety, failing public transport and dangerous active mobility. A paradigm shift is needed, which will involve prioritizing access over vehicle flow (see Chapter 3), rationalizing the use (and speeds) of private motorized vehicles, and comprehensively redesigning road environments. While the political challenge will be very difficult, it is time to recognize that any sustainable mobility policy that does not confront the automobile is destined to failure or irrelevance.

A specific challenge in the case of Latin America – common to other Global South countries – is that of **addressing informality in the provision of transport services**. Informal services often fill gaps in the provision of public transport (see Chapters 4 and 7), and many livelihoods depend on these markets, both in the case of drivers and users. Nevertheless, while the contribution of informal markets to urban economies needs to be recognised, the objective should be a transition towards formal economy. This is especially relevant in the case of public transport, and BRT has been a successful example of how informal workers can be integrated into new formal schemes. Nonetheless, there are concerns about informalisation of markets once again under app-based services (see Chapter 7). These new technologies should be harnessed towards formalisation and regulated to prevent precarious work conditions or insecurity for both drivers and users.

Finally, the chapters have shown that there are many **opportunities for innovation and improvement in Latin America's transport systems**. As cities seek to implement effective policies and adjust their urban environments in favour of sustainable mobility, new ideas and methods are desperately needed. This means that new models that prove to work can spread rapidly, from the Ciclovía (see Chapter 6) to the use of MaaS (Chapter 7). However, embracing the new should not come at the cost of neglecting important systems already in place. BRT is an important case, as an innovation that spread rapidly before the constraints were clearly apparent (see Chapter 4). Here, retrofitting and improving existing systems and policies can be crucial to reinforce gains that have been achieved.

Moving forward will require a shift in mobility paradigms, supported by concrete and effective actions. Implementing accessibility analyses in cities, such as the ones described in Chapter 3, will serve to define priorities and improve the design of transport projects. Likewise, adjusting and implementing regulation that eliminates hidden subsidies to individual motorised travel – such as parking minimums – and integrates new mobility solutions, while addressing negative externalities and ensuring benefits are distributed throughout society is key. Similarly, taxes, subsidies and charges need to be revaluated as well, with the aim of ensuring that both taxes and subsidies are progressive, and that the latter are efficiently assigned and leakages are eliminated or reduced to a minimum. The first step in this direction is to eliminate fuel subsidies (see Chapter 8) and to evaluate the implementation of congestion or environmental charges as measures for transport demand management.

Transport planning is not age and gender neutral and improving access and mobility for all will require understanding how transport projects affect different groups in different ways. Integrating the needs of vulnerable groups into planning and design is of major importance for delivering solutions that respond adequately to these needs. This includes not only accessible design for people with disabilities, which has slowly been adopted in large cities throughout the region, but including gender perspective as well. Moreover, the behaviour and mobility requirements of other vulnerable groups, such as children or the elderly also need to be considered.

Additionally, citizen participation and involvement in transport projects may prove vital for implementing sustainable transport solutions. As discussed throughout this publication and explored in detail in Chapter 8, car drivers often have more political power than other users and pose significant opposition to projects that may increase their costs or reduce circulation space. Consequently, empowering citizens to not only understand but appropriate projects that are more sustainable and equitable may help shift political incentives in their favour.

Finally, there are still many aspects not covered in this publication that need to be looked into to improve urban transport in Latin America and the Caribbean. For a start, there is a lack of evidence and research regarding freight transport. Latin American cities need to optimise the way freight is carried and delivered to commercial centres and last-mile solutions and eco-logistics require further study. Few cities in the region have schemes to ensure that freight is transported efficiently and sustainable, beyond restricting delivery hours.

The topic of institutions and governance is also key, in particular in a context of patchy oversight, widespread informality, and lack of resources and capacity. Where metropolitan areas exceed municipal boundaries, this issue can be fundamental. Many of the region's megacities face serious challenges in integrating transport systems across these barriers, and continuing urban expansion is likely to aggravate this problem. Meanwhile, local-scale governance of transport can prove to have beneficial effects, particularly regarding active mobility.

Moreover, while the experiences of users – and especially women – in different transport systems have been recently gathering some interest, this issue also requires further study. In a region that is classified year after year as having the top ten most violent cities in the world, and where there have been numerous reports denouncing high levels of harassment and insecurity experienced by women in public transport, the link between transport and security should no longer be ignored.

Thus, it is important to continue analysing urban transport issues, specifically from a Latin American perspective, and seeking to bridge the gaps in knowledge, implementation and discourse that often prevent the successful adoption of sustainable mobility policies in cities in the region. It is important to go past discourse and into the reality of cities, to ensure that urban residents across Latin America and the Caribbean can fully access the opportunities that cities provide.


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