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# Informal and Semiformal Services in Latin America: An Overview of Public Transportation Reforms



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This publication examines the integral role of semi-formal and informal transport services as viable and legitimate public transport options in Latin America. While the region is well-known as the “cradle of bus rapid transit,” the prevalence of semi-formal transport is often overlooked or scrutinized in a negative light. Based on the authors’ decades of experience as practitioners, using extensive literature review and six case studies, we critically analyze the advantages and disadvantages of bus reforms and alternative approaches such as mapping and use of technology.



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## Executive Summary

### Highlights

- ▶ Semiformal and informal transportation services—demand-responsive, unscheduled, and flexible public transportation services offered by self-organized operators without effective regulatory frameworks—fill a market need as they provide high-frequency, high-coverage, and adaptable services with fewer transfers. But they also create negative externalities such as pollution, congestion, and poor road safety.
- ▶ Latin American cities often “modernize” the informal sector by using bus rapid transit (BRT) as a technical and governance restructuring tool, but outcomes from decades of experience have been mixed.
- ▶ Reforms come at a cost—the larger the reform scale, the more time, financial capital, technical capabilities, and human resources a government will require. Higher fares and/or subsidies after the reform are possible to offset some of this cost. Negotiations with incumbents are challenging, and governments must prepare to compensate them while leveraging policy tools to ensure future transportation planning is not compromised.
- ▶ Alternative approaches to large-scale reform, such as improvement of semiformal services by mapping, digitalization, use of technology for e-hailing, driver training, and financial literacy for operators, among others are considered.
- ▶ For many Latin American cities, semiformal services will continue to coexist with formal services. Improving access for all citizens means investing in informal transportation services—and integrating them with the formal services when feasible.

**Semiformal and informal transportation services can be described as demand-responsive, unscheduled, and flexible public transportation services offered by self-organized individual operators, generally without effective regulatory frameworks.** In Latin America, more than half of public transportation trips are served by semiformal and informal services. In the region, the term “semiformal” applies to services that are legally authorized but operate under informal rules. In the

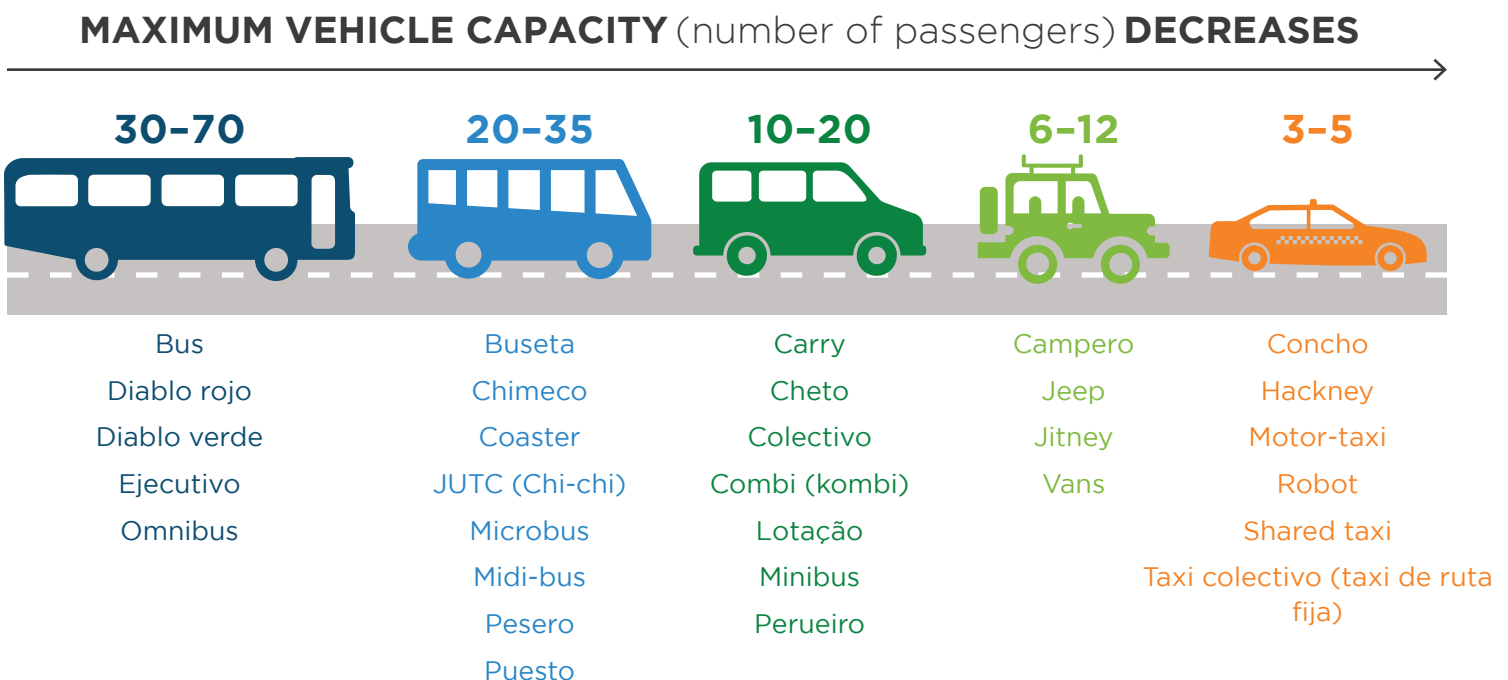
transportation sector, such services are typically characterized by dispersed property, daily rent of vehicles to drivers, and noncompliance with labor laws. Depending on the context and country, the term “informal” is synonymous with “illegal” and such services are banned. Nevertheless, across the region, informal transportation comes in different shapes, and flourishes under a multitude of names as seen in Figure ES-1.

**While Latin America is well-known as the “cradle of bus rapid transit,” the prevalent semiformal transportation services are often overlooked or viewed in a negative light. This working paper examines the integral role of semiformal and informal transportation services as viable and legitimate public transportation options in Latin American cities.** Informal transportation services fill a market need, especially in peripheral areas. They provide a flexible and easily adaptable service with less transfers needed and higher coverage and frequency than formal services. Residents, especially those living in transportation-

disadvantaged neighborhoods, rely on semiformal services that often complement the formal public transportation. Institutionally, informal and semiformal services run without public investment and do not require direct subsidy. On the other hand, they can create negative externalities in terms of pollution, congestion, and reduced road and personal safety as a result of competition among buses for passengers and limited government oversight of vehicle maintenance and service quality. Table ES-1 highlights the positive and negative characteristics of semiformal and informal transportation from the perspectives of users, government officials, and operators and drivers.

**Semiformal transportation reforms in Latin America often—but not always—occur as a result of, and in tandem with, new infrastructure-based BRT projects, but they have resulted in mixed outcomes.** On the plus side, bus reforms can contribute to congestion relief, reductions in harmful vehicle emissions, and improvements in

**Figure ES-1** | Select Taxonomy and Theoretical Maximum Vehicle Capacity of Informal Transit Services in Latin America and the Caribbean



Source: WRI Authors. Design adapted from Salazar Ferro 2015.

road safety. Implementing integrated fare payment systems can benefit users mainly by providing them access to a citywide network usually at a much lower cost than their having to pay each provider separately. With its centralized coordination, formal transportation is more conducive to the electrification of the public transportation sector.

**Reforms come at a cost for the government: the larger the scale of the reform, the more time commitment, financial capital, technical**

**capabilities, and human resources will be required from the government** (see Figure ES-2 for various timelines for implementing BRT corridors in select Latin American cities). In addition, for users, average walk and wait times can increase, as do the number of transfers required due to the restructuring of routes to trunk and feeder configurations. If the reform is not fully completed, the quality of service can decline resulting in an overcrowded, unsafe experience for users, while exacerbating citywide congestion and pollution.

**Table ES-1** Positive and Negative Characteristics of Semiformal and Informal Transportation from Three Perspectives

	USERS	GOVERNMENT OFFICIALS	OPERATORS/DRIVERS
POSITIVE	<ul style="list-style-type: none"> <li>Ubiquitous, on-demand service</li> <li>Affordable, especially for low-income populations</li> <li>Routes can be adaptable to users' needs</li> <li>Practical option for people to get around because of shorter headways and often fewer transfers, although not the most comfortable service</li> </ul>	<ul style="list-style-type: none"> <li>Satisfy the transportation needs of the citizens, especially in places where the government does not have the technical, financial, and/or institutional capacity</li> <li>Do not require government subsidies, and are good at managing fare evasion</li> <li>Create informal jobs in and around the transportation sector</li> <li>Informal transportation vehicles can serve as cultural icons that reflect the city's vibrant nature.</li> </ul>	<p><b>OPERATORS</b></p> <ul style="list-style-type: none"> <li>Do not require large capital investment and can be profitable</li> <li>Foster entrepreneurial spirit and a sense of community</li> </ul> <p><b>DRIVERS</b></p> <ul style="list-style-type: none"> <li>Even though it is informal employment, the income earned is more than minimum wage.</li> </ul>
NEGATIVE	<ul style="list-style-type: none"> <li>Quality of service is poor: users experience overcrowding, and physical and sexual harassment.</li> <li>Drivers often do not follow traffic regulations and jeopardize users' safety.</li> <li>Unreliable, as drivers often practice "fill-and-go" approach, and users might be charged twice if they transfer.</li> <li>Lack personal safety and security, especially for women and children</li> <li>Generally poor accessibility for people with disabilities</li> <li>Unless digitized/mapped, informal systems are often incomprehensible to users, and especially unfamiliar to visitors who do not know the routes.</li> </ul>	<ul style="list-style-type: none"> <li>Create negative externalities: old vehicles cause pollution, road safety issues, fragmented ownership, and lack of accountability.</li> <li>Difficult to monitor, regulate, and enforce standards</li> <li>Chaotic images of informal vehicles on congested roads do not conjure up the notion of a "modern" city.</li> </ul>	<p><b>OPERATORS</b></p> <ul style="list-style-type: none"> <li>Might lack financial capacity to upgrade and improve the limited service</li> </ul> <p><b>OPERATORS/DRIVERS</b></p> <ul style="list-style-type: none"> <li>Extortion is rampant and can threaten the lives of operators/drivers.</li> <li>Potential barriers to women entering the market as operators or drivers</li> </ul> <p><b>DRIVERS</b></p> <ul style="list-style-type: none"> <li>Long working hours, sometimes without formal contracts</li> <li>Intense "in-the-market" competition for passengers as well as for routes</li> <li>Exploitation often emerges as a major issue.</li> </ul>

Source: WRI authors.

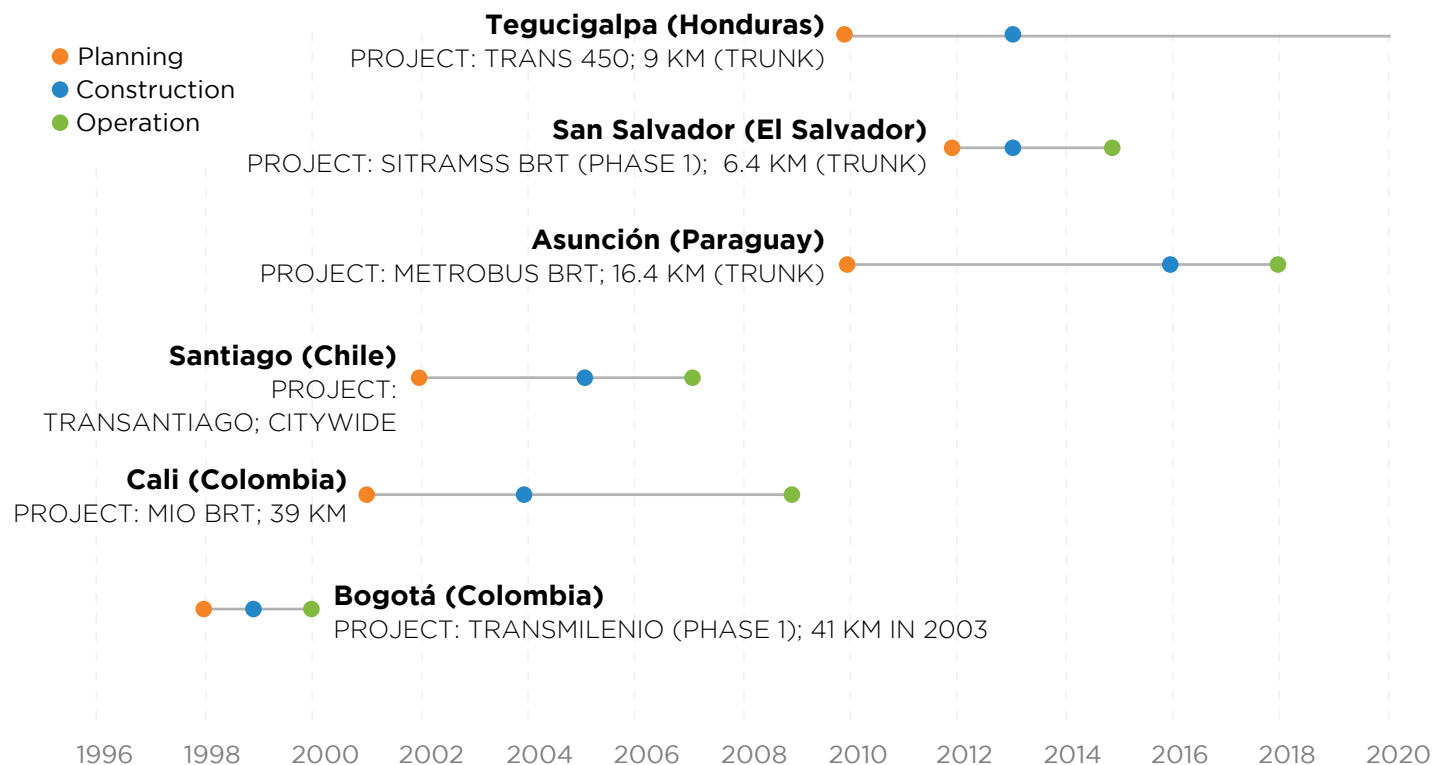
**This paper reviews six case studies—some more conventional than others—in Latin America to underscore the rich variety of reform processes and evolutions.** These case studies include: incremental transportation reform in Bogotá, Colombia; “Big Bang” or citywide approach to reform in Santiago, Chile; reorganizing both public and private services in São Paulo, Brazil; restructuring bus systems in medium-sized Colombian cities without the use of BRT systems; app-based semiformal operations in Mexico City, Mexico; and participatory digital mapping in the city of Santiago de los Caballeros, or simply Santiago, in the Dominican Republic.

**There is no single pathway for incorporating semiformal services in a centrally organized system.** The emerging consensus has been for the public sector to offer planning, regulation, and oversight of mass transportation, while the

private sector provides operational services under some organizational arrangement that is accountable to regulators—with the eventual goal of providing equitable and accessible transportation for all residents. A menu of approaches that city governments can take, and have taken, to upgrade and improve the informal sector is provided in Figure ES-3.

**In addition to larger-scale transformation, Latin America also notably showcases other technology-based initiatives aimed at improving public transportation, including use of innovative applications and digitalization of the transit network.** Many passengers, especially women, perceive these app-based services to be safer due to driver training and improved safety standards (Rasmussen 2019). Similarly, mapping and digitalizing of the minibus network is an important

**Figure ES-2** | Project Timelines to Implement BRT Corridors in Select Latin American and Caribbean Cities



Source: Adapted from Mojica and Díaz 2018.

**Figure ES-3** Various Informal Transportation Reform Approaches

**No action or hostile attitude toward incumbents:**

- Development of BRT system in parallel to existing paratransit systems while replacing or ignoring the informal systems
- Development of BRT system by completely removing incumbent operators along corridor

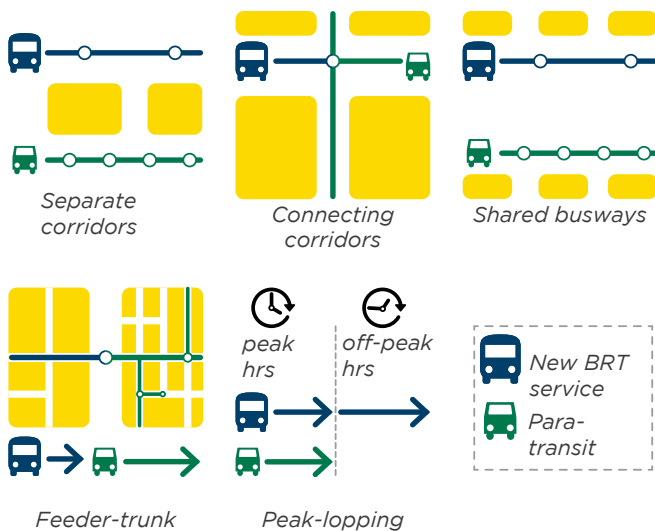
**Nonpunitive (but disruptive) service improvements:**

- New mobility/technology/mapping
- Gender inclusivity
- Driver training and improving labor conditions
- Improving operating environment (signage, priority lanes, etc.)
- Fleet renewal and improving fuel efficiencies
- Financial and business skills training

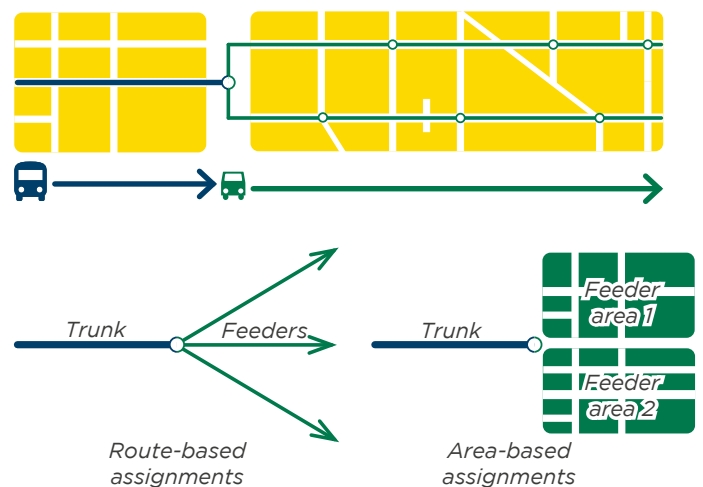
**Incorporating informal services into BRT systems:**

- **Some co-exist as a dual hybrid system, or**
- **With the intention of eventual 100% formalization of informal transit**
- Trunk and feeder system
  - Area/route licensing
- Peak looping (using informal services during peak hours)
- Concession
- Franchising
- Contracting
- First-mile/last-mile complementary services

**Complementary operations model for integrated BRT and paratransit services**



**Feeder-trunk operations model**



Source: Adapted from Jennings and Behrens 2017.



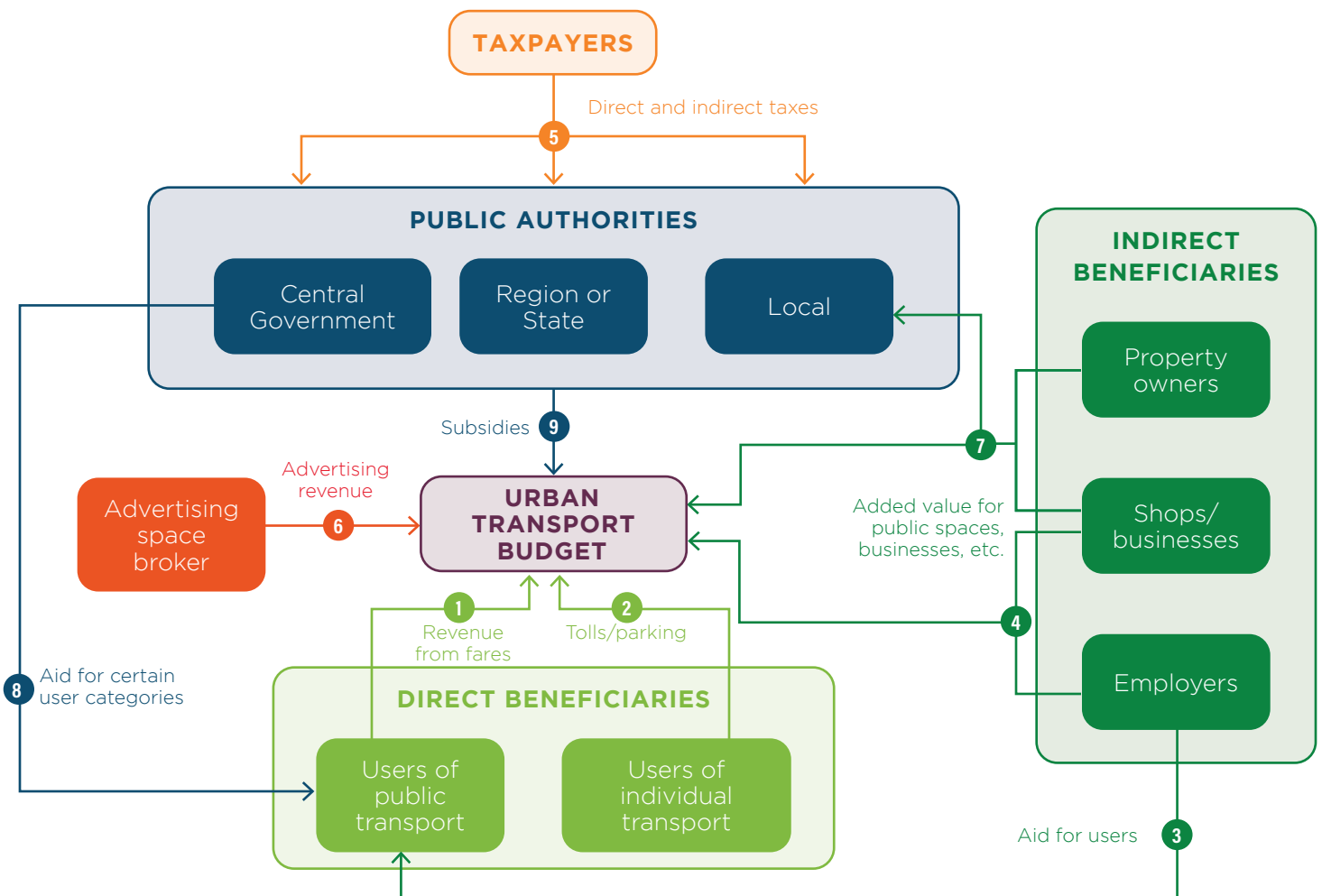
step to further improve the service of informal operators by matching passenger demand and supply, particularly during peak hours. By using a standardized data standard such as the General Transit Feed Specification (GTFS) for transit data, app-based services are beginning to offer dynamic trip planning features, seamlessly weaving together the city’s formal, semiformal, and other shared-mobility services (Venter et al. 2019).

**Negotiating with incumbent operators (and sometimes powerful bus companies) is a delicate and challenging process, and governments must be ready to compensate the incumbents** while leveraging the available policy tools to ensure future transportation systems and planning are not compromised. Understanding the business

models as well as the economic incentives of operators and drivers is also critical. Creation of formal cooperatives (if they don’t already exist) by bringing together individual operators can help city governments avoid managing countless operators separately. Building trust takes time, and broken promises can deteriorate relationships drastically. It is helpful to have a third-party stakeholder who can provide a neutral platform where the relevant parties can convene.

**Policymakers must carefully examine the potential pathways for reform and calibrate realistic expectations.** Especially in the early stages of bus network expansion, cities will need large capital investments, and they will also bear rising operations and maintenance costs for the growing

**Figure ES-4** | General Scheme for Funding Public Transportation Operations



Source: CODATU 2014.

urban infrastructure (Ardila-Gomez and Ortegón-Sánchez 2016). Costs not explicitly considered before the reform (e.g., crashes) will be internalized. Cities must realize the possibility of higher fares and/or government subsidies as a result of reform. Some approaches to fund operational costs are summarized in Figure ES-4.

**If there is neither an adequate level of funding nor institutional capacity, it may be better not to attempt a complete reform within a relatively short time horizon (two–three years).**

Gradual reform might be more practical for some cities, although there is a risk of being exposed to more external influences and uncertainties (e.g., economic and political) due to the longer timeframe. Some smaller-scale improvements that

can be considered include business skills training, safety training for drivers, creation of transportation workers' unions, bus fleet renewal, and investments in informal services' operating environments, including bus stops, bus stations, and nonmotorized transportation infrastructure (see Table ES-2). These modest approaches can curb many of the negative externalities.

**For many Latin American cities, semiformal and informal transportation services will continue to coexist with formal services and play a pivotal role, especially for transportation-disadvantaged residents.** Improving access for all citizens means investing in informal transportation services and upgrading and integrating them with formal services when feasible.

**Table ES-2**

Sample Strategies to Improve Semiformal and Informal Services without Large-Scale Bus Reform

BUSINESS DEVELOPMENT	OPERATING ENVIRONMENT	FLEET IMPROVEMENT	OPERATIONS
<ul style="list-style-type: none"> <li>• Business consolidation and cooperatives</li> <li>• Creation of transportation workers' unions</li> <li>• Business skills training</li> <li>• Business diversification</li> </ul>	<ul style="list-style-type: none"> <li>• Rank/terminus provisions</li> <li>• Bus priority lanes</li> <li>• Physical integration of taxi stands and nonmotorized transportation (NMT) with mass transit modes and public space</li> <li>• NMT infrastructure and access improvements near bus stations and stops (e.g., speed management, clear signage, safe transfer, and access to terminals)</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle renewal incentives (e.g., discounts for new fleets, payment of scrappage value)</li> <li>• Cooperative loans</li> </ul>	<ul style="list-style-type: none"> <li>• Safe driver training</li> <li>• Salaried drivers</li> <li>• Consolidated driver recruitment and management</li> <li>• Vehicle management and route rationalization</li> <li>• Complementary transit operation models</li> <li>• Cashless (and integrated) ticketing</li> <li>• Passenger information systems</li> <li>• Mapping and digitalization of transportation routes</li> <li>• Development or sponsorship of transportation apps and platforms to better optimize and integrate public transportation</li> <li>• Open public transportation data</li> </ul>

Source: Adapted from Jennings and Behrens 2017.

## Introduction

The ultimate goal of any public transportation system is to provide access to opportunities and destinations—jobs, services, education centers, and other amenities—in an affordable, comfortable, efficient, reliable, and safe manner for all citizens (Venter et al. 2019). For such transportation systems to be environmentally and socially sustainable, government officials must go beyond the narrow consideration of planning and implementing mass transit such as metro, rail, and bus rapid transit (BRT) systems, and consider other trip chains that facilitate door-to-door service. Sustainable transportation requires coordination and integration among different modes, including walking, cycling, and other formal, semiformal, or informal modes such as minibuses and microbuses in order to reduce greenhouse gas (GHG) emissions and local air pollutants, while providing access and mobility.

In this working paper, we focus on reform of semiformal and informal bus services as part of a city's overall public transportation system. In Latin America, more than half of public transportation trips are served by semiformal and informal services (Salazar Ferro and Behrens 2015).<sup>1</sup> These semiformal and informal services fill a market need, especially in peripheral areas where they serve lower-income communities. They provide a flexible and easily adaptable service with fewer transfers needed and higher coverage and frequency than formal services. At the same time, semiformal and informal transportation can create negative externalities in terms of pollution, congestion, and reduced road and personal safety.

## About This Working Paper

This working paper seeks to create an understanding of the integral role of semiformal and informal transportation services as viable and legitimate public transportation options in Latin America. While the region is well-known as the “cradle of bus rapid transit,” semiformal and informal transportation services are often overlooked or viewed in a negative light without any acknowledgment of their merits. Based on the authors' decades of experience as practitioners—as urban planners, transport engineers and

government policy advisors—and using extensive literature review of the region, we first provide an overview and characterization of the semiformal and informal transportation services in Latin America and then consider their advantages and disadvantages.

In the second part of this paper, we examine the benefits and challenges of public transportation reform—from semiformal to more formalized bus services. Reforms in Latin America often, but not always, occur as a result of, and in tandem with, new infrastructure-based BRT projects. But they have not always been successful nor have they effectively curbed negative externalities—at least not without intensive investment of time and finance. When reforms do not go to plan, quality of service can suffer—further resulting in an overcrowded and unsafe experience for users, while exacerbating citywide congestion. This paper then considers other attempts of smaller-scale reforms and alternative approaches to improvement in semiformal and informal transportation—ranging from simple upgrades of bus station/rank environment for greater accessibility and driver training to digitalization of public transportation routes.

The third section of this working paper examines select reform case studies in Latin America over the past two decades to underscore the rich variety of bus reform processes and evolutions along with their successes, failures, and lessons learned. These case studies include: incremental transportation reform in Bogotá, Colombia; the “Big Bang” or citywide approach to reform in Santiago, Chile; reorganization of both public and private services in São Paulo, Brazil; bus system restructuring in medium-sized Colombian cities without using BRT systems; app-based semiformal operations in Mexico City, Mexico; and participatory digital mapping in Santiago in the Dominican Republic.

Though there is no unique pathway for bus reforms, the emerging consensus is for the public sector to offer planning, regulation, and oversight of transportation, while the private sector provides operational services that are accountable to regulators with the eventual goal of providing equitable and accessible transportation for all residents. This paper concludes with a high-

level road map for bus reform in Latin America and a discussion of the different types of costs, implementation pathways, institutional capacity building, and financing considerations.

## What Are Semiformal and Informal Services?

Semiformal and informal transportation services generally refer to demand-responsive, unscheduled, and flexible public transportation services provided by self-organized small operators, in small to medium-sized motorized or nonmotorized vehicles, generally without effective regulatory frameworks (Jennings and Behrens 2017). A myriad of terms—some more positive-sounding than others—that describe these services include “traditional,” “artisanal,” “provisional,” “paratransit,” “illegal,” “alternative,” “clandestine,” “unregulated,” and “makeshift mobility.”

There is a rich tradition of transportation literature in the developing world context: Cervero and Golub (2011) provide a valuable global perspective on what informal public transportation looks like in different parts of the world. Hensher (2007) and Wilkinson (2010), among others, examine the bus contracting aspects and regulatory framework for upgrading or improving informal systems. Recently, scholars and practitioners in Latin American and Sub-Saharan African cities have begun to leverage digital tools and explore mapping traditional transit services (Klopp and Cavoli 2019; Goldwyn and Vergel-Tovar 2018; Mendelson 2016). All in all, the burgeoning variety of informal transportation studies include what constitutes “informal” vis-à-vis “formal” transportation, to what extent these services can be understood as part of “public transportation,” and how best to improve them for the betterment of the overall transportation system (Brussel et al. 2019; Fried et al. 2020).

Adopting a strict definition of informal transportation services is difficult and problematic since there is risk of omitting a service that does not meet the confined definition given the range of such services found around the world. Operators, for example, may have state-issued permits, but

largely function outside of the official regulatory framework and are usually unplanned by the public authority (Salazar Ferro et al 2012). At the same time, although the sector is primarily self-organized regarding market entry (e.g., new route allocation and territory assignment) and operations and management practices (e.g., timetable, fare, and terminal management) (Godard 2013; Heinrichs et al. 2017), it is still subject to disciplinary actions exercised by the state or the police (Kralich and Gutiérrez 2007). The flexibility and unscheduled nature of the service appear to be the common denominator among informal services. In some cases, informal transportation simply refers to “services. . . operating without official endorsement” (Cervero and Golub 2011).

Further, when does an “informal” transportation service become a “formal” service? What are the criteria, if any, to maintain a minimum level of quality of service—including scheduling, percentage of fixed routes, fleet size, fuel type, vehicle capacity, occupancy rates, and safety and security—that must be met for a service to be considered “formal”? How much regulation and enforcement does the transportation service need before it no longer qualifies as informal? In this paper, we consider transportation services as part of the formal-informal continuum. Over the past two decades, cities in Latin America have been moving toward greater formality—a process that has been marked by successes and setbacks—often by becoming associated with projects such as the deployment of a BRT system. There are also reform project initiatives that take place without BRT components.

Informal services exist because they fill a market need, especially when the government has limited capacity to provide such public goods (see Table 1 that compares capacity and throughput characteristics between formal and informal modes in the city of La Paz, Bolivia). They tend to provide frequent service with high network coverage that complements the limited reach of regulated modes of transportation. As a result, they require a relatively lower number of transfers between routes (Cervero and Golub 2011). The direct service, which connects residential areas in the peripheral areas to

the central business district (CBD) where abundant job opportunities exist, is important for users who want to travel to high-demand destinations (Salazar Ferro and Behrens 2015).

Informal transportation can also penetrate ridership markets in ways that formal transit typically cannot. In some areas of cities, especially in informal settlements, semiformal and informal services might be the only available public transportation option, or the only option for residents to access formal transportation services (King et al. 2017). Even in cities with well-established transit systems, informal transit can emerge as an important “gap filler” to provide coverage to neighborhoods where comprehensive formal transit services are not viable.<sup>2</sup> The decentralized and competitive nature of informal transit, along with its smaller vehicle sizes, helps operators justify expanding into areas

which otherwise would not have sufficient demand or feature adequate terrain to operate the large, conventional buses that are commonly procured by formal transit entities.

Moreover, since informal services are often offered by individuals, the owners do not need a large capital investment or administrative staff, which are prerequisites for government-run transportation agencies. The flexibility and low overhead costs make this business profitable for the owners (Behrens et al. 2015). Additionally, the informal sector itself provides many other direct and indirect economic benefits to transportation workers, including drivers, conductors, mechanics and repairmen, and vendors, among others.

Although semiformal and informal services fill a market need, they can also create negative

**Table 1** Comparison of Formal and Informal Operation Characteristics in La Paz, Bolivia

	FORMAL	PARATRANSIT (INFORMAL)				
	PUMA KATARI	MINIBUS	CARRY	MICRO	TRUFI	BUS
Vehicle capacity (number of people)	61	14	6	29	4	54
Number of vehicles	141	18,802	3,261	2,950	6,546	651
Speed (km/hr)	12-15 (3-7 during peak hours)	12-15 (3-7 during peak hours)				
Headway (min)	5-10	0.5-5				
Passengers per hour per direction (pphpd)	3,300	2,400-3,200				
Passenger-kilometers per hour per direction	9,900-49,500	7,200-36,000				
Passengers/direction	25,000	2.1 million				

Note: Speed for all transportation modes is the same and is low due to congestion in the city. General classification of different informal transportation can be found in Figure 3.

Source: Bürger 2018.

externalities. These services are typically clustered and congested on high-demand routes because they are more profitable. When self-organization or self-regulation becomes destructive competition, informal minibuses vie not only with each other, but also with more formal bus services such as BRT. As the number of inefficiently routed buses increases, harmful emissions and traffic incidents also increase. On the other hand, supply of informal services tends to fall short in low-demand areas or times, such as in the urban periphery or at night. Fares can also vary greatly based on demand, and other factors like weather and road conditions (Salazar Ferro 2015).

From the city government's perspective, it is hard to monitor, regulate, and enforce standards in a fragmented system. Informal service vehicles are often old, poorly maintained, and unroadworthy partly because of the cash-based nature of the business, which is capital-constrained and does not consider vehicle depreciation as an operating cost—leading to poor air quality and road crashes. Due to a lack of personal security, riders, particularly women, can feel uncomfortable, unsafe, and insecure using informal services (Allen 2016). Drivers practice “fill-and-go” departures that increase passenger wait times, particularly in the off-peak hours. To fit more passengers in a single trip, many operators replace original bus seats with long “horseshoe” benches, causing both overcrowding and safety issues (Dewey 2019). Lack of universal access on informal transportation is another major issue for people with disabilities (Access Exchange International 2012; Rickert 2003). Informal service providers operate a tough business.

Operators and conductors work long hours for fluctuating income with little or no enforcement of workers' rights and labor regulations. The drivers pay “rent” or a certain percentage of their daily earnings to the vehicle owners. As they do not have economic safety nets, their livelihood is hit hard when confronted with natural disasters and pandemics like COVID-19 (de la Peña 2020).

When informal services, with their non-centralized laissez-faire-like nature, create unintended impacts on passengers, drivers, and other stakeholders, the government is required to intervene. These negative externalities are not to suggest that informal services should be eliminated from the city. Rather, it requires that informal services be acknowledged as an integral part of a city's transportation system, making the most out of their benefits while minimizing the undesired externalities (Chen and Beard 2018). Table 2 summarizes the positive and negative characteristics of informal transportation services from the perspective of three stakeholder groups.

The negative aspects from Table 2 (e.g., poor quality of service) are not unique to the informal sector but can often be attributed to publicly run services. The 2016 CAF household survey (Vargas et al. 2017) from 11 Latin American cities, for example, highlights the components of the public transportation system that require major improvement (Figure 1). All of these present an opportunity to proactively leverage and harness experience and entrepreneurship from the informal sector.

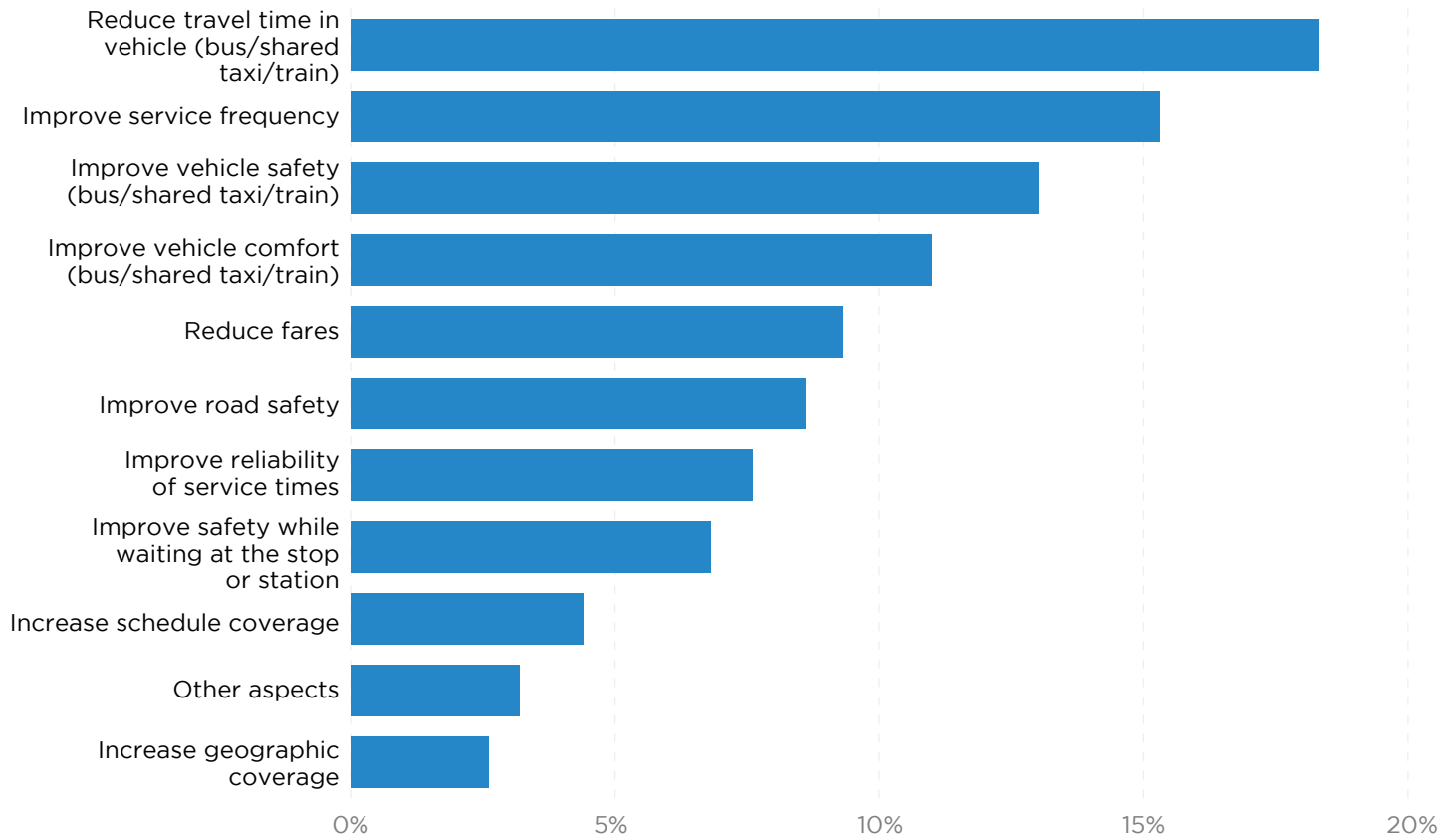
**Table 2** Positive and Negative Characteristics of Semiformal and Informal Transportation from Three Perspectives

	<b>USERS</b>	<b>GOVERNMENT OFFICIALS</b>	<b>OPERATORS/DRIVERS</b>
<b>POSITIVE</b>	<ul style="list-style-type: none"> <li>• Ubiquitous, on-demand service</li> <li>• Affordable, especially for low-income populations</li> <li>• Routes can be adaptable to users' needs</li> <li>• Practical option for people to get around because of shorter headways and often fewer transfers, although not the most comfortable service</li> </ul>	<ul style="list-style-type: none"> <li>• Satisfy the transportation needs of the citizens, especially in places where the government does not have the technical, financial, and/or institutional capacity</li> <li>• Do not require government subsidies, and are good at managing fare evasion</li> <li>• Create informal jobs in and around the transportation sector</li> <li>• Informal transportation vehicles can serve as cultural icons that reflect the city's vibrant nature.</li> </ul>	<p><b>OPERATORS</b></p> <ul style="list-style-type: none"> <li>• Do not require large capital investment and can be profitable</li> <li>• Foster entrepreneurial spirit and a sense of community</li> </ul> <p><b>DRIVERS</b></p> <ul style="list-style-type: none"> <li>• Even though it is informal employment, the income earned is more than minimum wage.</li> </ul>
<b>NEGATIVE</b>	<ul style="list-style-type: none"> <li>• Quality of service is poor: users experience overcrowding, and physical and sexual harassment.</li> <li>• Drivers often do not follow traffic regulations and jeopardize users' safety.</li> <li>• Unreliable, as drivers often practice "fill-and-go" approach, and users might be charged twice if they transfer.</li> <li>• Lack personal safety and security, especially for women and children</li> <li>• Generally poor accessibility for people with disabilities</li> <li>• Unless digitized/mapped, informal systems are often incomprehensible to users, and especially unfamiliar to visitors who do not know the routes.</li> </ul>	<ul style="list-style-type: none"> <li>• Create negative externalities: old vehicles cause pollution, road safety issues, fragmented ownership, and lack of accountability.</li> <li>• Difficult to monitor, regulate, and enforce standards</li> <li>• Chaotic images of informal vehicles on congested roads do not conjure up the notion of a "modern" city.</li> </ul>	<p><b>OPERATORS</b></p> <ul style="list-style-type: none"> <li>• Might lack financial capacity to upgrade and improve the limited service</li> </ul> <p><b>OPERATORS/DRIVERS</b></p> <ul style="list-style-type: none"> <li>• Extortion is rampant and can threaten the lives of operators/drivers.</li> <li>• Potential barriers to women entering the market as operators or drivers</li> </ul> <p><b>DRIVERS</b></p> <ul style="list-style-type: none"> <li>• Long working hours, sometimes without formal contracts</li> <li>• Intense "in-the-market" competition for passengers as well as for routes</li> <li>• Exploitation often emerges as a major issue.</li> </ul>

Source: WRI authors.

**Figure 1**

### User Perceptions of Components of Public Transportation in Latin America That Need Improvement



Source: Vargas et al. 2017.

Globally, there is no single recommended pathway for including informal transportation services in a centrally organized, well-planned, government-operated mass transit system. However, there is a menu of approaches that governments around the world can pick from to upgrade and improve the informal sector. These are often enabled by institutional reform and sustainable financing mechanisms (see Figure 2). The emerging

global consensus is for the public sector to provide planning, regulation, and oversight of mass transportation, while the private sector offers operational services through some form of organization, association, or company that is accountable to users and regulators (Venter et al. 2019). It is also important to acknowledge, however, that government interventions come with financial and institutional costs, as well as other trade-offs.



**Figure 2** | Various Informal Transportation Reform Approaches

**No action or hostile attitude toward incumbents:**

- Development of BRT system in parallel to existing paratransit systems while replacing or ignoring the informal systems
- Development of BRT system by completely removing incumbent operators along corridor

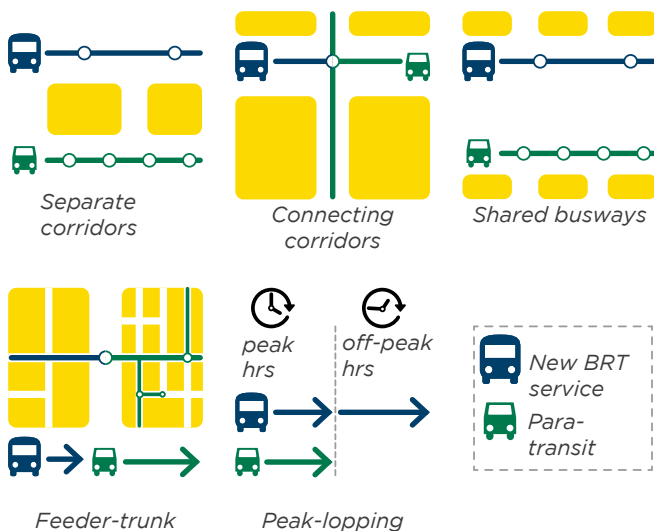
**Nonpunitive (but disruptive) service improvements:**

- New mobility/technology/mapping
- Gender inclusivity
- Driver training and improving labor conditions
- Improving operating environment (signage, priority lanes, etc.)
- Fleet renewal and improving fuel efficiencies
- Financial and business skills training

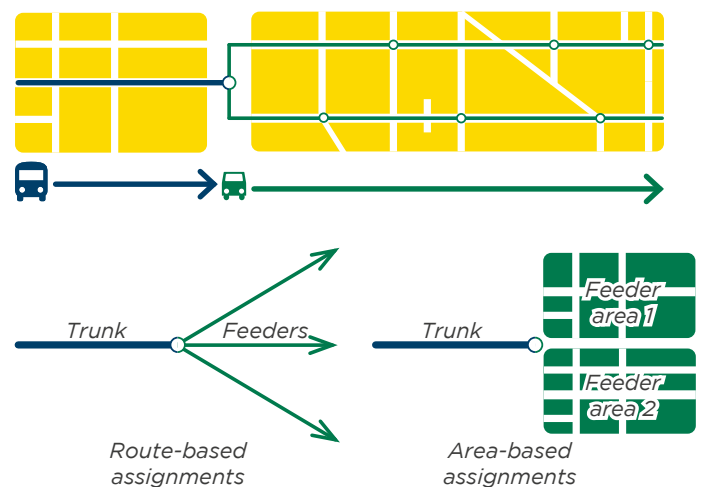
**Incorporating informal services into BRT systems:**

- **Some co-exist as a dual hybrid system, or**
- **With the intention of eventual 100% formalization of informal transit**
- Trunk and feeder system
  - Area/route licensing
- Peak looping (using informal services during peak hours)
- Concession
- Franchising
- Contracting
- First-mile/last-mile complementary services

**Complementary operations model for integrated BRT and paratransit services**



**Feeder-trunk operations model**



Source: Adapted from Jennings and Behrens 2017.

## Semiformal and Informal Transportation in Latin American Cities

Despite growing motorization in Latin American cities, public transportation, largely in the form of bus services, continues to be the primary mode of transportation. Data across 29 cities from the Observatory of Urban Mobility in 2016 reveal that the average modal share for (formally recognized) public transportation in the region is about 38.8 percent—in cities such as Lima (Peru), Quito (Ecuador), Caracas (Venezuela), and Mexico City (Mexico), the modal share for formal public transportation is more than 50 percent (Moscoso et al. 2019).

In the Latin American context, the term “semiformal” is applied to services that are legally authorized but operate under informal rules: dispersed property, daily rent of vehicles to drivers, and noncompliance with labor laws. Semiformal (or provisional) transportation services in most Latin American countries are provided under associations of individual operators. Countries such as Chile and Colombia require by law that these operators be affiliated with a company, which in turn receives an operating permit. Other countries like Mexico grant individual concessions to the semiformal services, but they are also organized in associations

that negotiate the number of permits, routes, and areas of operation with the authorities. Depending on the context and country, the term “informal” is synonymous with “illegal”—for example, in Colombia—and such services are banned (Korea Development Institute 2017).

People in the region still rely on “semiformal” or minibus services, which often complement the formal transportation services. When semiformal and informal modes are considered, according to the 2016 CAF survey (Vargas et al. 2017), the average percentage of formal households with no access to public transportation within 10 minutes decreases from 21.8 percent to 8.2 percent. These services are particularly important for residents of informal settlements or slums for many of whom the semiformal mode might be the only accessible transportation option (other than travelling by foot) within a short time interval (see Table 3).

Informal transportation vehicles come in different sizes and flourish under a multitude of names in Latin America—buseta, carry, cheto, chimeco, colectivo, combi (or kombi), concho, custer, ejecutivo, jeep, jitney, microbus, midi-bus, minibus, motor-taxi (or shared taxi), omnibus, pesero, puesto, (taxi-) trufi or taxi de ruta fija, and vans, among others (Figure 3). The informal sector serves more than half of all public transportation trips in Latin America (Salazar Ferro and Behrens

**Table 3** Percentage of Households in Four Latin American Cities with Accessible Transportation Means within a 10-Minute Walk

SETTLEMENT TYPE:	BUENOS AIRES		FORTALEZA		BOGOTÁ		CARACAS	
	FORMAL	INFORMAL	FORMAL	INFORMAL	FORMAL	INFORMAL	FORMAL	INFORMAL
Bus (formal)	96	89	96	95	67	54	71	67
Bus (informal)	45	11	53	51	74	49	68	77
Subway	9	8	7	4	-	-	42	20
Train	28	17	8	3	-	-	22	6
Motorcycle-taxi/Bike-taxi	4	0	54	48	24	2	70	78

Note: The table reports average surveyed characteristics of housing location for households in each category, differentiating whether they live in formal or informal settlements.

Source: Vargas et al. 2017.

2015). Exact modal shares of informal services for all passenger trips are difficult to obtain, but existing data suggest that informal trips range from about 30 percent to 40 percent in Guadalajara, Mexico; Mexico City; and Panama City, Panama; to approximately 40 percent in Bogotá and 50 percent in Lima (Estupiñan et al. 2018; Moscoso et al. 2019; Venter et al. 2019).

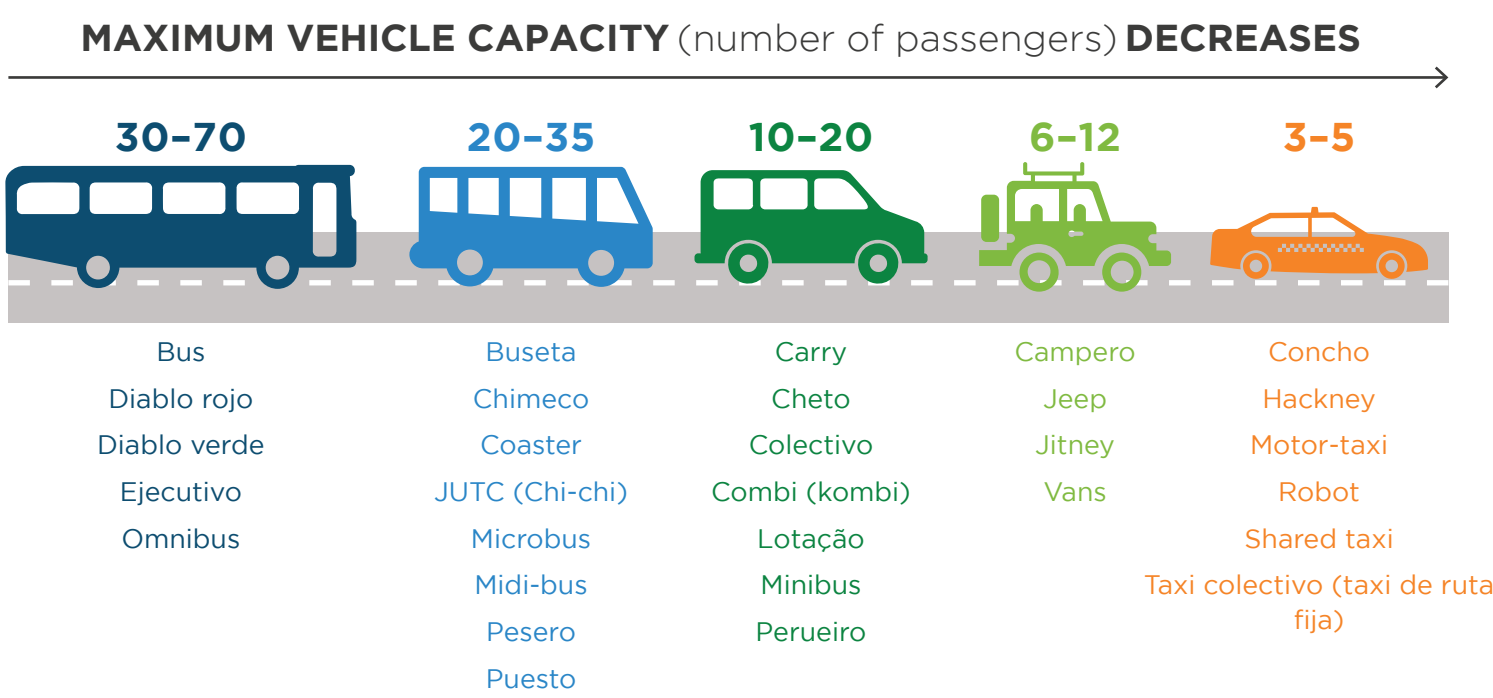
Figure 4 provides the number of motorized public transportation fleets in select Latin American cities. While combis (or kombis), vans, and minibuses are generally run by private operators, and hence are regarded as semiformal, the taxonomy of a vehicle does not necessarily reflect the vehicle’s formal or informal status. For example, in Brazil, São Paulo’s minibuses are considered part of the official service. It is also noteworthy that many Brazilian cities have a significantly smaller informal transportation sector since the last wave of individual bus services was replaced by large bus companies in the 1990s. Compared with their Latin American counterparts, Brazilian cities have more established contractual

relationships with private operators despite their long-term financial sustainability issues.

### A Brief History of Public Transportation in Latin America

Globally, informal transportation has developed under a particular set of circumstances, whether cultural, historical, or social. In Latin America, the history of public transportation can be traced back to the first half of the 20th century when trams or electric streetcars (eléctricos), usually owned by foreign companies, were introduced (Rosenthal 2016). At first, these systems were praised by governments as examples of modern transportation, but soon they could not keep up with urban growth. In the late 1920s, streetcars started facing competition from public buses and private cars, which offered more flexibility as they did not require rail tracks. Any entrepreneurial person with a relatively small investment could start a bus company, compared with streetcar companies that needed intensive capital.

**Figure 3** | Select Taxonomy and Theoretical Maximum Vehicle Capacity of Informal Transit Services in Latin America and the Caribbean



Source: WRI Authors. Design adapted from Salazar Ferro 2015.

**Figure 4** Motorized Public Transportation Fleet for Select Latin American Cities

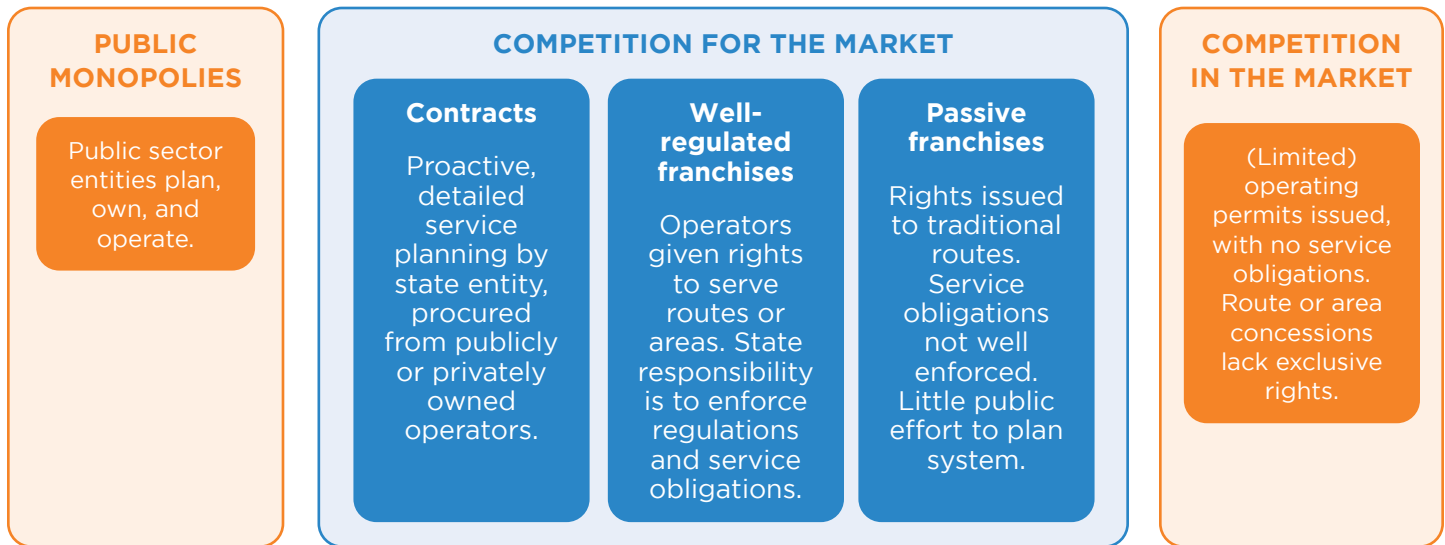
Note: The characterization of “combi/vans” includes all the vehicles of below 20-passenger capacity from Figure 3; “microbus” includes between 20 and 35 passenger capacity, and “standard bus” includes those above 35 passengers.

Source: CAF 2019.

By the mid-20th century, mass transit service in the region shifted largely to private minibuses operators who provided highly fragmented supply. Some of the later episodes of fragmentation were facilitated by national governments as a result of them shutting down state-owned firms and liberalizing the transportation industry as in the case of Chile and Peru (Timerman 2014; Estache and Gómez-Lobo 2005; Orrico Filho et al. 2007). In other cases, such as Bogotá and Mexico City, governments retreated to implicit laissez-faire policies as publicly

owned bus, tram, and trolley companies went bankrupt, and their ability to govern and expand public transportation declined (Flores and Díaz 2019). Over the decades, despite attempts by governments in Latin American countries to (re-)regulate them, these private operators have self-organized as companies, associations, or cartels. Given the lack of regulation, they have been competing “in the street” for business (or “in-the-market” competition; see Figure 5) under unclear and incomplete rules.

**Figure 5** Common Types of Government Bus Regulations in Latin America



Source Barter 2008.

Two notable exceptions are Argentina and Brazil, where the death of publicly owned bus companies in the 1960s did not give way to market fragmentation with small operators. Instead, relatively well-off minibus owners organized themselves, merged into large bus companies that rapidly gained control of the bus market, and eventually became the formal public transportation (Flores and Díaz 2019; Golub et al. 2009). This was feasible because government policies created high market entry barriers for individual operators who were then either absorbed into big companies or driven out of business. Regardless, different periods of informal operation have taken place over the years as the cities’ public transportation could not fulfill the needs of residents (e.g., surge of informal services in São Paulo in the 1990s in peripheral areas). The CAF (2011) reported that there were 231 private firms operating on 313 routes in Buenos Aires, Argentina, alone. In Brazilian cities, individual operators of minibuses (under government regulation) operate in favelas, or informal settlements (Vasconcellos 2017).

For recent bus reforms, cities in Latin America have undergone a “formalization” or systematization process. The idea is to move away from competition for passengers on the street (“in-the-market” competition)—with limited oversight of fares, route selection, driver wages, and labor hours—

toward competition for the transportation market, establishing guidelines around operation and service variables such as vehicle types, frequencies, schedules, and maintenance.

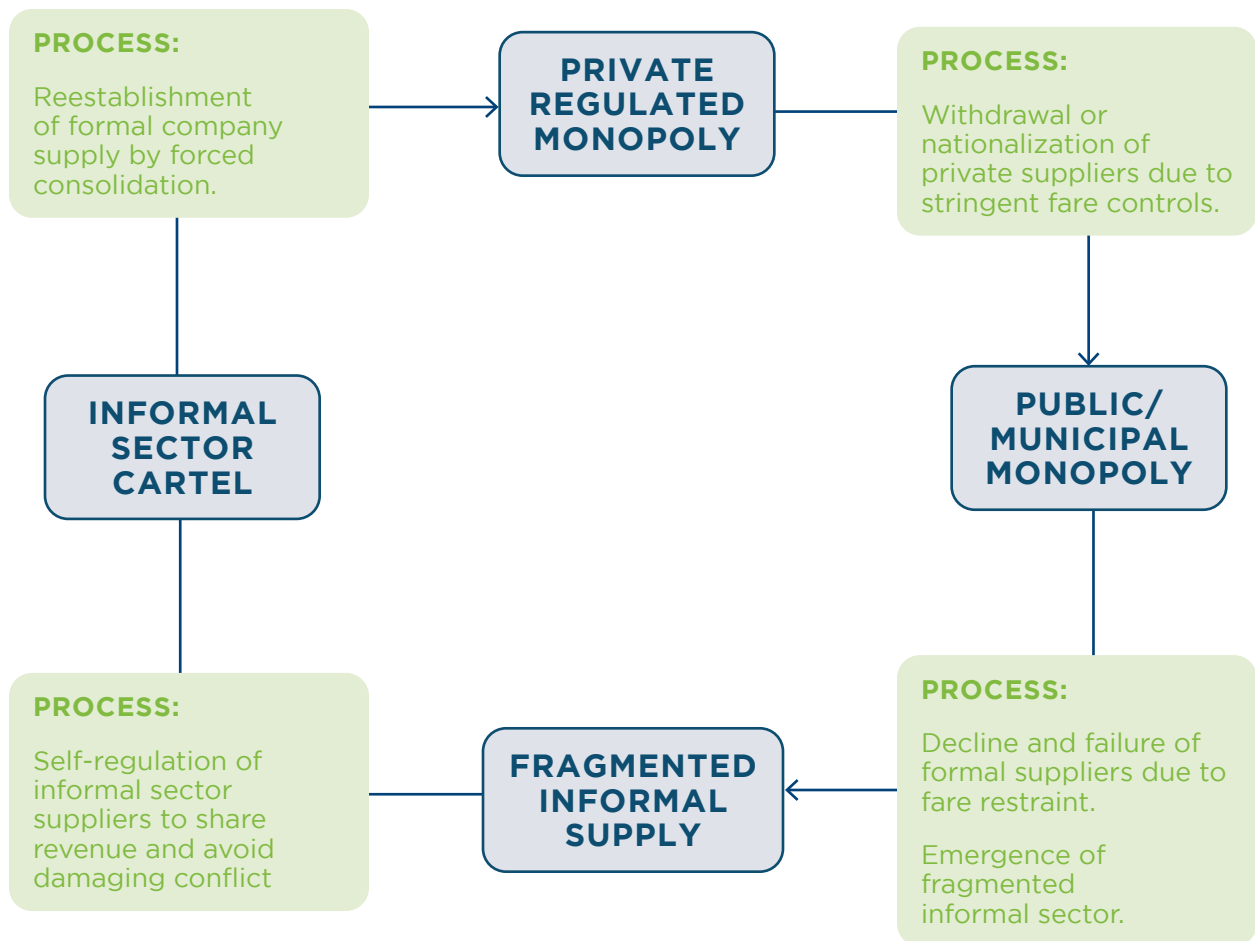
### Bus Regulatory Pendulums

One common justification for restructuring or transforming (or in some cases eliminating) informal transportation is to address market failures in the sector by the government. Gwilliam (2008) proposes a “regulatory cycle” framework (Figure 6) for so-called developing countries to explore the fluctuating role of government as the public transportation provision structure changes over time. Not all cities adhered to the particular steps outlined in the framework, but for many Latin American countries, the cycle often began with a privately regulated monopoly in the era of electric streetcars, which were then either withdrawn or nationalized and placed under public monopoly. When public or private sector companies were unable to sustain their operations, the market was opened up for semi-regulated or unregulated bus services. Over time, the fragmented supply of bus services led to an informal sector that self-regulated through self-associations and cartels. Eventually, the government’s role became to reestablish a more formal public transportation system through various means, including forced consolidation (Gwilliam 2008).

Perhaps the regulatory cycle is somewhat a misnomer, as we have witnessed in Latin America, and Gwilliam himself acknowledges that countries may not necessarily land on the same cycle starting point (Gwilliam 2008). Another scholar, Vasconcellos (2014, 2015, 2016), theorizes how Latin American cities are trapped oscillating between having ineffective government regulations and complete lack thereof, albeit taking different paths in each swing (Figure 7). In order not to perpetuate an ineffective system, we must avoid repeating past mistakes and patterns. As seen in Figures 6

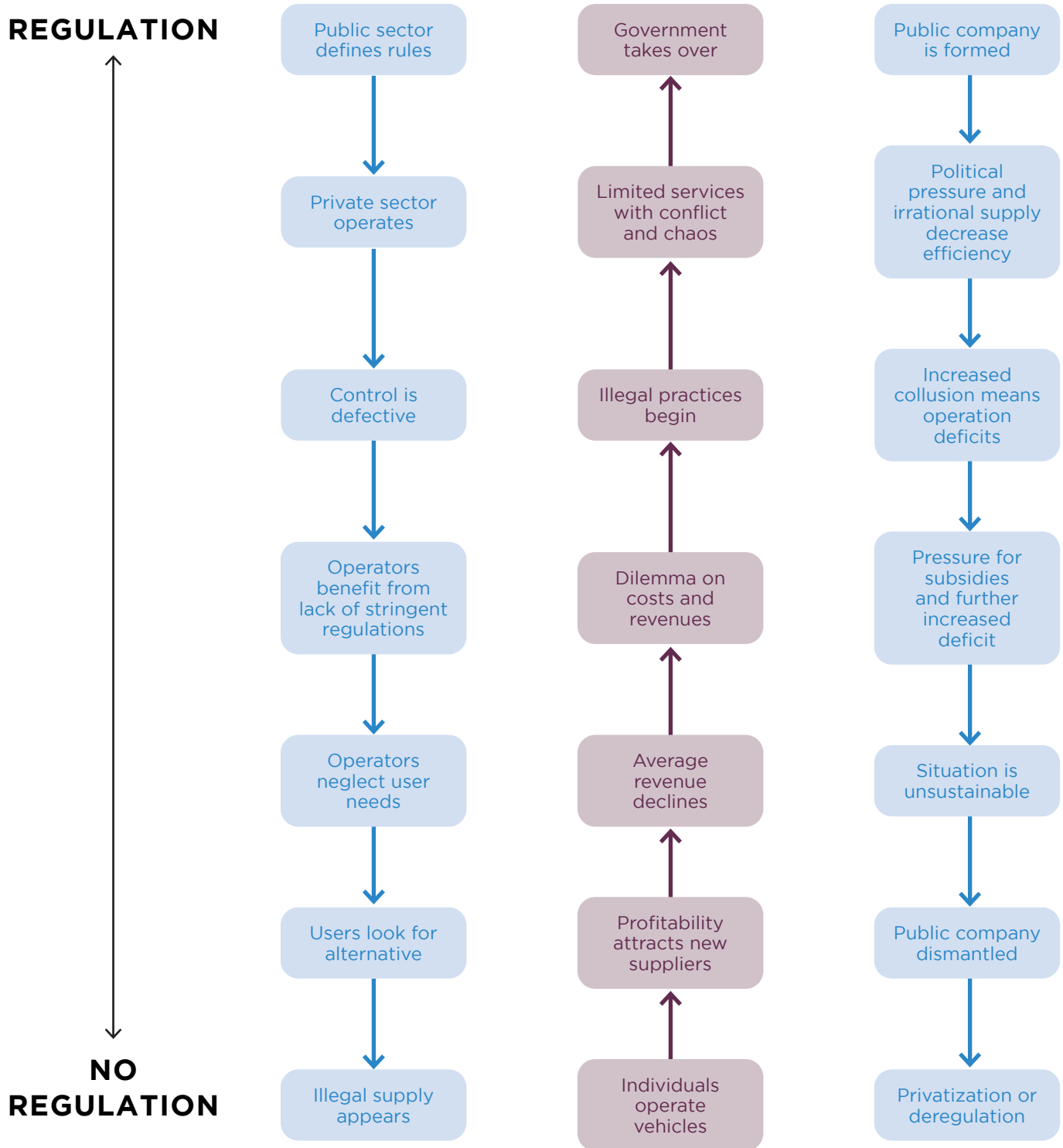
and 7, the way in which government authorities approach informal operators during the transition can have major consequences for passengers, incumbent operators, and the city itself. We must also recognize that beyond the transition lies the long-term sustainability of the city's public transportation system—amidst changing politics and government, inherent financial constraints, and the exigency to provide services to the most vulnerable members of the community through more equitable fare subsidies.

**Figure 6** | Bus Regulatory Cycle in Developing Countries



Source Gwilliam 2008.

**Figure 7** | Different Paths of Obstacles to an Effective Bus System



Source Vasconcellos 2016.

## Addressing Bus Reforms in Latin America

In Latin America and the Caribbean region, BRT plays a prominent role in bus reform, often as a governance, regulatory, and technical restructuring instrument for the transportation sector. A common approach is a complete and comprehensive replacement of informal and semiformal services with a deliberate effort to incorporate some or all of the informal operators into the new system. The process can be either gradual, corridor-by-corridor implementation, as in the case of Bogotá with TransMilenio, or immediate in a comprehensive replacement manner like what unfolded in Transantiago in Santiago, Chile—aptnly nicknamed

“Big-Bang” (Muñoz et al. 2014). The reform often includes route optimization focused around the BRT, setting up trunk BRT corridors where other routes are eliminated, and feeder buses connecting users from peripheral residential areas to the BRT.

One of the most delicate parts of the reform involves engaging with incumbent operators using various approaches which often involves some form of compensation for displaced/removed incumbent operators and/or allocation of (trunk and feeder) operation contracts (see Table 4 for past experiences in the region). The process is also often accompanied by a combination of policy approaches such as technical capacity building for incumbents to operate a BRT, driver training,

**Table 4** Experiences of Engaging with Incumbent Operators in Select Latin American Cities

CASE	ENGAGEMENT PROCESS	OPERATING CONTRACT TYPE	IMPACT ON INCUMBENTS AND THE CITY
Bogotá, TransMilenio BRT: Phases I and II (2000, 2003)	Bidding with preference: existing operators were given preferential points in the selection process to facilitate their transition.	Profit-sharing	<p>Small operators who could not raise enough capital were pushed out, resulting in opposition from small vehicle owners. This led to the city government creating costly compensation mechanisms of over \$400 million between 2013 and 2016.</p> <p>Informal transportation operators still provide services in the peripheries that are isolated from formalized operators.</p>
Bogotá, SITP (2011)	Bidding with preference to existing operators (including small owners).	Area contract (net cost)	<p>Small operators were not able to meet their financial obligations, and three out of 11 areas were abandoned.</p> <p>City paid compensation to incumbents to facilitate the transition.</p> <p>Services in the areas are being continued by semiformal operators, who compete for passengers with the formalized service.</p> <p>Reform process is incomplete, while the demand level is decreasing as passengers shift to motorcycles and bicycles.</p> <p>In 2019, the city completed a renegotiation process to provide financial assistance to formal service, and increase service quality requirements.</p> <p>In 2019, the city also completed new bidding processes for the areas that are not covered by formal service (not all contracts were awarded yet).</p>
Cali, SITP including BRT (2009)	Competitive tendering to allocate routes: operators formed five concessionary companies.	Profit-sharing	<p>Protracted negotiation with the operators amid slow and expensive reform implementation.</p> <p>Two of the four operators faced bankruptcy while smaller operators were left out.</p> <p>Expected ridership was lower while operation costs were higher than projected, thus causing double deficit.</p> <p>Rescue plan (2013–16), with its installment of a stabilization fund, fare increase, and contract duration, etc., led to an effective and financially sustainable transportation system again.</p> <p>Former bus operators are still operating (about 700+ buses).</p>



**Table 4** Experiences of Engaging with Incumbent Operators in Select Latin American Cities (Cont'd)

CASE	ENGAGEMENT PROCESS	OPERATING CONTRACT TYPE	IMPACT ON INCUMBENTS AND THE CITY
León, Sistema Integrado de Transporte Optibus (2003)	Negotiation with incumbent operators: 13 existing private concessionaries formed four operators for trunkways	Area contract (net cost)	<p>Took place over multiple administrations (15 years until the implementation of first phase).</p> <p>Difficult to enforce and penalize incumbent operators for their negative behaviors and performance, since the process was mainly through negotiation.</p> <p>Process resulted in an overall improved transportation system that integrates well with the city.</p>
Mexico City, BRT Insurgentes Corridor (2005)	<p>Grandfathering of existing operators into a new transport system: creation of CISA.</p> <p>Some fleets were operated by city bus company (RTP).</p> <p>Creation of Metrobús to oversee and manage BRT operations.</p>	Route contract (gross cost)	<p>400 permits were transformed into one single contract with the newly created private company (CISA). They became stakeholders.</p> <p>Set up a system for ensuring stakeholder revenue based on estimated revenue before the reform, making the service more expensive for the government.</p> <p>As revenue was not enough to cover all operating costs, the city started subsidizing operation through publicly owned city bus RTP.</p> <p>City has expanded service to seven corridors using a similar arrangement as Insurgentes, including new contracts for existing operators (through grandfathering) with CISA playing the key role in most corridors.</p>
Quito, Trolebús BRT (1995)	Replacement of private operators with public provision.	Route contract (net cost)	<p>Existing operators were assigned feeder routes.</p> <p>Service contracts for feeder routes were unstable, needed to be renegotiated often.</p> <p>This was risky for operators who were often left with uncertainties.</p>
Quito, Ecovía BRT (2002)	Contract given directly to existing operators.	Route contract (net cost)	<p>Financial requirements were not met by the private operators, and the contract was canceled.</p> <p>Private operators went bankrupt and operation was then taken over by the city.</p>
Quito, North Central Corridor (2005)	Service contract assigned to existing operators.	(Traditional) service permit (gross cost)	<p>Operators bought new fleet and are still in business for the designated corridors.</p> <p>Quality of service was compromised.</p>
São Paulo, Interligado Integrated Bus System (2000–04)	Negotiation with incumbent operators: operators were under concession contracts with the municipal public agency SPTrans.	Area contract (gross cost)	<p>Incumbent operators were integrated as feeder services in the new bus system.</p> <p>Fleet renewal of informal buses was possible with government support.</p> <p>Process achieved fare integration in the feeder area.</p> <p>While successful in pilot areas, scaling into other areas of the city was difficult as a result of policy changes at the city level and high financial costs in the long run. Further, since fares were high, especially for the low-income population, protests ensued.</p>

Note: Profit-sharing: Bus operators are compensated a predetermined share of overall revenue based on an agreed-upon formula (consisting of a combination of kilometers traveled and customers served). Area contract: Operators operate one or more services within a specified zone. Route contract: Operators receive licenses from the city authority to operate on one or more specified routes. Gross cost: Fare revenues are owned by the city officials, while the operators are paid by bus kilometers, bus hour, or other pre-agreed-upon formula with stipulations. Net cost: Operators get the farebox revenue (Institute for Transportation and Development Policy 2018).

Source: Hidalgo and Carrigan 2010; Institute for Transportation and Development Policy 2018; Mojica and Díaz 2018.

**Figure 8**

Schematic Diagram of Bus Market Fragmentation and Level of Regulation in Select Latin American Cities



Note: Some of these cities (e.g., Bogotá and Lima) have parallel public transportation systems.

Source: Data from Jennings and Behrens 2017; Trel 2014; Barter 2008, modified by WRI authors.

vehicle road worthiness testing, fleet renewal, and financing support for new vehicles and business, general road and infrastructure improvements, and upgrades of traditional stops, terminals, and station designs.

An alternate approach like in Lima is to establish a new BRT system that operates in parallel to incumbent services, which led to demand splitting among the two modes, and subsequently created financial distress for the existing operators (Venter et al. 2018).

Differing levels of bus service consolidation based on the degree of government regulation can be found in Figure 8. The chart is intended as a general schedule and in cities like Bogotá, Medellín, Mexico City, and Lima there can be parallel systems—both government-led public transportation provision and self-regulated privately owned buses—either as a result of the cities' ongoing reform process or weak governance capacity. Regardless of where

they fall on Figure 8, most cities, even those with comparatively successful reform cases, face numerous challenges in the long term. Some systems cannot sustain for-the-market competition while others are burdened by financial stresses derived from insufficient funding levels (Venter et al. 2019; Scordia and Muñoz-Raskin 2019; Mehndiratta and Rodríguez 2017).

## Emerging Technology Initiatives

In addition to larger-scale transformation, Latin America also notably showcases other technology-based initiatives that are aimed at improving public transportation. Mobile apps and technologies, like Jetty in Mexico City, are being used to reorganize the informal transportation industry (Dewey 2019). Many passengers, especially women, perceive these app-based services to be safer due to driver training and improved safety standards (Rasmussen 2019). At the same time, such app-based ride aggregator services have challenges around

affordability for lower-income groups (Tirachini et al. 2020) as well as financial viability of their business models in the long term.

Another example of innovation is the mapping and digitalizing of the minibus network, which has been carried out in more than 10 cities across Latin America (as of February 2020), including Bogotá (Colombia), Mexico City (Mexico), and Santiago (Dominican Republic) (DATUM 2020). Mapping is an important step to further improve the service of informal operators by matching passenger demand and supply, particularly during peak hours. The map of more than 1,000 routes served by pesero minibuses in Mexico City, for example, illuminates the commuting patterns of lower-income users, data that wasn't previously available from the more formal trips (Lane 2019). By using a standardized data standard such as General Transit Feed Specification (GTFS) for transit data, app platforms are beginning to offer dynamic trip planning features, seamlessly weaving together the city's formal, semiformal, and other shared mobility services (Venter et al. 2019).

## What are the Potential Benefits and Costs of Bus Reform?

Bus system improvement or reform can be a challenging process. It has numerous potential benefits but also requires longer-term commitments from governments. This is especially pertinent in the context of Latin America where cities tend to focus on upscale bus formalization. The more governments invest in heavy infrastructure to restructure a city's urban transportation system, the more time, financial resources, and technical and human capital it will require. The system's total operational costs, for instance, can increase after bus system reform, often as a result of unexpected costs. Depending on the funding sources, this can result in increased fares for users or higher requirements for institutional subsidies. Moreover, the reform can also result in longer walk and wait times and increased transfers for some users. While some holistic cost-benefit studies find that bus system reforms bring social and environmental benefits that are higher than the project's costs, the benefits are not necessarily progressive—the

benefits might go to middle-income residents rather than the very low-income population, and do not go to those at the top of the income spectrum (Carrigan et al. 2013).

Since the process potentially eliminates some of the unique benefits that informal bus networks provide, officials must be able to accept the risk and responsibilities; maintain, and not worsen, affordable access for vulnerable users—in terms of both monetary and time costs and coverage of public transit near their neighborhoods—who previously relied on the informal transportation modes; and properly balance the interests and needs of incumbent operators (including small owners), users, and the city government (see Table 2 in the Introduction). Below, we provide some salient potential benefits and drawbacks of bus system reform processes—in terms of climate change impacts, air quality, health and well-being, quality of service, access to opportunities, road safety, and institutional risks and responsibilities, among others. The inventory is not intended to be exhaustive, but to be used as a springboard for government officials to evaluate pathway decisions and set realistic expectations.

## Potential Benefits of Bus Reforms

### Positive Climate Impacts

Informal bus operators and owners often lack the financial capacity to maintain old and polluting vehicles without encouragement and support from the government. One of the primary benefits of bus reform is the reduction of transportation-related CO<sub>2</sub> emissions and particulate matter, which diminishes the sector's impact on climate change and the level of local air pollutants. In addition to a modal shift from informal buses, there are two common ways bus reforms can achieve a reduction of GHG emissions: by replacing and upgrading outdated buses (fleet renewal) and improving maintenance practices, and by using route optimization, which results in fewer vehicle kilometers traveled (VKT).

For small-and medium-sized cities that have limited technical and financial capacity, fleet renewal is often done to reorganize the traditional informal systems without the involvement of a BRT system. For the fleet renewal program to be successful,

it must be accompanied by sustainable and competitive business models and regulations that can incentivize operators and drivers to upgrade their bus fleets. During the 2010 bus reform in Pasto, Colombia, for example, 480 owners of 503 traditional buses, who could not otherwise afford to upgrade to new buses, received up to a 20 percent discount on the wholesale price of a new bus and a negotiated loan rate as part of the country's mobility improvement program Public Transport Strategic Systems (Sistema Estratégico de Transporte Público, SETP) (GGGI 2018). Fleet renewal can also take place over an extended timeframe with the government incrementally restricting vehicle types and only allowing operation of vehicles that meet more stringent emissions standards [e.g., the progression of the emissions standard in Transantiago after bus reform (Muñoz et al. 2014)].

In large-scale bus reform, fleet renewal typically results in fewer, larger buses, often accompanied by a process called route optimization in which duplicated routes are eliminated and large bus fleets are deployed on strategic routes to satisfy passenger demand. For instance, fleet renovation in León, Mexico, involved the removal of 200 traditional buses and deployment of 61 Euro 4 articulated buses. This resulted in a 13 percent reduction in emissions and 2 million liters less of diesel consumption in 2015 (GGGI 2018). In the municipality of Querétaro, Mexico, a combination of reduced fleet size (from about 1,300 to 700 vehicles) and bus route optimization is estimated to have resulted in an 85 percent yearly CO<sub>2</sub> emissions reduction (or about 22,000 tons) (Cordeiro et al. 2008). In terms of optimization, quality-of-service issues such as overcrowding and long wait times should be considered as part of the bus reform in order to avoid inadvertently driving passengers to individual private motorized modes, which would in the long run result in increased emissions.

The available literature also finds that route optimization, as a result of a decrease in overall VKT, leads to a greater reduction in emissions than replacing a fraction of the bus fleet with cleaner technology (Cordeiro et al. 2008). In another ex-post evaluation of environmental impacts, about 600,000 tons of CO<sub>2</sub> savings were estimated for MIO BRT system in Cali in 2013 (Hidalgo and

King 2014). As a caveat, it is important to note that emissions saved in many of these cases are calculated based on the supposition that a large share of the informal buses were scrapped as part of the reforms, although in practice the semiformal buses continued to operate in parallel—highlighting the difficulties of the reforms and how they may reduce net emissions.

### **Positive Health Impact through Improved Air Quality and Physical Activity**

In addition to a reduction in GHG emissions, bus reform can enhance the air quality in a city. In a less-congested city as a result of bus reform, buses can travel without much idle time and with fewer stop-and-go drive cycles. This positively affects passengers who may have had a greater exposure to pollution on the traditional buses. Based on estimates from Hidalgo and Gutiérrez (2013), for example, the first two phases of TransMilenio generated \$114 million in health benefits over two decades, mostly attributable to the reduction in premature deaths. Fewer emissions, especially air pollutants like SO<sub>x</sub>, can also help improve air quality, reduce acid rain, and consequently protect buildings, infrastructure, and historical properties.

Reducing the number of bus stops to increase average bus speeds, which is often coupled with the implementation of bus priority lanes, can also have health benefits. It has been shown that this encourages riders to walk to transit stops, which provides additional benefits to the passenger in the form of increased physical activity (Carrigan et al. 2013). Another possible physical benefit stems from modal shifts away from unsustainable sedentary motorcycle usages, especially among low-income users (Venter et al. 2018). On the other hand, given the high rates of motorization in the region, and the convenience that personal vehicles offer, there can be a significant downside of increased walk times to transit stops that public transit users would prefer to avoid, particularly those experiencing time poverty such as lower-income groups and women who often perform care-related tasks (Herrmann-Lunecke et al. 2020; Sagaris and Tiznado-Aitken 2018). Through route planning and station design, it is crucial to acknowledge the potential loss of public space to exclusive transportation lanes while

balancing the trade-offs between the bus operating speed and the walking distance required by passengers from across all walks of life—the elderly, disabled, people carrying packages and/or traveling with children (Velásquez et al. 2017).

Cities must also ensure that health benefits are distributed equitably, including by race, gender, age, and socioeconomic strata. During the initial five years of TransMilenio, studies found that air quality improved near BRT corridors where middle-income neighborhoods were located, whereas air quality worsened in lower-income areas partly due to the redistribution of older buses to poorer parts of the city (Hidalgo and Yepes 2005; Echeverry et al. 2005). A more efficient bus system that decreases door-to-door travel time more effectively by providing more frequent service and ubiquitous coverage (reducing walk times) can potentially have a larger positive impact on physical activity by helping reduce time poverty and/or freeing up time for other uses (Martínez et al. 2018; Suárez-Alemán and Serebrisky 2017).

### **Better Services through Travel Time Savings and Access**

As a consequence of bus reform, in-vehicle travel time savings for users can result from a decrease in VKT and usage of exclusive or dedicated bus lanes in congested areas of the city. Accompanying measures, such as traffic signal priority, improved bus stops, real-time fleet control, and other advanced fleet management and operational strategies are also important to achieve direct benefits for users. BRT buses can gain in the order of 10 kilometers per hour (km/h) of average operating speed over regular buses (Carrigan et al. 2013). Travel time savings of the BRT system in Cali after bus reform were estimated to be eight minutes every trip (Hidalgo and King 2014). In another study in Lima, travel times for those who switched from the traditional/informal public transportation to the BRT decreased substantially (35 percent) on average, although overall commute time reduced by only a few minutes as the BRT service was limited to one line (Scholl et al. 2018). Additionally, since users perceive wait time subjectively, implementation of dependable passenger information at bus stops as part of the formal transportation system can improve wait time

perception by at least 1.3 times (Fan et al. 2016; Mishalani et al. 2006).

In terms of access equity, findings vary based on the BRT configuration and coverage vis-à-vis the distribution of jobs and residential areas in relation to low-income populations. For example, while Lima's BRT serves middle-income and poor neighborhoods, the system has difficulty reaching the demographic that is classified as extreme poor. Since they tend to live in the periphery of the city, only 3 percent of the areas where this demographic lives enjoy BRT service, and only about 12 percent of the population can reach the BRT service within 15 minutes by foot. Many of these people still travel via informal transportation and make additional transfers (Scholl et al. 2016). On the other hand, the same study finds that 92 percent of extreme poor in Cali can reach a MIO BRT route within 15 minutes by foot. In some cases, the impact of access can be progressive over time. For example, for Phase 1 of TransMilenio, travel time savings for middle-income passengers were found to be 10 minutes per trip, compared to 18 minutes for the poor (Hidalgo and Yepes 2005). In Uberlândia, Brazil, bus reform led to the first Brazilian city with a 100 percent disabled-accessible transportation system (Pacheco 2013).

Given the provision of improved quality of service, BRT systems, after reform, have either similar or higher single-trip fares compared to traditional modes (Carrigan et al. 2013). This can impact the system's affordability for the city's poorest residents. At the same time, compared to fragmented systems, centralized systems—if the government has the financial means and political will—can create an equitable and integrated fare structure. For example, MIO BRT users in Cali, even after accounting for longer trips on average pay less than other mass transit users because of the integrated fare system (Scholl et al. 2016). The flat fare structure in Bogotá and Curitiba, Brazil, also means that higher-income commuters, who only travel a short distance, subsidize lower-income residents who commute further (Venter et al. 2019). Similarly, Lima's BRT flat fare structure allows poor commuters who travel long journeys to pay less than they would on semiformal and informal modes (Scholl et al. 2016). Passengers can also benefit from reduced fares or free transfers: according to Hidalgo and Yepes (2005), TransMilenio users, who

would otherwise have paid for two trips' worth of fare on the prior traditional system, save about 8-12 percent of their daily income. Some transit agencies also provide targeted subsidies and discounts to vulnerable communities, such as low-income people, seniors, medical patients, and students (Falavigna and Hernandez 2016; Guzman and Oviedo 2018).

## Improvements in Road Safety

Bus reform can also improve traffic safety in urban environments. As VKT are reduced, risk exposure is reduced, yielding lower probabilities of traffic crashes (Welle et al. 2018; Duduta et al. 2015). Duduta and Lindau (2016) estimate that road safety impact accounts for 10-16 percent of the overall economic benefits from BRT implementation. In Guadalajara, a statistical inference-based (using empirical Bayes method) ex-post study of the streets of median-running BRT with overtaking lanes at stations shows that crashes, injuries, and fatalities decrease by 56 percent, 69 percent,

and 68 percent, respectively (Duduta and Lindau 2016). These benefits are attributed to design elements such as dedicated pedestrian and bicycle infrastructure, and better street/crossing design (Welle et al. 2015). At the same time, the study also reveals that BRT implementation can shift crash risks to nearby streets when the design does not consider access to neighboring streets as part of the project scope.

The switch from loosely regulated operation permits to more strictly enforced driver contractual agreements is another important source of road safety improvement. This is achieved by changing the incentives for bus operators, who switch from competing with each other for passengers on the roads to an organized system where drivers are trained, their income does not depend on the number of passengers they pick up, and they no longer have to work overly long shifts (Bocarejo et al. 2012). New regulatory relationships with the government can also lead to better control of maintenance procedures. An

**Figure 9** | Multidimensions of Integrated Transportation System



Source: Compiled by Travis Fried (WRI).

exemplar is Transantiago in Santiago, Chile. Five years after the citywide formalization process, Transantiago achieved a 50 percent reduction in crashes involving buses (Muñoz et al. 2014). The National Commission for Road Safety of Chile cited several reasons, including shorter driver shifts, no incentives to compete for passengers, and reliable and well-maintained vehicles.

For smaller cities that want to improve their current transportation system without taking on wholesale formalization, different permutations of viable measures can be used to achieve a safer and more sustainable city environment. These include infrastructure improvements such as right-of-way designation and clear signage, driver training and education, speed management through establishing limits for different road types, promoting enforcement of laws and regulations for seat belts and drunk driving, and strategic reward and incentive schemes for incumbent operators (Welle et al. 2018).

## Benefits of Transportation Integration

Bus reform has the potential to create multimodal transportation systems. An integrated transportation system, from the perspective of sustainability, is a coherent and systematic approach to organizing travel activities balancing all the environmental, social, and economic costs (Givoni and Banister 2010). The level and process of integration will depend on a city's specific context, institutional capacity, and the ubiquity of traditional transportation alternatives. Different elements of transportation integration are illustrated in Figure 9.















From the government's perspective, empowered, integrated transportation authorities can represent effective institutional innovation that can break mode-based silos to address both formal and informal planning and operation (EMBARQ 2014). Along with the creation of dedicated transit agencies within city governments, establishing a new regulatory framework can create the opportunity to provide a social security safety net for drivers and operators, create clearer distinctions in the role of public bus operations, and bring a range of economic benefits to cities—from higher compliance with labor regulations to increased technical capacity of local authorities (Hidalgo and Carrigan 2010). Improving bus services can also

increase government accountability toward citizens (Paget-Seekins 2015).

Integrated bus reform can also have implications for the built environment. For instance, when unregulated, informal taxi ranks are replaced with formal stations, terminals, and depots, there are perhaps more commercial development and urban design opportunities associated with the formal systems' stations, terminals, and depots. Moreover, conditions for bus fleet electrification—as is being undertaken in Belo Horizonte and Campinas in Brazil; Bogotá, Colombia; and Santiago, Chile (Sclar et al. 2019)—are more conducive under an integrated system, since the deployment of e-buses involves additional complex logistical matters such as procuring buses (and batteries), establishing charging infrastructure, and working with utilities and the energy sector. In addition, competent transit agencies with integrated systems can better coordinate and respond to emergency situations such as natural disasters and pandemics (CDMX Resilience Office 2016).

From the users' perspective, an integrated fare system, as part of the overall urban transportation integration, is a well-recognized way to make transit services more affordable. Ridership is known to increase with fare integration as more riders can transfer across modes on a single fare (Venter et al. 2019). As described above, targeted subsidies for specific passenger demographics are more possible in an integrated system. With dedicated agencies, ongoing user consultations and surveys regarding their needs (e.g., handicap accessibility) can also be effectively incorporated in transportation planning and service delivery. When public transportation investments are coupled with investments in safe infrastructure for nonmotorized first- and last-mile trips, commuting can be more enjoyable and accessible. Other potential benefits of bus reform for users include: mandated universal access to public transportation, enhanced passenger experience with real-time arrival information, published route and schedule information, formalized and all-weather stations, possibly improved personal safety as a result of the presence of security staff, cameras on board and in stations, and mandated increased share of underrepresented demographics (women, people with disabilities) employed in the transportation sector.

**Figure 10** Integrated Public Transportation Structure (Including Minibuses) of Mexico City

	FEDERAL DISTRICT					STATE OF MEXICO		NATIONAL GOVERNMENT	
Transport modes	Public Transport—centralized district-owned companies		Mass Transport—decentralized district-owned companies			Public transport	Mass Transport — decentralized state-owned companies	Private concessionaire	
	Individual concessions					Individual concessions			
Modal share (federal district)	 62%	 2%	 4%	 1%	 27%		 1%	 1%	
Strategic planning	Secretary of Mobility					Secretary of Transport (SCT)	Secretary of Commerce	Secretary of Transport (SCT)	
Management & operations	Individual concessions					Individual concessions			
Infrastructure	Individual concessions	Secretary of Infrastructure (SOI)			SCT SOI	Individual concessions	Secretary of Infrastructure (SOI)	Secretary of Transport (SCT)	
	Local police (municipal level)						Local police (municipal level)		Local police

Source: Varela 2015.



From the perspective of incumbent operators, moving away from each operator guarding their own farebox revenue toward a more centralized distribution of citywide revenue based on clear and transparent rules can avoid competition in the market (Venter et al. 2019). The reform process can also incentivize workers in the transportation industry, who previously endured long hours without benefits, to join unions for collective action and bargaining power (Global Labor Institute 2019; Paget-Seekins 2015). Salaries, benefits, and working conditions of formalized transportation workers are found to be improved (McCaul 2012). At the same time, because the informal sector offers significant employment opportunities for various low-skilled workers, it is imperative to absorb as many incumbents as possible into the new system—by retraining and hiring them as formal employees (e.g., as bus drivers or station staff), providing them business training and financial literacy so they can be more effective at achieving cost reductions and increasing revenue, including them as equity shareholders, subcontracting for different parts of bus operations (e.g., in feeder service), or by mitigating and compensating for their job losses through vehicle scrap value payment and disturbance (loss of business) allowance (Cervero 2015; McCaul 2012).

For the integration of public transportation, informal services, an often overlooked or ignored mode of transportation, should be proactively included to serve as a complementary service (e.g., for first- and last-mile connectivity) in a multimodal ecosystem. For example, a study of transportation ridership in the 100 largest urban areas of Mexico reveals that despite the government's investment in high-capacity transit, many users primarily rely on informal modes such as minibuses and minivans for their daily commutes (Guerra et al. 2018). This trend is no exception for Mexico City, where the government has especially invested in high-capacity transportation modes such as BRT and metro, but residents still rely significantly on minibus services (Varela 2015) (see Figure 10 for Mexico City's transportation governing structure and various mode shares). Given that BRT and rail are expensive and time-consuming to implement, transportation policies that solely focus on such capital-intensive infrastructure inevitably ignore the needs of a

majority of the citizens in the country.

The issue of lack of integration between formal and semiformal/informal modes becomes more pronounced if the service provision is to be pro-poor. Modes like BRT require sufficient demand densities to be able to cover operations and maintenance costs. If the city is limited by finite financial, technical, and political capacity, there might be pockets (typically in peripheral areas) that formalized transportation inevitably bypasses or provides subpar quality of service. Based on the 2016 CAF survey, only 31.8 percent of formal households in La Paz have access to formalized transportation, with the figure decreasing to 16.7 percent for the lowest-income quartile group. At the same time, the percentage with access to transportation increases to 82.4 percent when considering semiformal and informal modes, while the lowest-income quartile also gains 61.8 percentage points (Vargas et al. 2017). In Lima, the most cited barriers for not using the BRT system among the poor include: a lack of BRT routes serving the desired destination, long queues, and bus delays. As a result, their daily BRT usage is only 15 percent, compared to 33 percent usage of other informal modes such as combis and custers (Vargas et al. 2017). Moreover, 30 percent of Metropolitan BRT trips involve some form of local informal transportation, implying that those who do use BRT use it as part of their intermodal trip (Scholl et al. 2016).

## Potential Costs of Bus Reforms

### Service Rigidity, Reduced Coverage, and Frequencies

Formal transit systems, while boasting many performance advantages (such as reliability, travel time savings, and comfort), typically offer service which is more rigid than informal transportation. Routes, and the buses that ply them, are difficult to adapt to unique circumstances. For instance, formalized routes only stop at prescribed locations. There may also be a physical aspect to the rigidity of formal buses since the smaller informal vehicles may be able to navigate narrower streets through informal or lower-income neighborhoods more easily than conventional or articulated buses could. Under traditional formal bus systems, drivers also

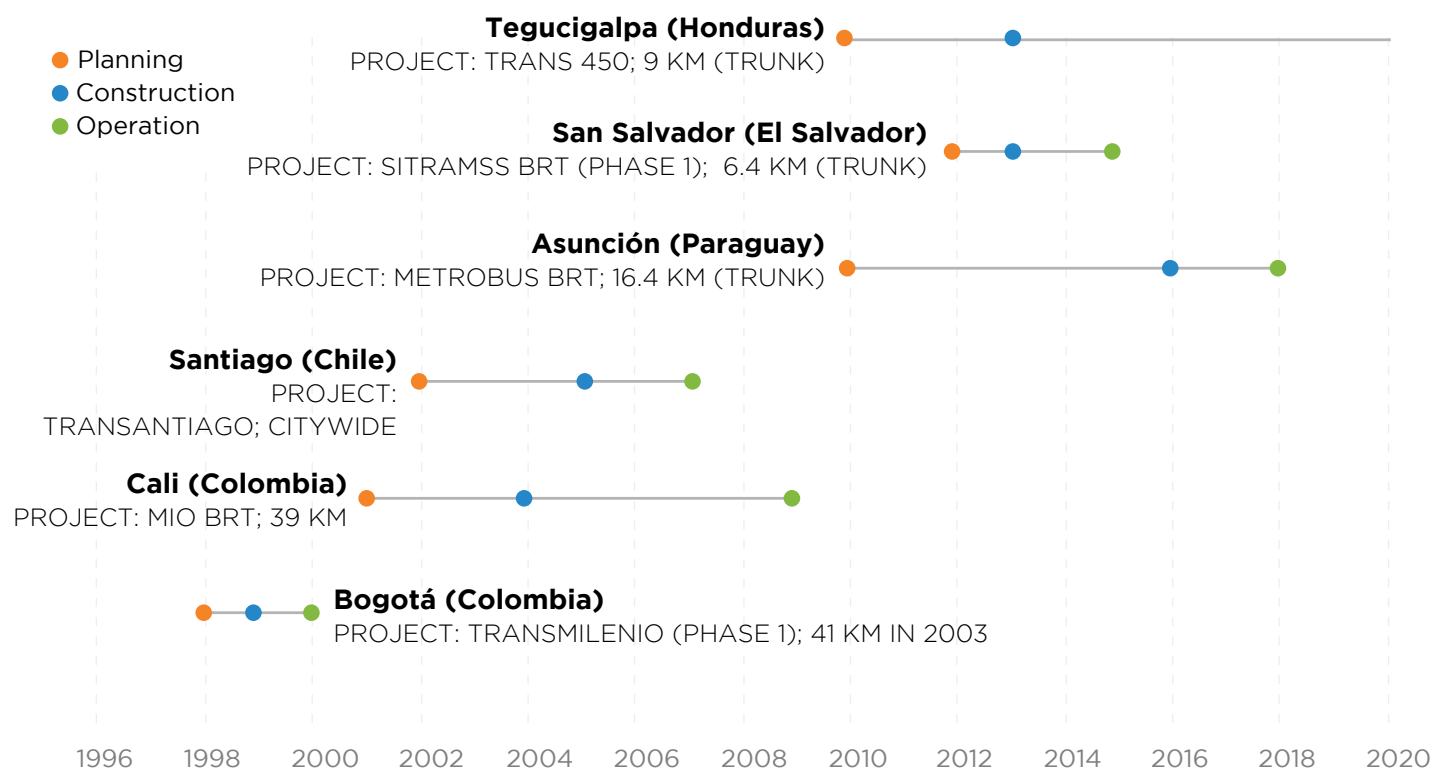
lack the flexibility to let passengers board and alight at other locations along the route, and they only deviate from planned routes in response to passenger demand, construction, congestion, or other obstacles (Rodríguez et al. 2016).

Formal bus systems take longer to respond to new ridership trends than do informal systems. This could be further exacerbated by a context of weak institutions and political instability that can hamper the ability of transit agencies to adequately respond to changes in demand in a timely fashion—that is, high turnover, low-paid technical staff, a lack of budget, and a lack of technical capacity of staff in public transit management agencies, among others. On the other hand, as informal operations are usually small-scale, with only one or two buses, drivers often serve as direct decisionmakers regarding their vehicle’s route and promptly fulfill the shifting passenger demand (Kumar et al. 2016). Traditional operators are also knowledgeable of passenger demand trends, and can nimbly reroute

buses to respond to shifting market demands (such as a new or expanding neighborhood) (Cervero and Golub 2011). In contrast, formal systems often have to navigate a bureaucratic and cumbersome process before providing new services (Cervero 2001).

In addition to rigid routes and service planning, formal systems lose the flexibility and demand responsiveness to maintain a large coverage area with frequent service. In Santiago, Chile, for example, the average wait time to catch a bus was four minutes with the semiformal system (Gómez-Lobo Echeñique 2007), and is currently over double that with the formalized Transantiago network (Moovit 2019). Similarly, during the early phases of reform in TransMilenio, passengers who commuted through one or two transfers experienced an increase in overall travel time by two minutes per trip as a result of longer wait times (Lleras 2003). While there are advantages to decreasing the number of buses in a fleet in

**Figure 11** Various Project Timelines for Implementing BRT Corridors in Select Latin American Cities



Source: Adapted from Mojica and Díaz 2018.

largescale formalization (such as less congestion, maintenance, and labor needs), this often means shorter routes or lower frequencies. A recent ex-post study by Gómez-Lobo (2020) reveals that increased generalized costs to passengers associated with reforms are statistically significantly correlated with deteriorated ridership in Colombian medium and large cities after Integrated Massive Transport Systems (Sistema Integrado de Transporte Masivo, SITM) bus reforms.

Of course, the argument is not to completely abandon formalized systems since the relative effectiveness, predictability, and safety of formal routes and stops have their own merits, especially in rapidly changing chaotic cities. The point is for transportation agencies to anticipate the potential costs and be flexible in responding to new trends. As such, depending on the city context, a balancing hybrid approach that undergoes both formalization and gradually incorporating/upgrading informal services for routes with lower passenger volumes might be warranted in order to satisfy the transportation needs (Venter et al. 2019; Salazar Ferro 2015).

### **Increased Institutional Responsibility and Risk**

The process of bus reform is a large institutional undertaking and presents new responsibilities and risks to government agencies. Under informal systems, bus services tend to self-organize: grassroots associations of drivers standardize fares (albeit the potential price coordination), control headways, and establish rules to prevent the transit system from drowning in anarchy; some even hold their own traffic courts, provide access to credit, and secure discounts for fuel and insurance (Kumar et al. 2016; Muñoz et al. 2009; Cervero 2001). While these self-organized groups can be corrupt, they demonstrate a remarkable ability to self-govern informal transit systems. Replacing and reconfiguring a bus system leaves many of the roles and responsibilities from the informal sector to be managed by government agencies.

First and foremost, reform implementers must be prepared for a significant time commitment. In particular, Latin American cities that employ BRT systems for their bus reform process may make assumptions about a short implementation

timeframe (between three to five years) within a single office term (Mojica and Díaz 2018; Paget-Seekins and Muñoz 2016), but prior experiences show that the duration varies vastly (see Figure 11) depending on the political will and political window of opportunity to be able to reach a consensus among lawmakers and the outcome of negotiations with the incumbents. As bus reform takes place over a stretch of time, BRT coexisting with poorly regulated informal systems, as a result of “spillover effects” (Echeverry et al. 2005), can impose negative impacts, especially on poorer communities that live in the peripheries of cities.

In addition, there is a danger that the reform project fails to be completed—as a result of prolonged delays and logistical interruptions, political adversaries, resistance and protests from incumbent operators, increasingly expensive land acquisition and construction costs, or a combination of all of them (Venter et al. 2018)— and leaves communities worse off. While the participation of semiformal incumbent operators is critical during the initial transition period, the iterative engagement process can be long and taxing, and can come with political and financial costs for the government. Moreover, there may be some unanticipated costs of trying to include the incumbent operators in the formalized system, such as capacity building needed so that the operators have the necessary technical and managerial skills for the transition and that they are able to adequately participate in the bidding and contract negotiations, among others (Schalekamp 2017; Venter 2013).

While consolidation of fragmented companies makes it more convenient for the government to regulate, they can also turn into conglomerates. For example, half of Bogotá’s transit concessions have been acquired by three companies in the city, while one company in Mexico City exerts a substantial influence on two BRT bus operating companies (Paget-Seekins et al. 2015). On the other hand, incumbents with less capital or financial literacy can also be left out of the bidding process. As seen in early bus reform efforts in Mexico City (Flores-Dewey and Zegras 2012), conglomerates of incumbents with considerable political and financial power can influence the city’s future transportation policy as well as the expansion and sustainability of the public transportation system. Given this

tendency toward oligopoly, bus reform's intent to correct market failure by fostering competition "for the market" can inadvertently result in a "no-competition" situation (Paget-Seekins et al. 2015).

Running a formal system also requires governments to expand their technical and administrative planning capacities. As the informal transportation systems are reconfigured, government transit agencies take on new responsibilities for planning routes, setting and collecting fares, procuring buses, and managing administrative structures. Even when some responsibilities are relegated to a third party, bus reform efforts commonly require a large commitment by government policymakers

to coordinate and allocate institutional resources to support transit system operations (Hidalgo and Carrigan 2010). As services were previously privately owned and operated in the semiformal/informal setting, newly formed or restructured transit agencies have limited experience. They thus face the challenge of reclaiming authority over the public transportation system, while building their own capacity (Paget-Seekins et al. 2015).

As governments expand their role to facilitate formal transit adoption, they are often faced with newfound financial issues, such as recovering transportation infrastructure costs, which is often insufficient exclusively with user fares. Financial risks are inversely related to institutional maturity

**Figure 12**

Examples of Expenditure Burdens and Revenue-Generation Potentials of Different Public Transportation Improvement Approaches

**RED** = High; **YELLOW** = Medium; **GREEN** = Low or Zero

PUBLIC SECTOR EXPENDITURE		NEW MASS TRANSIT	GRADUAL/STEPED TRANSITION	EXISTING SERVICE UPGRADE
Capital	Fixed infrastructure	RED	YELLOW	GREEN
	Fleet	RED	RED	YELLOW
	Incumbent operation compensation	RED	GREEN	GREEN
Operating	Public authority	RED	RED	YELLOW
	Operating deficit subsidy	Context specific	Context specific	GREEN
	Infrastructure maintenance	RED	RED	YELLOW
	Fleet maintenance	RED	RED	GREEN
	Passenger-side subsidy (if applicable)	Context specific	Context specific	Context specific

PUBLIC SECTOR REVENUE GENERATION		NEW MASS TRANSIT	GRADUAL/STEPED TRANSITION	EXISTING SERVICE UPGRADE
Land Development	Land value capture (levy)	RED	GREEN	GREEN
	Land value capture (lease rental)	RED	GREEN	GREEN
Operating	Station retail	RED	YELLOW	GREEN
	Advertising	RED	RED	GREEN

Source: Adapted from African Centre for Cities 2015.

(Iossa and Waterson 2017) and cities that lack previous experience running transit systems have a higher likelihood of experiencing fiscal woes. Although formalized transit systems can save costs by consolidating buses and streamlining routes, operating them typically costs more than informal services due to higher labor and maintenance expenses, procurement of cleaner buses that meet stringent environmental standards, and extra management overhead (Muñoz et al. 2014; Rodríguez et al. 2016). Public transit operations also have higher operating expenses because of the additional requirements in the formal system than their market-driven, competition-facing informal counterparts (Cervero 2001).

Often, city officials advertise and expect that bus reform schemes will be revenue-neutral, rationalizing that the higher cost of the reformed system would be covered by improved and optimized efficiencies in the service provision. Unfortunately, on-the-ground realities from many Latin American cities (including Santiago, Chile; Bogotá; Monterrey; Mexico City; Lima; and Quito) demonstrate that formal transit requires a government subsidy and/or higher fares to stay afloat (Mehndiratta and Rodríguez 2017; Muñoz et al. 2014; Hidalgo and Carrigan 2010). Nowadays, many BRTs in Latin American cities are facing quality of service issues—not because they are intrinsic to BRT systems, but because of a lack of funding and weak institutions (Lindau et al. 2014). Public transportation subsidies in cities like Buenos

Aires and Caracas are 239 percent and 117 percent times as high, respectively, as the collected farebox revenue since they also offer discounted fares to low-income populations who qualify for social assistance (Vasconcellos and Mendonça 2016).

Subsidies in Latin American countries typically come from the government's general budget and, therefore, compete with other investment needs. These sources of revenues are unstable and dependent on the political cycle. As an exception, in Brazil, there is a special form of subsidies called Vale Transporte, which, by law, requires employers to cover transportation costs of the (formal) employees (Vasconcellos 2017). This, subsequently, allows transit agencies to charge higher fares. Other feasible revenue sources include charging negative externalities (e.g., congestion) through economic transportation demand management mechanisms (Financiera de Desarrollo Nacional 2019), although widespread adoption of these instruments is yet to be seen. Figure 12 compares a general public sector expenditure and revenue-generation potential for different approaches to bus reform transitions and improvements. In the case of limited capacity to install networks of formal scheduled bus services, the most appropriate discourse of bus reform for a government could be upgrading existing informal transit services for better service quality, or a combination of corridor-by-corridor bus reform with incremental service improvement (African Centre for Cities 2015).

## Case Studies from Select Latin American Cities

The case studies in this section examine six different approaches to semiformal and informal transportation service reform that have taken place across select Latin American cities. These case studies focus on cities where bus services are predominantly provided by the private sector under operational permits and illustrate a variety of reform approaches that have unfolded in Latin America over the past two decades. The approaches encompass: gradual reform using BRT in Bogotá;

citywide or “Big Bang” transformation in Santiago, Chile; bus system reorganization in medium-sized cities of Colombia without BRT elements; reform of both public and private services in São Paulo; on-demand application-based service provision using informal minibuses in Mexico City; and mapping and digitization of minibuses in Santiago, Dominican Republic. Each case study presents different promises, potentials, and pitfalls. While none is a perfect recipe for reform, collectively they offer many useful lessons for transportation policymakers and planners. A summary of the case studies is presented in Table 5.

**Table 5** Summary of Six Transportation Service Reform Case Studies in Latin American Cities

CASES	TIMEFRAME	SUMMARY
Two Stages of Public Transportation Reform in Bogotá, Colombia	Pre-2000	<ul style="list-style-type: none"> <li>• “The War of the Penny”: Drivers, whose income was based on farebox revenue, competed against each other to attract passengers, leading to street chaos, increased traffic pollution, and high crash rates.</li> </ul>
	2000–06	<ul style="list-style-type: none"> <li>• Corridor-by-corridor implementation of <b>TransMilenio</b>, feeder-trunk BRT system.</li> <li>• Phase I (2000-2002) and Phase II (2003–06).</li> <li>• Creation of <b>TransMilenio S.A.</b>, a citywide transportation authority.</li> <li>• It was considered a success by international standards and curbed many negative externalities.</li> <li>• Operators who could not raise enough capital remained semiformal service providers, continuing to operate outside of TransMilenio.</li> </ul>
	Post-2006	<ul style="list-style-type: none"> <li>• Created <b>Integrated Transport System</b> program (<b>Sistema Integrado de Transporte Público, SITP</b>) as part of the Mobility Master Plan in 2006.</li> <li>• Reform expanded from limited Phases I and II TransMilenio corridors to citywide integration.</li> <li>• Small operators that could not raise enough capital dropped out.</li> <li>• Gradual reform was intended for three years but the transition continues up to this day.</li> </ul>
	Current	<ul style="list-style-type: none"> <li>• Only about 6.7% of total trips uses semiformal transportation, but the problem of in-the-street competition persists.</li> <li>• Formalized system has quality-of-service (reliability and overcrowding) issues.</li> <li>• Unmet expected passenger demand, coupled with a congested city, means service provision of SITP becomes more expensive.</li> <li>• Bogotá is planning to start a bidding process for areas that are not currently under formalized SITP.</li> </ul>
Four Decades of Bus Reforms in Santiago, Chile	Pre-1980s	<ul style="list-style-type: none"> <li>• State-owned highly regulated bus company.</li> </ul>
	1980s–90s	<ul style="list-style-type: none"> <li>• Deregulation with privately owned small buses setting their own routes and fares.</li> <li>• Improved service frequency and coverage temporarily, but number of buses increased, and congestion exacerbated.</li> <li>• Created cartels of operators.</li> </ul>

**Table 5** Summary of Six Transportation Service Reform Case Studies in Latin American Cities (Cont'd)

CASES	TIMEFRAME	SUMMARY
Four Decades of Bus Reforms in Santiago, Chile	1990s–2000s	<ul style="list-style-type: none"> <li>Regulation reintroduced, and multiple tendering processes took place in 1992, 1994, and 1998.</li> <li>Reform reduced extra buses and decreased allowable fleet age.</li> <li>Bidding processes were uncompetitive as operators colluded to influence policy.</li> <li>Problems of fragmented routes, bus ownership, and services that lacked mode integration persisted.</li> </ul>
	Post-2000s	<ul style="list-style-type: none"> <li><b>Transantiago</b>, a citywide integrated transportation system, was launched in 2007.</li> <li>The launch caused confusion and chaos due to a lack of essential BRT components, unclear communication with the public, and a “Big-Bang” approach to implementation.</li> <li>Technical issues were later fixed, but additional infrastructure investments meant Transantiago could not be financially self-sustaining.</li> <li>Eliminated duplicate routes and more buses were removed; semiformal taxis were incorporated.</li> <li>City government constantly renegotiated the contracts with operators to address service quality, fare evasion, and competition in the streets. Operators who could not keep up with contract terms exited the system.</li> </ul>
	Current	<ul style="list-style-type: none"> <li>Transantiago achieved an integrated system—in terms of modes, operations, and fare payment.</li> <li>With centralized coordination afforded by integration, Santiago is transitioning to e-bus-based public transportation.</li> <li>Fare evasion is rampant and Transantiago is losing passengers—requiring further subsidies. Protests ensue.</li> </ul>
Reforming Public and Private Services in São Paulo, Brazil	1950s–90s	<ul style="list-style-type: none"> <li>Foremost reform took place in the 1950s—earlier than Hispano-American counterparts.</li> <li>Individual minibus operators challenged publicly owned bus companies and became the legitimate public transportation providers.</li> <li>Small companies further merged in the late 1970s, resulting in a bus industry with major players wielding significant political and economic clout.</li> </ul>
	1990s–2000s	<ul style="list-style-type: none"> <li>In the mid-1990s and early 2000s, poor quality of formal services and high fares led to an explosion of “alternative transport”; about 25% of users shifted to informal van services.</li> <li>Authorities (reluctantly) supported the informal sector counter of oligopolistic bus companies, until the sector’s aggressive competition became intolerable.</li> </ul>
	Post-2000s	<ul style="list-style-type: none"> <li>Creation of <b>Interligado System</b> project to address service quality issues in the existing system and to incorporate the growing informal sector into the formal one.</li> <li>Negotiations with both informal operators and formal bus companies were a major challenge.</li> <li>Reform achieved fare integration. Bus fleet adopted stricter fuel emission standards as well as progressive accessibility solutions.</li> <li>Reform also resulted in further concentration of capital among small, powerful companies.</li> <li>Reform was intended to be citywide but only affected a small pilot area due to city governance changes in 2005 and high implementation costs.</li> </ul>

**Table 5** Summary of Six Transportation Service Reform Case Studies in Latin American Cities (Cont'd)

CASES	TIMEFRAME	SUMMARY
Reforming Public and Private Services in São Paulo, Brazil	Current	<ul style="list-style-type: none"> <li>Public transportation is highly regulated and services are provided by private firms under public concessions.</li> <li>Most informal operators became large companies with access to credit and scale gains.</li> <li>Legalized minibuses operate in favelas.</li> </ul>
Transport Reforms in Medium-Sized Cities in Colombia	2007	<ul style="list-style-type: none"> <li><b>Public Transport Strategic Systems (Sistema Estratégico de Transporte Público, SETP)</b> was introduced.</li> <li>Targeted midsize cities with 250,000–600,000 residents.</li> <li>Facilitated transition from individually operated, semi-regulated services to more organized bus systems.</li> <li>National government co-financed 40–70% of investments, while local government funded the rest.</li> <li>Large-scale implementation of BRT corridors is prohibited.</li> <li>Twelve cities applied: Armenia, Buenaventura, Ibagué, Manizales, Montería, Neiva, Pasto, Popayán, Santa Marta, Sincelejo, Valledupar, and Villavicencio.</li> </ul>
	Current	<ul style="list-style-type: none"> <li>Cities benefited from SETP grants in various piecemeal infrastructure projects.</li> <li>The program alone is financially insufficient for complete reform, and the transition is incomplete.</li> <li>Semiformal bus services continue to operate along with informal motorcycle taxis.</li> </ul>
App-Based Semiformal Operations: Jetty in Mexico City, Mexico	Post-2013	<ul style="list-style-type: none"> <li><b>Jetty</b>: an app-based minivan service startup associated with traditional pesero operators.</li> <li>Launched in 2017.</li> <li>Positions itself as more affordable than other technology network companies (TNCs), while users pay a higher fare than traditional jitneys for better service.</li> <li>Users use the service for convenience and personal safety reasons.</li> <li>Users belong to middle- and high-income demographics.</li> <li>Continued challenges: getting operating permit from the city and other regulatory issues; facing opposition from incumbent operators; and financial viability of the business model.</li> </ul>
Participatory Digital Mapping in Santiago, Dominican Republic	2019	<ul style="list-style-type: none"> <li><b>Mapeando Santiago</b>: public transportation mapping initiative by Urban Transportation Resource Center for Latin American and Caribbean Cities (DATUM, Datos Abiertos de Transporte Urbano y Movilidad), 100 Resilient Cities, among others.</li> <li>Mapped and digitized concho transportation routes.</li> <li>Data formatted in General Transit Feed Specification (GTFS), an open, interoperable data standard.</li> <li>A collaborative effort involving incumbent operators, students from local universities, Santiago officials, civil society organizations, and city residents.</li> <li>Questions remain around how and who will maintain and update the digitalized maps.</li> </ul>

Source: Compiled by WRI authors.



## Public Transportation Reform in Two Stages in Bogotá, Colombia

Until 2000, Bogotá's public transit comprised 20,500–21,000 buses, minibuses, and microbuses affiliated with 64–68 different private companies as well as individual owners, with scarce regulation by the local authorities (Hidalgo and Graftieaux 2006; Ardila 2007). Before the bus reform, the old transportation system functioned as a chain of intermediaries (Figure 13), where the local government granted companies route permissions. The companies, instead of operating the buses directly, leased the operating rights to bus owners. Vehicle owners in turn rented the buses to drivers, who derived their income from the farebox revenue. As companies sought profits by introducing buses, the incentive was to expand bus fleets resulting in more buses than were technically required (oversupply of buses) (Bustamante 2007). As the number of passengers is limited (or fixed), having a surplus of buses generated fierce competition on the street between drivers that was locally dubbed as “the war of the penny”—that is, drivers will compete against each other to pick up the highest number of passengers possible. The road battle meant service was mostly frequent, but it also resulted in a reduction in profits for bus owners as well as street chaos, increased traffic, pollution, and high crash rates. It also generated big pressure on governments to raise fares to cover the inefficiencies.

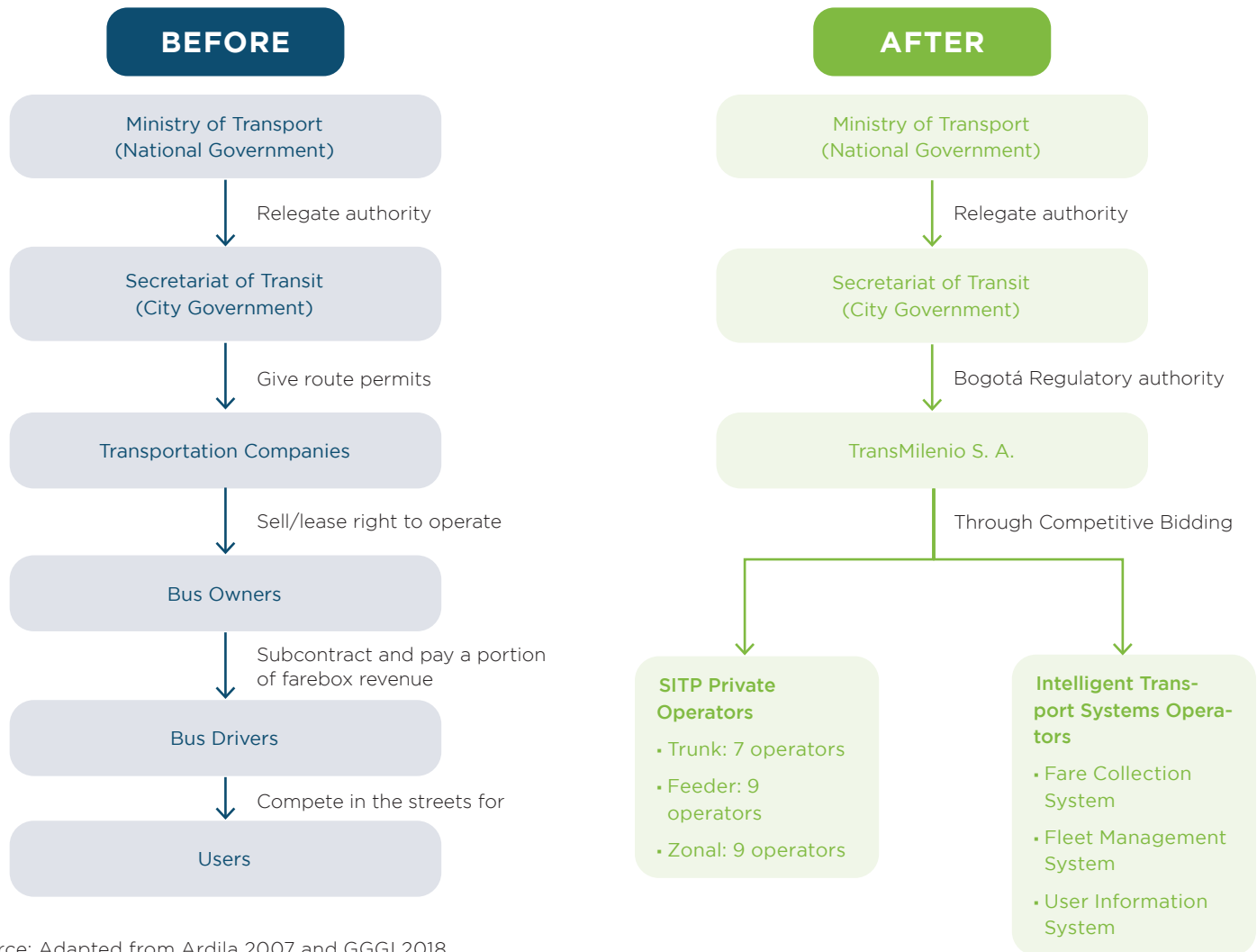
The strategy to overcome the deteriorating transportation conditions in the city was to implement a corridor-by-corridor feeder-trunk BRT system, TransMilenio. Phase I of implementation of four trunk lines took place between 2000 and 2002, followed by project development of Phase II between 2003 and 2006, which added three more main lines. During the first six years, 84 km of bus-only lanes and 663 km of feeder routes were constructed (Hidalgo et al. 2013). The reform was more than technical; it restructured the governance of the public transportation system in Bogotá with the formation of TransMilenio S.A., a citywide transportation authority that plays a major role in managing operations quality as well as revenues and costs of the BRT and its feeder network (see Figure 13). In order to remove the incentive to compete on the streets, the authority designed

and oversaw the competitive tendering process, which provided advantages for the participation of existing bus companies and incumbent vehicle owners. In initial rounds of bidding, however, traditional operators were reluctant to participate, and companies from other industries (e.g., Colombian freight companies and bus body manufacturers) entered the process (Orrico Filho et al. 2007). The operational (concession) contract allowed operators to provide service in the transportation network, with strict requirements regarding service compliance and with depots built by the city. The contracts were assigned for 10 years, with the opportunity for extension based on bus fleet mileage.

The first two phases of TransMilenio are widely considered a success by a wide range of scholars and practitioners (Echeverry et al. 2005). They were well-received by users who provided high satisfaction ratings, shortened their travel times (particularly for low-income people in the periphery who also benefited from a more integrated fare structure), and reduced traffic fatalities, air pollutant emissions, and around one million tons of CO<sub>2</sub> emissions per year (Hidalgo and Carrigan 2010; Turner et al. 2012).

At the same time, Bogotá's corridor-by-corridor approach created two categories of operators in the city's public transportation system: those who were selected found a new role in the system, while most of the incumbents, who were outside of TransMilenio, continued to exist especially in the peripheral areas as many also felt left out. This was especially critical for small owners of older vehicles, whose income was reduced as daily passengers per bus declined. There was an effort to involve these owners in Phase II, but the process was cumbersome and resulted in additional costs to the concessionaries. In addition, incumbent bus owners lacked the financial capacity to fund the investment needed. Owners, who started as stakeholders, also had their concessionary ownership reduced when other investors joined or when the larger investors increased their share through equity.

In 2006, Bogotá approved a Mobility Master Plan, which includes the SITP (Sistema Integrado de Transporte) program. The SITP bus reform was intended to be implemented gradually over three

**Figure 13** Bogotá's Public Transportation Structure before and after Bus Reform

Source: Adapted from Ardila 2007 and GGGI 2018.

years, but the actual operations did not start until September 2012 (Hidalgo and King 2014; TransMilenio 2012). The city went from limited coverage BRT corridors of Phases I and II to citywide reform, expanding bus integration. Bogotá reorganized existing bus routes into trunk (BRT) and other routes, created a competitive bidding process with priority for existing operators, and initiated a gradual implementation (Financiera de Desarrollo Nacional 2019; Hidalgo and King 2014). SITP reform was not limited to bus operations: other components, such as centralized fare collection, operations control, and a user information system, were also included in the process. Some infrastructure components like bus shelters at the bus stops in arterial roads, and bus

stop markings and signage on local roads were also added. The construction of depots was a joint responsibility of operators and the city. Because of land scarcity in urban areas, most depots were temporary without adequate facilities.

The idea of SITP reform was to transform all the remaining semiformal public transportation services in the city into a well-regulated system, with private operators but with much more control and oversight from the city through the TransMilenio S.A. New concessions (of 24 years) included large incentives for all the existing bus companies and small owners (which formed new companies) to participate through concessions. Still, conditions of the competitive tendering process required

by the Colombian law jeopardized the ongoing participation of existing bus owners who may not have the financial muscle to raise capital and leverage debt in order to comply with contract terms. As a result, the “gradual” process of semiformal transportation reform has continued to transition up to this day.

While the two-phase corridor-by-corridor reform of TransMilenio in earlier years resulted in overall positive impacts, including user satisfaction, citywide SITP implementation has been less fruitful. Although the number of semiformal and informal services has decreased significantly over the years, there is still a small number of provisional (or semiformal) transportation operating in the city of Bogotá—albeit only 6.7 percent of total trips compared to 11 percent formalized SITP and 18 percent TransMilenio BRT as seen in a 2019 mobility survey (Secretaría Distrital de Movilidad 2019). In some routes, problems of old in-the-street competitions persist. Moreover, total trips over the last decade in public transportation has remained stable, despite growth in population and the city’s economic activities—implying that overall participation in formalized bus services has declined. Users report low satisfaction rates with the formalized SITP service, particularly due to a lack of reliability and overcrowding. Residents are, in fact, transitioning to private motorcycles and bicycles (Secretaría Distrital de Movilidad 2019). Because expected passenger demand has not occurred, service provision in Bogotá has become more expensive especially when accounting for increased congestion and time wasted in traffic.

Consequently, operators in the formalized system are facing financial difficulties: fares are simply insufficient to cover operating costs. Some operators went bankrupt as city governments struggled to finance the new formalized services that require permanent subsidies (Financiera de Desarrollo Nacional 2019; Hidalgo and King 2014). In 2019, the city had renewed agreements with formal operators to help their finances and improve service quality. At the same time, it had started a bidding process for new zones that have not been covered under the formalized SITP. Final progress is expected in the next couple of years.

## Four Decades of Bus Reforms in Santiago, Chile

Santiago has witnessed profound changes in public transportation over the past four decades. Until 1979, Chile had a state-owned bus company with services tightly regulated by the government. Between 1980 and 1990, transportation authorities under the regime of Augusto Pinochet shifted to an active deregulation policy influenced by neoliberal ideologies, allowing privately owned small buses free entry to the market and letting operators set their routes and fares (Paget-Seekins et al. 2015). While this improved frequency and coverage of transportation service in the short term, the number of buses in the city ballooned from 4,760 in 1977 to more than 13,000 at its peak in 1991, worsening traffic congestion, air pollution, and road crashes (Gómez-Lobo Echeñique 2007; Sanhueza et al. 2001). Cartels of operators, who imposed high fares, were also formed (Sanhueza et al. 2001).

As democracy resumed in Chile in 1991, regulation was reintroduced. To address the excess supply problem and consolidate the fragmented bus market, routes were assigned through bidding processes, and preference was given to incumbent operators with bus fleets. Bus operators were also encouraged to upgrade bus fleets through increased fares. The tendering processes that took place in 1992, 1994, and 1998 were still relatively uncompetitive, and groups of operators, who coordinated their bids, grew into interest groups, heavily affecting the regulatory change (Dewey 2013). A decade of step-by-step reform reduced the excess of buses and decreased the fleet age, leading to improved environmental quality (Paget-Seekins et al. 2015). However, the basic structure of long, winding bus routes and dispersed fleet ownership, which lacked integration with metro and among bus routes, and with still too many underutilized bus fleets, prevailed. In addition to minibuses, semiformal sedan taxis (or shared taxis; taxis colectivos) operated on specific routes (Figueroa 2007). This also meant that the semiformal public transportation network had high geographical coverage, as evidenced by about 98 percent of residents in 2001 who lived less than 800 meters away from one of the 323 semiformal direct routes with average service frequencies of four minutes (Behrens et al. 2016).

To address these challenges, the national government started planning for an ambitious citywide integrated transportation system in 2002. This new system, Transantiago, attempted to integrate bus operations among themselves and with the metro. At the time of system planning (2004), Santiago had 8,000 buses operated by more than 3,000 micro-entrepreneurs (Gschwender 2005). The city was divided into 15 bid zones—5 for main trunk units and 10 for the feeder system. The fleet was reduced by 4,600 buses as route duplication was eliminated. Buses for the main routes were larger (articulated buses) so passenger capacity was theoretically kept the same, although, in reality, the buses experienced overcrowding. Sedan taxis that were previously serving 355 routes were also tendered into Transantiago's feeder system (Salazar Ferro et al. 2012). The modernizing effort also included a centrally controlled integrated ticketing system. Transantiago was launched in February of 2007. It had a rocky start due to lack of bus priority, bus stops, integration facilities with metro and bus depots, and user information, and also due to general confusion and chaos that resulted from the sudden, or “Big-Bang,” approach to implementation (Hidalgo et al. 2016; Muñoz and Gschwender 2008).

After the muddled launch, Transantiago increased the size of the fleet by 1,500 buses and added 90 km of dedicated bus lanes to mitigate system performance and address overcrowding and congestion. Initially, the system was intended to be financially self-sustaining (Muñoz et al. 2014), but additional investment requirements meant the need for substantial unexpected government subsidies. Moreover, to address issues such as competition in the streets, fare evasion, and poor customer service, the government renegotiated with the operators several times throughout the years (17 times during the first six years), using various approaches—for example, incorporating performance variables, and making amendments in the agreements through laws to incentivize and impose operators to deliver quality service (Muñoz et al. 2014). As the negotiation waltz between officials and operators continued, 5 out of the 11 original companies exited the system by 2012 because they could not keep up with the contract terms.

Public transportation in Santiago has come a long way. In the beginning, the “Big Bang” reform approach was criticized as being technocratic with the original contract primarily conceived to attract private investors, without considering and involving the impacted users (Maillet et al. 2019; Paget-Seekins 2016). Over the 10 years since its inception, Transantiago has achieved some major milestones. Santiago has a well-integrated public transportation system in terms of modes, operations, and fare payment. Partly due to its integration, it is also one of the leading cities in Latin America to pursue electrification of mobility. There are currently more than 400 electric buses circulating in the city and an ongoing open tender to replace 2,000 existing buses with cleaner and quieter electric vehicles (Azzopardi 2020; Orbea 2018). On the other hand, despite being ranked as one of the most advanced systems in the region (Van Audenhove et al. 2014), Transantiago still faces significant challenges to win the hearts of its users. While the metro in Santiago is recognized for its quality, bus services obtain lower user satisfaction ratings (Vidal and Chekh 2018), and bus-based transportation is losing participation in terms of total trips (Transporte del Gran Santiago 2019).

As such, the next chapter of Transantiago remains uncertain: public transportation has become the thorny venue for riots against the backdrop of societal inequality (Hidalgo 2019; Londoño 2019); fare evasion has reached 35 percent, averaging about 28 percent of trips between 2016 and 2018 (González et al. 2019); and Transantiago's financial performance has resulted in ever increasing subsidy requirements. Perhaps the silver lining is that new electric and low-emission buses have received better appreciation from transit users than diesel counterparts (Azzopardi 2020; Transporte del Gran Santiago 2019). This, potentially, can help Santiago usher in a new era of its bus transportation system.

## Reforming Public and Private Services in São Paulo, Brazil

The foremost bus reorganization process in Brazil took place in the 1950s, much earlier than many Hispano-American counterparts. Instead of resulting in atomization of the bus industry, minibuss operators came together, reorganized as companies

to challenge the failing publicly owned bus (and tram) companies, and successfully established themselves as the legitimate and primary public transportation providers in Brazilian cities (Orrico Filho et al. 2007). The policy context was also favorable for these bus companies as they were awarded monopolies over specific regions of the city, effectively creating high barriers to entry for smaller operators (Flores and Díaz 2019). By the late 1960s and early 1970s, the Brazilian “economic miracle” took place, and engineers influenced by post-World War II United States (e.g., Robert Moses) planned many cities, including São Paulo, to create mobility conduits for millions of private vehicles, which soon began to compete with buses (Radomysler 2015).

In the late 1970s, after the oil crisis, the government tried to save the bus industry by implementing concentration policies, further merging smaller bus companies and adopting minimum fleet sizes (Golub et al. 2009). This action was feasible partly due to the country having kickstarted its bus manufacturing industry, as the Brazilian government obliged incoming bus companies to deploy big bus fleets (rather than using existing minibuses) (Orrico Filho et al. 2007). The government also provided consistent operational subsidies for buses to improve quality of service in order to attract users. This inevitably created a bus industry with big players who over time grew to wield significant political and economic clout.

Different waves of informal transportation provision took place throughout Brazil’s transportation history, but the most prominent surge of “alternative transport” modes, locally known as *perueiro* and *lotação*, happened between the mid-1990s and early 2000s. By 2000, approximately 70 percent of Brazilian cities with populations over 300,000 had some form of informal transportation (Ferriera and Golub 2004). The poor quality of the incumbent transportation services—including poor connections, low comfort levels, long wait and travel times—and increasing fares primarily contributed to the explosion of the informal sector (Golub et al. 2009). In São Paulo, riders’ modal shift from formal bus to informal van service was estimated to be around 25 percent (Balassiano and Braga 1998). Initially, not only the users but also some transportation authorities (at least

reluctantly) welcomed this informal service as allies against the oligopolistic bus companies. As these alternative modes became aggressive in their competition in the street, officials were compelled to address the informal transportation sector (Orrico Filho et al. 2007).

The Interligado System is a transportation restructuring project initiated by the Municipality of São Paulo in order to tackle the twin issues of improving the quality of service of the existing formal system and incorporating informal services into the formal system. In 2001, Transport Act 13.241, which established principles and conditions for transportation service bidding processes, was approved. Eight area concessions, considered part of the structural or main components of a bus network, were tendered among private bus companies, while eight permits for local and feeder services were bid to cooperatives of individual informal operators (Hidalgo 2009). In 2004, system integration using onboard electronic fare collection was completed for all buses, minibuses, and vans, although construction of corridors continued. As a result of route reorganization, the main routes were reduced from 829 in 1998 to 584 in 2004, while the bus fleet decreased from 10,956 to 8,473 over the same period (Municipal Secretary of Transportation 2004). Local and feeder services after the reform reduced the number of micro- and minibuses from about 15,000 to 4,000–6,000 (Municipal Secretary of Transportation 2004; Zarattini 2003).

The main implementation challenges came from negotiations with informal self-employed operators and formal bus companies. Small owners and operators boycotted the initial public information meetings, organized standoffs in the city, and committed violence against the involved institutions. Municipal officials used conciliatory and participatory approaches and had extensive discussions with the operators on terms and conditions related to concessions, fare collection, remuneration, and creation of local cooperatives (Hidalgo 2009). While several scholars—Balassiano (1996) and Cervero (2000), for example—argued for legalization of the sector for reasons of safety, congestion alleviation, and emissions reduction, others (Orrico Filho et al. 2007) criticized how the process was actually done, claiming that the “push-

out” approach restricted the operators to areas with limited market opportunities, and operators ended up either retiring, losing the obtained permits for not complying with the stipulations, or selling them to bus operators.

Opposition from bus companies was also severe as they wanted to remove competing informal operators but did not want to change the existing regulatory regime from which they were benefiting. Bus companies stopped paying the workers in order to stall services and threw the city into chaos. In addition, as a protest, some companies deliberately failed to meet performance targets such as renewing fleets (Zarattini 2003). The Municipality of São Paulo created the Municipal Council of Transport and Traffic to negotiate with bus company representatives. Some criticized the process as a “black box” lacking transparency (Campos 2016), while others (Orrico Filho et al. 2007) pointed out the lack of consultation with users who experience the public transportation daily. One of the main results of the reform was further concentration of capital and bus fleets among small, powerful bus companies—for example, VIP and Transcooper with 1,733 and 1,003 vehicles, respectively (Campos 2016).

The São Paulo project was intended to be citywide, but the service changes took place only up to 2005 with no further continuation because of city-level governance and policy changes as well as high implementation costs (Venter et al. 2019). As a result, only some corridors and neighborhoods were transformed. For example, in 2004, while the entire BRT system, Expresso Tiradentes, with its two corridors was completed, only 8 out of 31 originally planned corridors, Passa Rápido, were implemented (Hidalgo 2009). Different piecemeal projects continued to be implemented. The city of São Paulo, for instance, created 300 km of dedicated bus lanes (primarily by painting them) (Flores 2014). The only citywide transformation achieved during the Interligado project was fare integration among bus-based services in the Municipality of São Paulo. The integration was later expanded to include regional rail as well as other municipalities in the metropolitan area. At the same time, during the pilot phase, multiple positive impacts were recorded: the city’s overall fleet used less-polluting fuels; fleet renewal adopted

progressive accessibility solutions (Campos 2016); public transportation trips and boarding between 2002 and 2006 grew 15 percent and 49 percent, respectively (Hidalgo 2009), and as several operational inefficiencies were trimmed through faster transfers and a convenient payment system, users experienced shorter travel times and reduced costs (Hidalgo 2009).

Given all the difficulties, the pilot scope of mobility transformation in São Paulo can be considered an example of reform with modest success. Today, most transportation services in São Paulo are provided by private firms under public concessions, and the city’s formal public transportation system is heavily regulated. Most informal operators have now become large companies with access to credit and scale gains, and they make up about 42 percent of São Paulo’s public transportation system. Legalized minibuses still operate in favelas located in the city’s peripheries (Vasconcellos 2017).

## Transportation Reforms in Medium-Sized Cities in Colombia

While Colombia with its celebrated TransMilenio in Bogotá is famous for BRT-based bus reforms, the country also has attempted to restructure public transportation without the involvement of BRT infrastructure in medium-size and small cities. In 2007, the National Development Plan (2006–10 presidential period), under Act 1151, extended implementation of bus-based public transportation to midsize cities with between 250,000 and 600,000 inhabitants (Hidalgo and Díaz 2014). This program is known as the Public Transport Strategic Systems (Sistema Estratégico de Transporte Público, SETP) and is intended for planning studies and infrastructure construction projects jointly pursued by the national government and the private sector.

SETP requires cities to transition from semi-regulated bus services to organized bus systems, with companies, rather than individuals, providing services under contracts with the local government instead of simple permits. However, large-scale implementation of BRT corridors is excluded from the SETP program since passenger demands in medium-sized Colombian cities are not high

enough to warrant the introduction of high-capacity corridors, platforms, and articulated/bi-articulated buses (Korea Development Institute 2017). The most prominent characteristics of the program consist of bus route restructuring (often accompanied by fleet renewal); construction of bus stops, stations, depots, and pedestrian/bicycle infrastructure; and the formation of an information and communications technology (ICT) system (Korea Development Institute 2017).

In accordance with Colombian Law 310, the national government cofinances 40–70 percent of urban transportation investment costs, while local government funds the remaining 30–60 percent of the overall costs (Korea Development Institute 2017). Twelve cities, with populations between 300,000 and 550,000 inhabitants, have applied for the national funding thus far: Armenia, Buenaventura, Ibagué, Manizales, Montería, Neiva, Pasto, Popayán, Santa Marta, Sincelejo, Valledupar, and Villavicencio (Financiera de Desarrollo Nacional 2019). The cities then created special-purpose agencies to advance the reform, signed co-funding agreements with the national government, received funding for planning and infrastructure, and initiated the transformation of the existing permits into more detailed service provision contracts (Financiera de Desarrollo Nacional 2019). However, similar to the experiences of large cities in the country, financial limitations hampered the transition in these medium-sized cities.

First, the reform was financially prohibitive due to additional administrative costs, costs of maintenance and replacement of the existing bus fleet, and labor costs as determined by Colombian law. Moreover, to be revenue-neutral, cities were initially required to pay all costs with the user fare. In 2016, this requirement of full-cost coverage was no longer compulsory, but because public transportation operations still do not break even, cities continue to struggle and look for additional sources of funding. Unfortunately, despite new authorizations by the Colombian Congress to charge private car use—in the form of congestion, pollution, and parking charges—to provide additional funding sources for public transportation, approval through city councils has not been possible due to strong opposition from car users. Colombian cities are also reluctant to use the

scarce general-purpose budget (mainly property and commerce taxes) to cover financial gaps in the transportation operation systems (Financiera de Desarrollo Nacional 2019).

As a result, although several cities benefited from national SETP grants to enhance transportation infrastructure, the effort to transition to formalized public transit has not been completed. Some cities (e.g., Manizales and Santa Marta) have adapted their operations, with operators renovating the bus fleet and using common branding for buses, but integrated ticketing, centralized dispatch, and new service contracts are not yet in place. The existing operators continue to provide services under general permits, and are not necessarily complying with labor laws for drivers. In Pasto, the first city to leverage the SETP program for public transportation reform, formalized buses directly compete with informal shared taxi services (that are illegal under Colombian law), which take advantage of unscheduled passenger drop-offs and pickups (GGGI 2018). Other cities (Sincelejo, Valledupar, Santa Marta, and Riohacha) have seen their ridership decline sharply due to competition with informal motorcycle taxis that provide door-to-door service at low cost.

Overall, the national SETP program is a great entry point for public transportation reform in medium-sized Colombian cities, but the program by itself is financially insufficient. To be truly sustainable, recognition of the need for public transportation subsidies, not only to cover the extra cost of formalization but to fund better-quality and affordable public transportation services for all citizens, needs to be an accepted public policy by decision-makers.

## App-Based Semiformal Operations: Jetty in Mexico City, Mexico

Public transportation comprises 66.5 percent of daily trips in Mexico City, mostly in semiformal jitneys (peseros), with 11.5 million passenger-trips per day, while Metro, Light Rail, and Metrobús BRT, which are largely concentrated in Mexico City's central boroughs, carry 5.6 million passenger-trips per day (Instituto Nacional de Estadística y Geografía 2017). As opposed to Metro, Light Rail,

and Metrobús BRT, jitneys do not receive any public subsidy, but have regulated fares ranging from US\$0.25 to US\$0.50. Entrepreneur Onésimo Flores Dewey saw this as a market gap and opportunity to use technology to transform the jitney sector. His technology solution is Jetty, an app-based minivan transportation service.

Technology network companies (TNCs), such as Cabify, Yaxi, Easy Taxi, and Uber, entered Mexico in 2013–14, initially operating illegally until the Mobility Law of Mexico City was enacted in 2014 and a new framework was developed a year later to allow these transportation services in the city. Mexico City was the first Latin American city to regulate TNC operations (Eisenmeier 2018). This was then followed by similar regulation in the State of Mexico in 2017. The new mobility companies, including TNCs, belong to the informal-formal paradigm of transportation service provision. They also have the potential to be integrated with the larger public transportation system. One enterprise in the State of Mexico leveraged the TNC regulation to launch Jetty in association with traditional jitney operators. Similar to other TNCs like Uber, Jetty uses apps for booking, but the service is more akin to bus aggregators where you combine similar trips and accommodate more passengers. The company positions itself as more affordable than other TNCs (like Uber) while users pay a higher fare compared to peseros for a better quality of service (Dewey 2019).

Jetty provides home-to-work commuter trips during peak hours, and the service is available in three business districts of Mexico City (Schlickmann 2019). The app for booking and trip payment was developed by INNKU, a local technology company. One of the main challenges for Jetty before launch was to acquire an operating permit. Officials in Mexico City (like many other city officials around the world) have limited experience regulating and integrating TNCs into the city's transportation system (Welle et al. 2018). The plethora of names and service provision models also add to policymakers' predicament (Chang 2018). The newly created TNC permit registration of Mexico City, for example, is called "Registration as operator and administrator of an application or platform to enable individuals to hire private transportation services" (Dewey 2019). Jetty itself identifies as a

"technological layer" as well as a "microregulator" (Schlickmann 2019). After extensive discussions with local authorities, and clearing many obstacles, Jetty eventually obtained a license to operate in the State of Mexico and Mexico City.

Recruiting incumbent jitney operators was another major challenge as they were not open to the new (and perceivably risky) business model. Jetty eventually convinced a partner, a small transportation company in the northern suburbs, and they jointly bought four new 19-seat vans (Dewey 2019). After the launch in August 2017, however, the operation was immediately stopped by existing jitney operators who considered the new service to be "pirates" encroaching on their territory. Jetty renegotiated with local jitney associations and was again allowed to operate, but in a less attractive area.

Jetty was able to grow its service from 4 to 19 vans, and convinced SVBus, a large bus company owned by a jitney association leader from Mexico City, to join its platform, thereby further enabling a large service expansion with the addition of 45-seat buses to its fleet. Within the first year, Jetty has carried over 160,000 passengers, has an average trip rating of 4.92 out of 5 stars, and 80 percent of users continue to use the app 15 weeks after their first try. Jetty's first year of operations also resulted in no criminal incidents or major collisions (ITF 2019). A recent user survey with more than 2,000 participants reveals additional insights into why Jetty is popular among its users. Convenience ("booking of seat") and personal safety ("security against theft") top the list of reasons. There is also a significant difference in the responses from women and men regarding "security against harassment." Fare is ranked seventh in the list of reasons, which implies that the cost of Jetty trips, despite being more expensive than other public transportation modes in Mexico City, is not a major issue for its average users who tend to have higher incomes than the general population (Tirachini et al. 2020).

Despite its popularity, Jetty continues to face opposition from traditional operators and regulatory issues. In March 2019, its service to Santa Fe was blocked by jitney operators, but then reestablished (Nava 2019). In February 2020, the mobility authority of Mexico City, apparently in the



long-term interest of formal public transportation, suspended the permit of SVBuses using the Jetty platform, and service was replaced by city buses (Riojas 2020). At the time of writing, the issue had not been resolved. Nevertheless, other routes in Mexico City and the State of Mexico are still using the platform.

Although the Jetty case illustrates a private sector-led initiative, its underlying approaches are similar to those of government-led bus reform. Some obvious examples include incentivizing incumbent drivers and owners not to compete in the market by paying them fixed salaries, providing driver training for road safety, and having and enforcing stringent operating standards. One lesson that transit agencies can learn from technology-based transportation service providers is the capitalization of immediate user feedback from the e-hailing platform to improve the service quality. Though the impacts of ICTs on larger ride-hailing and e-hailing services remain to be seen, emerging evidence shows that Jetty has affordability issues for low-income passengers (Tirachini et al. 2020).

As an alternative to failed attempts to formalize public transportation in Mexico and the region, Jetty used emerging technology as a way to improve the traditional business model of the jitney operators. The adopted model seems to be more resonant with certain user demographics, more flexible, and less stiff than those offered by public agencies, with their bureaucracy and eternal political infighting. The impact of this approach on transportation improvement without full-scale reform seems promising, but it is still in the making, with challenges not yet fully resolved.

## Participatory Digital Mapping in Santiago, Dominican Republic

With the spread of geolocation-enabled cellphones, digitalizing transportation services is an innovative trend that leverages ICTs to collaboratively engage with incumbent operators and reform public transportation. Santiago de los Caballeros, or simply Santiago, the second-largest city in the Dominican Republic, was the first Caribbean city to map its transportation system. The final map was integrated into Google Maps in September 2020.

Often, reform of the public transportation system is hindered by scarcity of basic transportation data such as bus routes, stops, frequencies, and fare information (Eros et al. 2014; Klopp et al. 2015; Mendelson 2016). In Santiago, public transportation services, known as *conchos*, provided by sedan cars, operate more like a fixed taxi system, under a concession from government authorities. Before the mapping effort, residents of Santiago traditionally relied on word of mouth and local knowledge to get around the city, since the city had no standardized information about the routes.

Mapeando Santiago was a 2019 public transportation mapping initiative of DATUM, a regional platform for open public transport data, and 100 Resilient Cities, among others. The former was founded by a consortium of partners, including the Inter-American Development Bank, World Resources Institute, Massachusetts Institute of Technology, Columbia University, and Mastercard Center for Inclusive Growth (Dominican Today 2019). With the help of 30 students from local universities, the team mapped and recorded spatial data of about 60 urban, interurban, and peripheral routes (WRI Mexico 2019). From the outset, emphasis was placed on the participatory nature of the project, involving and examining the needs of a wide range of actors, including city residents, the three local universities, and civil society organizations representing disabled groups to Santiago municipal officials, and incumbent operators (Fischer et al. 2019). Community participation ensures longevity of the project as it strengthens local technical capacity, receives feedback, and builds on the service and policy planning at the grassroots level.

Another important characteristic of the mapping project is the use of open-source tools. These tools are ideal for scaling up digitalization efforts, especially in data- and funding-constrained contexts (Fried et al. 2020). The Mapeando Santiago project used MapMap (Project Mapping Central 2017) and Mapillary (Mapillary 2020) mobile applications to collect route data and capture images of public space along the routes. Mapping volunteers, primarily students, collected data manually to ensure accuracy, and visited neighborhoods to assess the security and

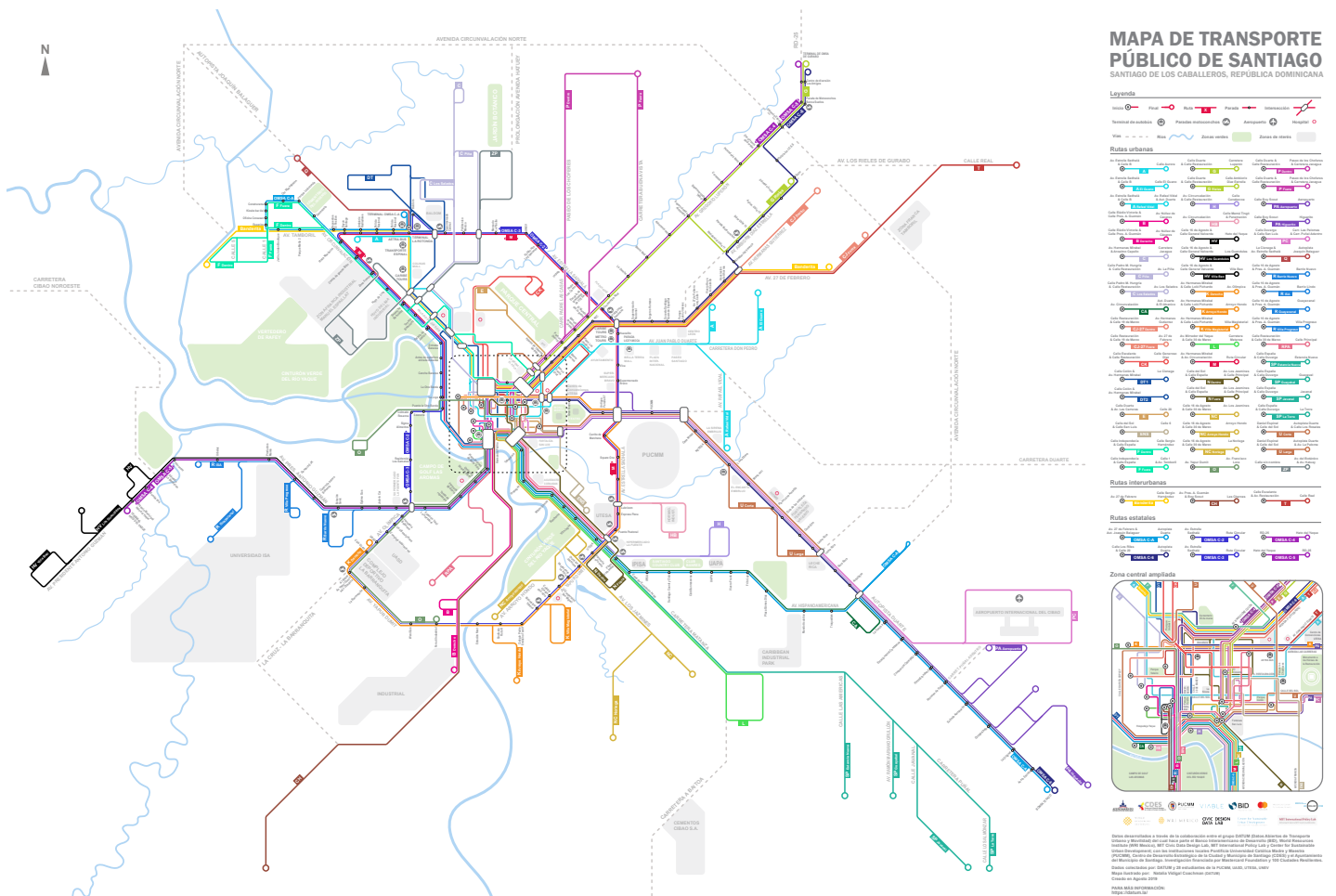
accessibility of the area. The project also conducted complementing online surveys to understand how users perceive the public transportation system.

Technical staff then formatted the collected data into General Transit Feed Specification (GTFS). GTFS is a standard, interoperable data format for public transit data-as-infrastructure that allows for its ease of use in dynamic trip planning, transit scheduling, and accessibility analysis applications. Open data was an integral component of the project that enabled project transparency and accountability for all stakeholders involved (Klopp et al. 2019). The processed GTFS data and final map (Figure 14) were shared on DATUM's open repository, which also curates transit data from other countries in the region (DATUM 2020). Open data repositories for transportation service data

play a critical role in allowing cities and residents to freely use and share information and knowledge that encourages transparent dialogues and analyses on how to best navigate and improve these public transportation systems. Making data open can also spur entrepreneurial innovation and cross-sector collaboration.

Mapping routes can provide a more holistic picture of a city's overall transportation network and fill the knowledge gap in planning and managing a more effective and inclusive city. As an alternative to large-scale BRT reform, a participatory and collaborative mapping process can facilitate an open and conducive dialogue among different stakeholders, including the incumbent operators and drivers. In the long term, the use of standard and open data can cultivate data-driven

**Figure 14** Public Transportation Map of Santiago de los Caballeros



Source: DATUM 2020.

transportation policies and planning. Given the enormous potential, digitalization and mapping efforts have spread to more than 10 cities across five Latin American and Caribbean countries, including Brasília (Brazil), Cochabamba (Bolivia), Managua (Nicaragua), and Xalapa (Mexico) (DATUM 2020).

Regarding mapping informal services, some scholars caution that given the entrepreneurial nature of the service operation, making the system visible through mapping can invite unwarranted danger and interventions, particularly from government actors (Klopp and Cavoli 2019). Digitalizing routes could also be seen as the first step toward formalization, and, as a result, incumbent operators could become resistant to digital mapping out of fear of what changes are afoot. Moreover, transportation digitization efforts thus far have been spearheaded by urban activists, local civic hackers, universities, and international nongovernmental organizations. Even with formal transportation data, city officials in the Global South still have limited capacity to shoulder the potentially expensive role of maintaining and upgrading the existing maps or deploying them for actual transit network planning (Kitchin 2014).

Mapping public transportation services provides an innovative and up-and-coming approach to engage with, upgrade, and reform the traditional sector, but its long-term impacts on public transportation and transit planning are yet to be understood to the fullest.

## Guidance for City Officials: Considerations for Bus Reform in Latin America

City governments in Latin America have taken a wide range of approaches to upgrade and organize the informal or minibus systems both with and without larger-scale BRT investments. Yet public transportation reform projects still need to overcome technical, institutional, financial, and political barriers (see Table 6 for survey of barriers and potential solutions). They require large commitments by decision-makers, coordination among several stakeholders, and allocation of adequate levels of funding.

This chapter provides high-level considerations that cities may take into account when addressing the informal (and semiformal) transportation sector. The guidance is not intended to be used as a cookie-cutter approach, and authorities should be aware of and consider the historical and local contexts, as well as unique political economy factors among different stakeholders, in determining how they address the reform.

### Bus Reform Process

The starting point for bus reform will vary from city to city depending on the specific situation, but three different measures—institutional design, operation-related actions, and capital investment—can be considered at a high level.

- ▶ From an institutional design perspective, modifications of the existing governance structure or a new regulatory framework may be needed as the system moves away from loosely regulated operational permits to quality contracts. If necessary, a new land-use and transportation authority will be formed to supervise contracts and coordinate with both more formalized public transportation and incumbent services. The revised institutional framework can also specify legal contracts, fare regulations, and labor regulations that can compensate and incentivize incumbent operators. Promotion of safety standards and establishment of worker liability insurance for all operators in the regulatory framework can help integrate the formal and semiformal/informal sectors (Cervero 2000). Other regulatory aspects include market entry—for example, a combination of vehicle-kilometers-based and number-of-passengers-based pricing to share risks between the government and operators, operator compensations to avoid monopolistic competition by frequent tendering via decoupling asset lifespan, and service tendering and/or allocating the services (by areas or routes) among different operators—as well as vehicle emissions standards to reduce air pollution.
- ▶ In terms of operation, reform involves reducing repeated routes that essentially serve the same destinations, underutilized routes to avoid congestion and long wait times, making

**Table 6** Barriers and Possible Solutions for Implementing Bus Reform

BARRIER	DESCRIPTION	SOLUTION
<b>Misalignment of stakeholder interests, including opposition from incumbent operators and users</b>	There are stakeholders overseeing multiple overlapping roles with conflicting interests in the decision-making process. Bus operators are concerned about losing their livelihoods, and users might fear worsening service. Negotiations with incumbent operators are perhaps the most challenging part of bus reforms.	<ul style="list-style-type: none"> <li>▪ Strong leadership is fundamental for mitigating technical, economic, commercial, operational, and political risks of bus projects.</li> <li>▪ Building trust takes time. Involving operators early in the planning stages and throughout negotiations is critical.</li> <li>▪ Understand the business models and incentives of the underlying value chain of semiformal services so that each party has an interest in the reform.</li> <li>▪ When existing supply is provided by atomized bus owners who are also bus drivers, it may be possible to compensate or incorporate them into a new ownership structure.</li> <li>▪ Involve users and the general public early in the planning stages, as well as conduct studies and consultations to understand user behavior, preferences, and perception sufficiently.</li> <li>▪ Ensure that service improves especially for the users in the lowest income quintile, in terms of overall accessibility, bus fare, and travel time.</li> </ul>
<b>Institutional complexity and capacity</b>	Different departments and agencies, some of them with overlapping responsibilities and jurisdictions, tend to work in isolation. Technical capacity of agencies can also be low.	<ul style="list-style-type: none"> <li>▪ Gather sound technical and independent advice during the different project phases (e.g., from external consultants, think tanks, and local universities).</li> <li>▪ Establish or strengthen mobility/transportation-related laws and traffic codes.</li> <li>▪ Link existing plans (e.g., master plan) and strategies for increased project effectiveness.</li> <li>▪ Create new roles and responsibilities within public transit agencies to ensure integration.</li> </ul>
<b>Competing modes</b>	National governments tend to favor the car and motorcycle value chains for economic development and job creation opportunities. However, cities can end up facing the burden of road congestion that, in turn, traps buses operating in mixed traffic conditions.	<ul style="list-style-type: none"> <li>▪ Improved service provision as a result of bus reform can make the service more attractive and ensure existing users are more likely to continue using the service despite having purchased private vehicles.</li> <li>▪ Gradual consolidation of competing services along transit corridors (e.g., through use of informal transportation routes as formal feeder services to maintain access).</li> <li>▪ Integrated ticketing, which can facilitate seamless transfers.</li> </ul>
<b>Lack of good data</b>	Ideally, agencies or operators would have substantial data on passenger travel patterns in order to make changes to the system. However, many systems with pressing problems lack detailed data and technical capacity to gather and analyze it.	<ul style="list-style-type: none"> <li>▪ Plan and build capacity for a large data collection effort on both informal and formal services prior to making decisions.</li> <li>▪ Collect input from stakeholders and the general public.</li> <li>▪ Sound technical advice on how to use existing data to make decisions.</li> </ul>

Source: Lindau et al. 2010; Vasconcellos 2016; Finn et al. 2011; Hodgson et al. 2013.

adjustments to service attributes such as vehicle size and scheduling to match demand patterns (e.g., by using Jetty-type demand responsive shuttles or other semiformal services), and introducing complementary routes and stations as needed. Semiformal and informal service providers can be part of this integrated operation (e.g., as feeder services) as the general goal here is for the public agency to contract out services to private operators and set the conditions for improved service provision. Strong traffic planning and control system coordinated by the local government, with the appropriate technical resources to manage daily traffic and avoid congestion and crashes is also warranted.

- ▶ Capital investment for reforms entails procurement of new bus fleets as new service hierarchy might require a different set of vehicle sizes, depending on demand levels and planned frequencies. Moreover, strategic infrastructure investments targeted at informal operations (e.g., off-street parking and designated stops for incumbents) should also be part of the reform priorities.

In addition to the abovementioned three measures, stakeholder participation plays a significant role in the success of reform transition. During the early planning stage, it is of paramount importance for the city government to identify all the major stakeholders who will be impacted by the changes to the bus service. The rule of thumb is to bring stakeholders together as early on in the process as possible in order to properly plan and ensure the success of the reform process. In some countries, the national government may largely fund and monitor transportation systems, while in other countries this is the responsibility of the municipal or metropolitan agency (or a new agency that is dedicated to transportation and urban planning). In some cities, private operators are major stakeholders, with varying levels of influence on public policy. Additionally, the involvement of civil society organizations in the process of bus reforms depends heavily on local and national mandates, the activity of nonprofit organizations, and citizens' participation in the city.

Negotiations with incumbent operators is perhaps the most challenging and inevitable step of the reform process. Building trust takes time while partnerships and relationships can go sour instantly.

Sometimes, the government is reluctant to work with the semiformal and informal services and vice versa. Complete replacement of existing bus systems without providing the incumbents any options is not recommended. For a smooth transition, governments must be ready to compensate the incumbents in some way, while addressing the relevant political economy issues and leveraging policy tools for long-term sustainability of the city's overall public transportation system. One suggestion is to create formal cooperatives (if they don't already exist) involving individual operators in order for the city government to avoid managing countless operators separately or risking the emergence of "mafia-type" collectives (Vasconcellos 2016). The process is delicate, and it is occasionally helpful to have a third-party stakeholder who can provide a neutral platform where the relevant parties can convene.

Different forms of compensation include the following:

- ▶ Inclusion of incumbent operators, owners, and drivers in the new system (e.g., as employees of BRT, equity shareholders, being subcontracted to operate feeder services)
- ▶ Improving the skills and professionalism of drivers or retraining workers in other areas of the transportation industry
- ▶ Paying for scrap value of old minibuses
- ▶ Providing loans and discounts to acquire new buses
- ▶ Offering onetime or over a defined period disturbance allowance for business losses or relocation to different routes (Cervero 2015)

The role of the public agency is to work with the operators who are resistant to change as they are afraid of losing some or all of their business as well as personal independence. Often, the public agency opens a bidding process with the bus operators to determine the routes or city areas that each operator will serve. The public agency will then continue to monitor system operations and will have formalized contracts to regulate the operators. At the same time, the public agency must seek user input through multiple consultations. Public consultations should not be a onetime happenstance. Instead, as part of best practice to maintain accountability, the transportation system should incorporate public

feedback on a regular basis. Data collection does not guarantee that the information will be used, and thus a mechanism to deliberately utilize public comments to strengthen public transportation design and implementation should be established (Kash and Hidalgo 2014). Additionally, awareness and educational campaigns that inform users how they can use the new transportation system and what changes they can expect should be included as part of the transition. Although this process may be cumbersome for the transit agency, it can facilitate public acceptance and ensure high quality-of-service delivery.

The project life cycle shown in Figure 15 depicts a sample pathway for transition from service regulated under operation permits to a more formalized system. Note that the list of items provided are wide-ranging, and the whole life cycle package might be more suitable for larger-scale bus reforms. Furthermore, Box 1 details the preliminary costs that officials can expect to incur when undertaking full-fledged bus reform. Reforms with a heavy infrastructure investment will require a commitment of time, financial resources, and technical and human capital. After considering all the costs, benefits, and feasibilities, the government

must, most importantly, ensure that the upgraded system leads to improved—or at least retains the same level of—access to urban amenities.

A matrix of improvement strategies—through regulations, business incentives, and public (and private) sector investments primarily directed at the semiformal/informal sector—without large-scale reform are listed in Table 7. Strategies that positively impact the financial security of the incumbent operators while maximizing operation efficiencies can be useful in building trust and long-term relationships between government officials and operators. Making the operating environment of the informal service safe through urban design and driver trainings can be beneficial for both the drivers and passengers. Grassroots initiatives, such as digitalizing transportation routes, which can make the network more visible and transparent for planning, should be nurtured. Policymakers should also seek ways to leverage data, technologies, and accompanying emerging services to bring about informal reform and integrate them into a multimodal system. Many of these strategies can be deployed as part of the corridor-by-corridor bus service reform.

**Figure 15** | An Example of the Bus Reform Project Life Cycle



Source: Compiled by WRI authors.

**Box 1**

**Preliminary Costs Associated with Bus Reform**

**PLANNING, EVALUATION, AND DESIGN COSTS**

Planning the reorganization of bus networks requires a good understanding of users’ travel patterns. Because the existing operations are private and typically fragmented, information about ridership or operating costs is not systematically collected. Ideally, cities will have existing household travel surveys that could be updated for the specific purpose of the project. For cities that might not have these kinds of comprehensive studies, corridor-specific studies can be done to understand passenger demand, origin-destination patterns, vehicle occupation, operational speeds, and other relevant data. Allocating resources to engage with stakeholders, such as coordination among agencies, incumbent operators, bus users, and the general public, is also important for project success as it can reduce risks in the early stages of the project. Overall, planning, evaluation, and design costs include:

- Origin-destination studies and corridor specific surveys
- Stakeholder identification, engagement, and negotiation costs (both in terms of time and money)
- Study of underlying business transactions of the incumbents: Who owns what? Who pays for what? What are the dynamic relationships among owners, drivers, operators, etc.?
- Compensation for incumbent operators, owners, and drivers, as well as other associated costs (this is an often-underestimated cost and can include capacity-building

activities such as improving financial literacy, understanding contracts before the operators can effectively participate in the negotiations)

- Design of alternative reorganization plans
- Feasibility studies (legal, technical, environmental, socioeconomic evaluation)
- Evaluation of funding and financing alternatives
- Design of necessary infrastructure such as bus stops, transfer facilities, citywide fare collection system, and depots
- Design of accompanying measures or systems (when applicable)—including, integrated ticketing systems, traffic priority signaling, system branding, user information, and fleet management systems
- User consultation, education, outreach, and campaigns—in order to inform people about the changes and how to use the new system

**CAPITAL AND OPERATION COSTS**

To manage a transit system, cities must take into consideration multiple aspects regarding initial investment and operations and maintenance costs (Table B.1.1). As cities eliminate duplicated routes, utilize fewer buses, and increase system efficiency, system costs can be reduced. At the same time, the cost per vehicle increases since the transit agency internalizes labor and maintenance costs. When the coverage of the bus system increases, additional infrastructure as well as operational costs may be incurred.

**TABLE B.1.1. PRIMARY CAPITAL AND OPERATIONAL COSTS ASSOCIATED WITH REFORM**

<b>Initial capital investment costs</b>	<ul style="list-style-type: none"> <li>■ New bus purchase to replace current buses that have exceeded their useful life (including private vehicles that incumbent operators scrap) or to meet increased demand throughout the project’s life cycle</li> <li>■ New bus depots when they do not exist</li> <li>■ Additional upfront costs for infrastructure/technology (e.g., fare collection system), as applicable</li> </ul>
<b>Operations and maintenance costs</b>	<ul style="list-style-type: none"> <li>■ Fuel costs</li> <li>■ Annual depot and other infrastructure operations, maintenance, and overhaul costs</li> <li>■ Operator wages and other compensations</li> <li>■ Transit agency costs in case a new one is set up to oversee the formalized system, or a new unit is set up within the agency to coordinate and enforce new regulations/contracts</li> <li>■ If applicable, operation of additional features (user information, fleet management)</li> </ul>
<b>Additional costs that might not be considered in self-regulated markets</b>	<ul style="list-style-type: none"> <li>■ Tax compliance that might have not been applicable under informal operations, such as corporate profit taxes, payroll, and social security taxes. The net effect of this for the public sector is uncertain and depends on whether it results in higher fares or higher subsidy requirements, and how much this new tax revenue offsets them.</li> <li>■ Labor regulation compliance, which might increase labor costs</li> <li>■ Environmental compliance that might require advanced vehicle maintenance and more frequent vehicle renewal</li> <li>■ Additional insurance costs, as formalized operators comply with increased insurance requirements</li> <li>■ Operational costs to ensure sufficient frequencies in low-demand areas or times of the day to uphold (at least) the prior level of access</li> </ul>

Source: Compiled by WRI authors.

**Table 7**

Sample Strategies to Improve Semiformal and Informal Services without Large-Scale Bus Reform

BUSINESS DEVELOPMENT	OPERATING ENVIRONMENT	FLEET IMPROVEMENT	OPERATIONS
<ul style="list-style-type: none"> <li>• Business consolidation and cooperatives</li> <li>• Creation of transportation worker unions</li> <li>• Business skills training</li> <li>• Business diversification</li> </ul>	<ul style="list-style-type: none"> <li>• Rank/terminus provisions</li> <li>• Bus priority lanes</li> <li>• Physical integration of taxi stands and nonmotorized transportation (NMT) with mass transit modes and public space</li> <li>• NMT infrastructure and access improvements near bus stations and stops (e.g., speed management, clear signages, safe transfer, and access to terminals)</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle renewal incentives (e.g., discounts for new fleet, payment of scrappage value)</li> <li>• Cooperative loans</li> </ul>	<ul style="list-style-type: none"> <li>• Safe driver training</li> <li>• Salaried drivers</li> <li>• Consolidated driver recruitment and management</li> <li>• Vehicle management and route rationalization</li> <li>• Complementary transit operation models</li> <li>• Cashless (and integrated) ticketing</li> <li>• Passenger information systems</li> <li>• Mapping and digitalization of transportation routes</li> <li>• Development or sponsorship of transportation apps and platforms to better optimize and integrate public transportation</li> <li>• Open public transportation data</li> </ul>

Source: Adapted from Jennings and Behrens 2017.

## Paying for Bus Reform

The lack of sustainable financing approaches to public transportation projects is an important obstacle for bus reform. The tacit assumption that transportation services would be financed solely through farebox revenues has not worked well. As bus services have evolved to more regulated formalized systems, certain costs, such as labor and environmental compliance costs, are now being internalized in the operational costs. Especially in the early stages of bus network expansion, cities will need large capital investments, and they will also bear rising operations and maintenance costs for the growing urban infrastructure (Ardila-Gomez and Ortegón-Sánchez 2016). At the same time, captive riders aspire to switch to private cars and motorcycles once they have the resources (Jauregui-Fung et al. 2019). Subsequently, cities also face competition from private modes, especially motorcycles—as seen in small and medium-sized Colombian cities (Red de Ciudades Cómo Vamos 2015), resulting in declining passenger demand and revenue from fares, thereby increasing the need for public subsidies.

Importantly, financing models of public transportation systems that are designed primarily with efficiency and cost recovery in mind should be reconsidered. Given the increasing competition from private modes—which may gain even more preference in light of the COVID-19 pandemic—and the political resistance to eliminating many of the services provided by informal providers, a new paradigm would be possible if the models used to design the formal systems took into account to a great extent service quality and user needs, and allowed for increased frequencies and smaller buses in some contexts (in off-peak hours, for example).

## Possible Sources of Funding

The responsibility for public transportation provision in Latin American countries is assigned to local governments, often with limited funding for capital investment or operations. Some governments have recognized the importance of urban public transportation in advancing national goals, such as mitigating the effects of climate change, improving air quality and road safety, and poverty reduction, among others (Díaz and



Bongardt 2013). As such, national programs such as PROTRAM (Programa Federal de Apoyo al Transporte Masivo) in Mexico and the National Urban Transport Policy in Colombia have provided incentives to advance bus formalization in their respective countries, while the Growth Acceleration Program (Programa de Aceleração do Crescimento, PAC) in Brazil has provided funding for capital investments for bus reform. Since numerous informal vehicles will cease operations, scrappage funds can be set up both at national (e.g., Mexico) and local (e.g., Bogotá) levels to fund the replacement of bus fleets.

The national programs are typically being financed with loans from multilateral development banks such as the Inter-American Development Bank, the World Bank, and the Development Bank of Latin America (Corporacion Andina de Fomento, CAF). One of the benefits of these banks is that they bring knowledge and provide technical assistance for planning and design studies either in terms of grants and/or at very low costs. Having access to the international community also means making the global tendering processes easier. On the other hand,

the preparation processes for these applications are lengthy and involve high transaction costs. In most parts of Latin America and the Caribbean region, the difference in the interest rate on loans offered by development bank and bonds from commercial banks is small, and hence development banks might not bring much competitiveness. Beyond financing for heavy infrastructure (such as BRTs), national and city governments as well as the international banks should consider financial packages that focus on improving urban access through investment in NMT infrastructure and semiformal/informal transportation service quality improvements.

As a possible option, environmental financing instruments, such as the Clean Technology Fund (CTF), and funds from the Global Environment Facility (GEF) and the Clean Development Mechanism (CDM) can be deployed for public transportation projects (Ardila-Gomez and Ortegón-Sánchez 2016). Generally, accessing climate funds through these sources for transportation projects is cumbersome as it requires the provision of evidence that the project will reduce GHG emissions. This is particularly difficult

**Table 8** Private Sector Risks to Transportation Infrastructure Investments and De-risking Instruments

TYPE OF RISK	TRANSPORTATION EXAMPLE	POSSIBLE EFFECT ON PROJECT	DE-RISKING INSTRUMENTS
<b>Politics / policy</b>	Regime change leads to new national transportation policy platform	Disruption of policy context for revenue generation	<ul style="list-style-type: none"> <li>• <b>Insurance and guarantees:</b> Product which assures repayment for a fee</li> </ul>
<b>Technology</b>	Obsolescence of project technology	Poor system performance	<ul style="list-style-type: none"> <li>• <b>Open system and standards:</b> Using technologies that are open and interpretable regardless of the vendor</li> </ul>
<b>Economics</b>	Fluctuations in exchange rates	Investment devaluation; possible increase in debt	<ul style="list-style-type: none"> <li>• <b>Swaps and derivatives:</b> Borrower pays a fee for risk coverage</li> <li>• <b>Local currency loans:</b> Loans issued and repaid in local currency</li> <li>• <b>Liquidity facilities and lines of credit:</b> Institutions granting access to quick, short-term cash</li> </ul>
<b>Construction</b>	Construction delays impair service provision by private firm	Increased costs during construction period	<ul style="list-style-type: none"> <li>• <b>Liquidity facilities and lines of credit:</b> Institutions granting access to quick, short-term cash</li> </ul>
<b>Operations</b>	Incorrect demand estimates based on poor data	Reduced revenues based on lack of demand	<ul style="list-style-type: none"> <li>• <b>Insurance and guarantees:</b> Product which assures repayment for a fee</li> <li>• <b>Concessional finance:</b> Special exclusive interest rates and funds</li> </ul>

Source: Adapted from Leipziger and Lefevre 2015.

with transportation due to various causal factors and a longer time horizon to observe the changes. These funds also tend to be small compared to national finance and private flows (Lefevre et al. 2014). Public-private partnerships as a financial mechanism to advance projects are another viable approach as long as the revenue covers costs and expected profits for private investors are achieved (World Bank 2017). Potential risks to private sector investment in transportation infrastructure and de-risking instruments are summarized in Table 8. Additionally, taxes on property (land value capture), vehicles, and fuel (when the revenue goes to municipal governments); fiscal transfers from national governments; and debt directly obtained by subnational governments can also be used to cover infrastructure and operational costs of systems (see Box 2 as an example for how different revenue streams can fund public transportation in Bogotá).

Compared to capital investments, funding for operations is more challenging in the long term. Public transportation subsidies are well-studied and recommended in the transportation economics literature (Basso and Jara-Díaz 2010). Nevertheless, funding to provide subsidies is not always available. At the same time, since social unrest around transportation costs (e.g., in Santiago, Chile) has erupted in recent years, there may be more political will for subsidies targeted toward lower-income groups. Subsidizing public transportation can mean progressive redistribution among different groups of society (Basso and Silva 2014). Using data from Santiago, Basso and Silva (2014) found that transit subsidies may also be a very good measure to reduce transportation-negative externalities while increasing social welfare.

In Latin America, while rail services are heavily subsidized, only a few cities provide subsidies for bus-based public transportation (CAF 2011) even

though bus service is more often an important mode in low-income communities. Meanwhile, local governments struggle with a lack of continuous sources of revenue to cover the gap between operations and maintenance costs and revenue from fares. In Colombia, it was impossible to subsidize public transportation operations using the public budget until 2015 (Financiera de Desarrollo Nacional 2019). Similarly, in Chile, the decision to subsidize public transportation was politically unpopular and came only as a result of the operational losses from Transantiago implementation (Muñoz et al. 2009). In Mexico City, negotiation terms for a private-public partnership led to Metrobús implicitly providing “hidden” subsidies to the private bus company, RTP, while leaving itself with a wider financial margin between per kilometer costs and revenue (Dewey 2013).

Other innovative sources of revenue to fund public transportation operations beyond fares are provided in Figure 16 (CODATU 2014). Transportation demand management tools, such as congestion charges and parking charging schemes (e.g., implemented in São Paulo and Medellín, respectively) are prospective new sources of funding for public transportation (Hidalgo et al. 2019). Many of them are also effective at both reducing the reliance on private cars and mitigating negative externalities such as air pollution and GHG emissions. Moreover, diverting expenditures in infrastructure for private vehicles; obtaining revenue from real estate rental in transfer facilities; advertising in stations, stops, and buses; and the sale of carbon reduction credits through clean development mechanisms are additional revenue-generating opportunities of varying potential that need further exploration.

## Box 2

## Potential Revenue Sources for Public Transportation in Bogotá and Other Colombian Cities

A recent study by FDN estimates the potential sources of funding in Colombian cities to supplement fares and evaluates difficulty in securing government approval for actual implementation (Financiera de Desarrollo Nacional 2019). Authors list nine potential sources of revenue, including fuel surcharges, off-street and on-street parking charges, congestion charges, surcharge on intercity tolls, air pollution charges, permits to travel during plate restriction days and hours, and traffic crash compensations (Financiera de Desarrollo Nacional 2019). The study concludes that different sources may jointly cover costs and eventually generate surplus for infrastructure expansion.

In the case of Bogotá, the estimated aggregated revenue from these sources was up to Col\$2,824,011 million in 2017 (around US\$960 million). In that year, the gap between operational cost and revenue in public transportation in Bogotá was Col\$650,000 million (around US\$220 million). Hence, advancing some of these revenue sources would provide enough revenue to cover operational subsidies and advance more capital investments needed in transit in Bogotá (which is now advancing a US\$3 billion metro line plus other BRT extensions with the support of the national government).

Getting approval for these sources of revenue, however, is challenging as the main barrier has been political buy-in. (See Table B.2.1. for different sources of potential revenue and the possibility of getting approval.) On four occasions, the city government of Bogotá has proposed the City Council approve congestion and off-street parking charges, but councilmembers rejected these proposals on the grounds that they affect the middle class and that the public transport system does not have the capacity to provide quality transportation to the displaced car users. Other sources of revenue, such as an increase in the gasoline tax, and new pollution and road safety taxes on vehicles require approval from Congress, which is also unlikely. Interestingly, while Bogotá's politics do not favor bus-based projects, the city shows great interest in higher-capital investments such as metro.

**TABLE B.2.1. POTENTIAL REVENUE SOURCES FOR FINANCING PUBLIC TRANSPORTATION IN THE CITY OF BOGOTÁ**

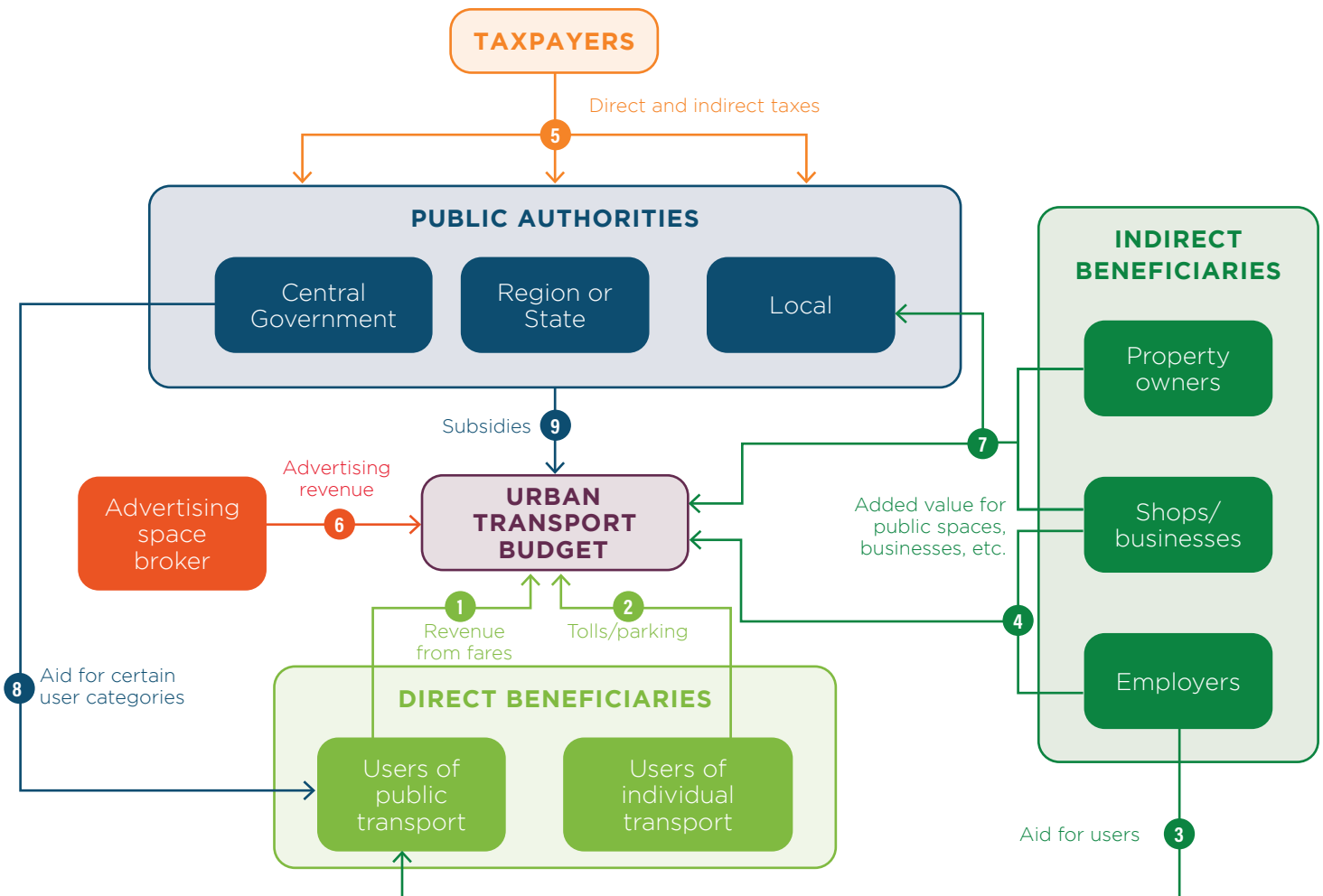
FUNDING SOURCE	POTENTIAL (US\$ MILLION/YEAR)	AUTHORIZATION THROUGH	APPROVAL	COLLECTING REVENUE	ASSUMPTIONS/SOURCE
Fuel surcharge	25	National law	Very difficult	Very easy	+5% over current level
Off-street parking charges	34	Local ordinance	Difficult	Difficult	Variable, up to \$0.50 per hour
Congestion charges	27	Local ordinance	Difficult	Difficult	Study by Bogotá's secretary of mobility in 2013
Tolls on national roads (city connections)	9	Local ordinance	Intermediate	Easy	10% of current toll revenues
Air pollution charges	132*	National law	Very difficult	Very difficult	Burden estimated in the air quality plan, city of Bogotá
	156	Local ordinance	Difficult	Difficult	
On-street parking	27	Local ordinance	Easy**	Difficult	Studies by secretary of mobility
Fixed payment to travel with plate restriction	42	Local ordinance	Easy**	Intermediate	Studies by secretary of mobility
Traffic accident charges	452*	National law	Very difficult	Easy	Deaths and injuries data

\* Requires approval by national law, revenue according to value of statistical life

\*\* Approved by City Council, not yet implemented

Source: Financiera de Desarrollo Nacional 2019.

**Figure 16** | General Scheme for Funding Public Transportation Operations



Source: CODATU 2014.

## Conclusion

Bus-based public transportation is the primary mode of transportation in most Latin American cities. Semiformal and informal services play a major role as integral public transportation options, but they are often not adequately studied in the region. In this paper, we explored the characterization of semiformal services in Latin America and compared their advantages and disadvantages. These are low-cost and effective services that provide ample coverage, especially for lower-income demographics who live in peripheral areas. At the same time, they bring negative externalities in the form of traffic fatalities and congestion, as well as labor malpractices and compliance issues, among others.

In order to address the negative externalities, cities in the region have attempted reforms that seek formalization, fleet renewal, and integration of public transportation services. One of the reform mechanisms is the use of BRT projects as an urban governance and technical restructuring tool—such as in the cases of Bogotá, Cali, León, Mexico City, and Quito. However, there are other approaches to semiformal service improvement that are less reliant on BRT. To reflect the rich variety, we examined cases from Bogotá, Santiago (Chile), and São Paulo as well as in several medium-sized Colombian cities; Jetty service in Mexico City; and a mapping experience in Santiago, Dominican Republic. Reform experiences and outcomes depend on variations in the historical context, government capacity, political economy

of stakeholders, and timing. In general, reforms resulted in improved bus system operations, reduced negative externalities, and savings in travel times and costs. Nevertheless, there were multiple institutional, technical, and financial issues, which prevented reforms from fully realizing their objectives.

One key element in public transportation reform has been the involvement of incumbent bus operators in the process. This usually comes at a cost (in terms of time as a result of long, winding negotiations, for instance) that is not necessarily reflected in the planning process. Planning also tends to be optimistic in terms of expected ridership and operational costs. Governments also believe the operational revenue will cover all the necessary costs, including scrapping of the older fleet, system supervision, and management, etc. Unfortunately, cities do not have financial or institutional muscle to make the transition from semiformal to formal service possible. When reforms are not completed, one of the consequences could be that the new system competes with existing semiformal and informal services—as in the case of Bogotá and Cali in Colombia—thereby exacerbating some residents' access to opportunities. Even in the cases that completed reforms, like in Santiago, Chile, service quality could be very low because of the “Big Bang” effect.

The case studies discussed in this paper highlight the importance of adequate planning, funding, and institutional capacity. For decision-makers, although the lessons in this working paper are drawn from Latin American cities, the three requirements transcend geographical boundaries and are essential for any bus reform and improvement endeavors globally—be it in South and Southeast Asia or sub-Saharan Africa. In terms of planning, it is important to have not just realistic ridership and costs but also a well-thought-out implementation process (see previous chapter as well as Tavares et al. [2018]). In terms of funding, the reform needs more than just initial capital costs of infrastructure and other transition costs. It also requires sustained funding streams to keep the service running at a reasonable fare for the long term. Some feasible funding includes national funding, revenue from city governments such as fuel taxes, economic demand management mechanisms (congestion charging), and land taxes (land value capture). In terms of improving institutional capacity, the general recommendation is to first create a

dedicated transportation and land-use agency with sufficient staff who are competent at planning and coordination, and have technical skill sets. Leadership that can both influence and implement policies is also essential. It is also important that the agency does not lose its capabilities and objectives as it tries to grow and expand.

If there is no adequate level of funding or institutional capacity, it may be better not to attempt a complete reform within a relatively short time horizon (two–three years). Gradual reform might be more practical for some cities, although there is a risk of being exposed to more external influences and uncertainties (e.g., economic and political) due to the longer timeframe. As an alternative approach, the paper discussed how Latin American cities have tried to improve their semiformal systems without reliance on large-scale BRT elements or full reform. Some smaller-scale improvements that can be considered are business skills training, safety training for drivers, creation of transportation workers' unions, bus fleet renewal, and investments in operating environments of informal services, including bus stops, stations, and NMT infrastructure. Many of the persisting negative externalities can be curbed through these modest approaches. Leveraging technology to e-hail semiformal services and mapping and digitalizing transportation networks for greater visibility are also some promising and scalable examples of gradual improvements.

There is no single pathway to improve and reform informal transportation. Policymakers must examine the potential advantages and disadvantages of the reform process and set realistic expectations. Given that the semiformal and informal sector serves more than half of all public transportation trips in Latin America (Salazar Ferro and Behrens 2015), the sector will continue to play an essential role as a viable public transportation option for a large proportion of citizens. Overall, integrated bus systems, including semiformal and informal services, have the potential to better serve users' needs, improving the city's productivity and quality of life and contributing to urban sustainability through lower emissions, better air quality, and safer roads. But if options are limited, the government should prioritize investing in informal services and infrastructure that can deliver substantial benefits to the most vulnerable citizens among us.

## Endnotes

1. The exact figures are difficult to obtain due to variations in what different countries consider to be “semiformal” and “informal” services.
2. The “Dollar Vans” of New York City, the “Black Cabs” of Belfast, and the “Little Cuba Cabs” of Miami all demonstrate this phenomenon (Reiss and Lavey 2014; Cervero and Golub 2011).

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The current paper contain preliminary research, analysis, findings, and recommendations. It is being circulated to stimulate timely discussion and critical feedback, and to influence ongoing debate on emerging issues. The current paper may eventually be published in another form and its content may be revised.