ove Office of Evaluation and Oversight

Comparative Case Studies of Three IDB-supported Urban Transport Projects

Cali Case Study Annex

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EXECUTIVE SUMMARY

This case study presents the main findings and lessons learned from implementing an integrated bus rapid transit (BRT) system in Cali, the third-largest city in Colombia. Cali presents a distinctive approach to addressing urban mobility challenges through a BRT system as it intended to fully upgrade public transport in the city, in contrast to the incremental corridor-by-corridor approach adopted in Lima and Montevideo, the other two cases assessed by the Office of Evaluation and Oversight (OVE) of the Inter-American Development Bank (IDB). The findings from this case study were used to inform OVE's larger comparative case study evaluation of IDB-supported integrated mass transit projects.

Before the project, the conditions of Cali's urban transport were characterized by poor quality in service delivery and several related negative externalities. Cali's deregulated urban transport sector had a very fragmented transport market run by private and informal operators, whose incentives were oriented toward minimizing costs (including those for service quality and bus replacement or maintenance) and maximizing the number of passengers. The resulting negative externalities included bus oversupply and inefficiency, high levels of congestion, pollution, and traffic accidents generated by the traditional bus operators.

The early success of Bogotá's BRT system influenced the national and local authorities in the design of a comprehensive program to replace most of Cali's deregulated and inefficient bus system with a modern, integrated BRT system. The government-designed project proposed an extensive BRT network that would maximize efficiency and mobility in the city—particularly for low-income *caleños*–and reduce pollution and accidents. The proposal required reducing the number of traditional bus operators (and buses), largely replacing them with the new integrated mass transport system (the MIO). The project was conceived as a key component of the new National Public Transport Program. The national policy established the limits, funding, and characteristics of the BRT-based system, while the local government led the implementation. Construction started in 2006, and the system inauguration was planned for 2009.The proposed approach thus involved a big bang approach to upgrade public transport in the city.

The active participation of the national Government provided a larger initial investment and allowed an expanded scope for the infrastructure design and system coverage. Although the national government's participation required the local government to align with the overall strategy for urban transport defined in Bogotá (including the substitution of a BRT-based solution for the original light-rail plan), the resources available for capital investments largely exceeded those of comparable BRT projects in Lima and Montevideo, allowing for a very comprehensive project. IDB financed the lion's share of the national Government's contribution to the project, and provided technical advice during the preparation and construction of the infrastructure. However, the Bank did not participate in the design of the BRT operational stage, which was rolled out as a public-private partnership (PPP) financed exclusively by MIO users (through fares).

While the objectives and scope of the proposed intervention addressed Cali's key development challenges in urban transport, the project exceeded the city's local capacity for implementation. The proposed project aimed at reducing congestion, accidents, and

emissions in Cali, while improving overall mobility and the access of the low-income strata –all key issues in Cali. The design of the system also met most internationally-agreed BRT standards. However, some shortcomings in capacity to manage large and complex infrastructure projects became evident early on, with impacts in terms of implementation delays and project final cost. These factors were compounded by particularly short political cycles without reelection, fast turnover in managerial and technical positions in the executing agencies, a weak link between city planning and the design of the MIO, and delayed implementation of key components on institutional strengthening and the social viability program. Some preliminary technical studies used to approve the loan had to be adjusted once the infrastructure phase was well advanced, when deeper studies were prepared. Issues with infrastructure designs, coordination between Cali's different planning and utility services, and the preparation and oversight of some construction contracts increased both the cost and implementation time of the project (four extra years were needed to complete the infrastructure). Finally, the weak link between urban planning and the project meant a lost opportunity in terms of transport-oriented development, which would have enhanced the sustainability of the system and strengthened value capture.

As the emphasis at project design was placed on the infrastructure, the proposed arrangements for system operation showed significant weaknesses, compromising the overall performance and results of the MIO. The demand forecasting exercise was overly optimistic—and that was particularly risky for a project that is to be fully sustained by fare revenues. Similarly, the weaknesses in the locally prepared PPP agreements reflected the complex nature of the project operation, and the local government would have benefitted from additional technical support from national and international agencies. The proposed broad replacement of the operators of the old bus system was a complex task, and it was not accompanied by the timely delivery of the social mitigation component that would offer attractive alternatives to the losers. As a result, the previous sector was only partially integrated into the new system. The excluded operators have increasingly posed organized resistance to the MIO, leading numerous demonstrations and actions and causing significant costs both to the system and to Cali's citizens. In addition, the bus-scrapping program is taking longer than expected, and continued competition from the previous system has contributed to failed demand forecasts and compromised MIO's financial sustainability. Finally, the local governance for project management would also have benefited from a more centralized structure: while institutional capacity in Metrocali improved over time, the fragmentation of the transport authority in the municipality generated permanent coordination challenges that aggravated the situation of the system over time. Only after the intervention of the national Government in late 2013 did the situation change, and system performance indicators and demand began to slowly improve. Overall, the unbalanced allocation of responsibilities and risks created a deadlock.

While MIO has represented a significant infrastructure and operational upgrade of Cali's public transport, the project still falls short of delivering several of the expected results. On the positive side, the system contributed to emissions reductions and improved the comfort and safety of buses. Although the number of accidents in the city remained stable on a per capita basis, MIO contributed to improved safety within the system. Travel times improved along the main corridors and in some areas, but the results are mixed when system-wide or overall mobility is measured, and most performance indicators (frequency of buses, timeliness, average speed) are significantly below the expected project outcomes, often representing a decline vis-à-vis the previous system. Satisfaction rates for MIO started high during the first months of operation, but because of the system´s underperformance, they quickly declined to 25% in 2013

(source). Also, in parallel, Cali citizens have progressively moved toward private modes of transport, with the overall public transport share declining over time.

The project's final cost greatly exceeded initial estimates. Initial plans estimated the MIO cost at US$495 million, with about US$400 million being funded by the two levels of government and US$95 million by the private sector. According to recent assessments by Colombia's supreme audit institution and the national government, the final cost has increased to US$1,111.7 million for the public sector and US$370 million for the private operators, at 2012 US dollar prices. These numbers take into account the cost of revising and expanding the scope of some original infrastructure, construction cost overruns, legal liabilities, and operational losses, among other contributing factors.

Suggestions for the future

Some key lessons for the IDB emerge from the case of Cali's MIO. IDB's role was limited to the provision of funding and technical advice for the implementation of the system's infrastructure (as originally envisioned in 2004). The scope of the Bank's intervention is, to a great extent, defined by the preferences of the borrowing government and in this case the regulatory framework for urban transport that guided the project design. However, to ensure the achievement of the project objectives, future interventions on the scale of the MIO could benefit from a stronger IDB role in providing –at least– technical advice and lessons learned in such key areas as the following:

(i) Strengthening overall urban planning capacities and linking the transport intervention to a broader plan;

(ii) Ensuring high quality standards for preliminary economic and technical studies to avoid costly infrastructure redesigns later;

(iii) Improving institutional and governance diagnostics to ensure proper management of infrastructure and operations, taking into account the city's capacity limitations, the institutional context, and the political dynamics;

(iv) Giving priority to the timely delivery of the social, environmental, and institutional components to prevent negative impacts from the project, promote broad ownership, and ensure smooth implementation;

(v) Supporting BRT agencies in the design of PPP agreements and risk-sharing mechanisms, and in the overall definition of the system operation;

(vi) Considering innovative public transit reforms to complement BRT systems to better incorporate incumbent private bus operators (e.g., *colectivos*, minivans, paratransit);

(vii) Deepening the diagnosis of poor people's mobility needs in the planning and feasibility stages—including analyses of issues around access, spatial mismatches between skill-appropriate jobs and housing, travel patterns, and affordability—to inform Bank urban transport projects; and

(viii) Encouraging transport-oriented development planning around BRT stations, possibly in coordination with the Bank's Urban Development division.

I. INTRODUCTION

1.1 **In Cali, as in most cities in Colombia, the public transport sector experienced high levels of congestion, accidents, and pollutant emissions.** Extreme fragmentation and a weak institutional and regulatory framework characterized the sector, generating an oversupply of buses, inadequate use of routes, and fleet obsolescence. By 2003, the aging fleet of buses and minibuses peaked at 6,301 vehicles aggressively competing for passengers along 242 routes, with a total capacity of 186,647 seats, transporting users at a very low rate of 1.3 passengers per kilometer.[1] The poor levels and quality of service delivery affected users in terms of travel times, safety, comfort, and reliability. Affordability was also an issue, given the lack of an integrated fare and the need to transfer buses to reach a destination.[2]

1.2 **Inaugurated in 2009, the MIO was Cali's first integrated mass transit system and a comprehensive response to the city's transport challenges.** This system took a holistic approach to address Cali's mobility and environmental issues. Given the initial successful experience with bus rapid transit (BRT) systems in Bogotá and other cities,[3] national authorities required the new transport infrastructure to meet the characteristics of BRT systems (see Box A.2 in Annex). The implementation was supported by a US$200 million investment loan from the Inter-American Development Bank (IDB), approved in 2005.

1.3 **This case study presents the main findings and lessons learned from implementing a BRT system in Cali, to inform a larger comparative case study evaluation of IDB-supported integrated mass transit projects**. The case study seeks to identify factors that affected success and created challenges and barriers to effective implementation of the Cali system. In addition, it assesses the extent to which the project delivered on key objectives: improving mobility and access for the general public, and particularly for low-income populations, and reducing local and global pollution.[4] Box 1.1 briefly describes the case study approach and methods.

Box 1.1. Case study approach and methods

The team used a mixed-methods approach, reviewing (i) legal, technical, and financial documents available in the Bank's repository systems and local institutions, as well as the project's progress report; (ii) a series of previous evaluations performed by the team; (iii) information gathered in focus groups and interviews with key informants, including all the relevant internal and external stakeholders to the project; (iv) objective performance data from the system and citizens' surveys; (v) original data collected from the system's users and non-users; and (vi) information collected during interviews and meetings with IDB staff involved in the project and with local stakeholders during field missions. Box A.1. (Appendix) describes the methodological approach and sources of evidence in detail. The analysis of the project follows the OECD-DAC criteria of assessing the relevance, implementation and efficiency, project effectiveness, and sustainability of the results.

1 *Cali en Cifras* (2007).

2 Gómez Cárdenas (2011).

3 DNP (2002); DNP (2005). See Box A.2. in Annex for a full summary of national government requirements.

4 Reducing accidents is often stated as an important objective of urban transport projects; assessing this outcome is beyond the scope of the current evaluation but may be a focus of future ones.

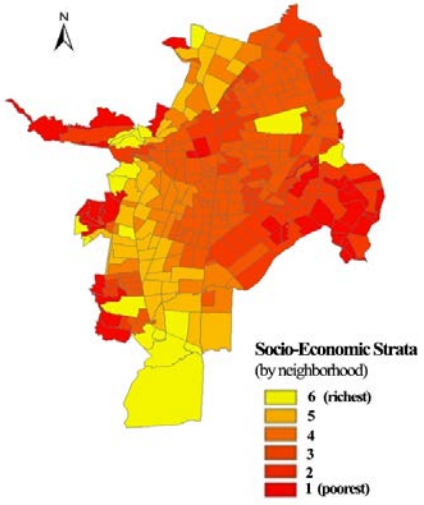
II. CONTEXT

A. Cali's development challenges

2.1. **Santiago de Cali is the third most populated city in Colombia and the political and socioeconomic center of the country's southwest**. The city is comprised of almost 2.4 million inhabitants, with a high urban population density of about 20,904 people per km^2 within the city's municipal limits.[5] The Metropolitan Area of Cali spans 2,811 km^2 across the municipalities of Cali, Palmira, Yumbo, Jamundi, and three other minor towns, with a total of about 3 million people.[6] The city is divided into 22 administratively autonomous *comunas* (or districts) and 248 neighborhoods (see Figure 2.1). Since the 1960s, as a result of the booming agriculture industry, Cali has attracted foreign capital investments and large influxes of migrants. The city's proximity to the city of Buenaventura, the country's most important port for international commerce, has shaped its development, turning it into the main economic center of the Pacific region.

2.2. **Low-income and poor populations tend to be concentrated in the western hills and, especially, eastern areas.** The middle class (in the city center) and the richest populations (in the south) reside along a north-south axis around which the city developed in terms of infrastructure. Figure 2.1 maps the administrative division of the city, highlighting the location of the lowest-income neighborhoods.

Figure 1.1. Poverty Map of Santiago de Cali (2010)



2.3. **The levels of poverty and inequality in Cali rank very high amongst Colombia's large urban areas**. In 2005, a third of the population lived under the poverty line.[7] According to the national socioeconomic stratification, about 52% of the population belong to the poorest strata, 1 and 2, and only about 1% belong to stratum 6.[8]

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5 DANE (2005). Also Parés-Ramos et al. (2013).

6 While Cali's Metropolitan Area is legally recognized in Colombia, it has not been incorporated into a metropolitan authority to date. Nevertheless, Cali experiences a conurbation process with the northern and southern municipalities of Yumbo and Jamundi.

7 Taimur et al. (2012).

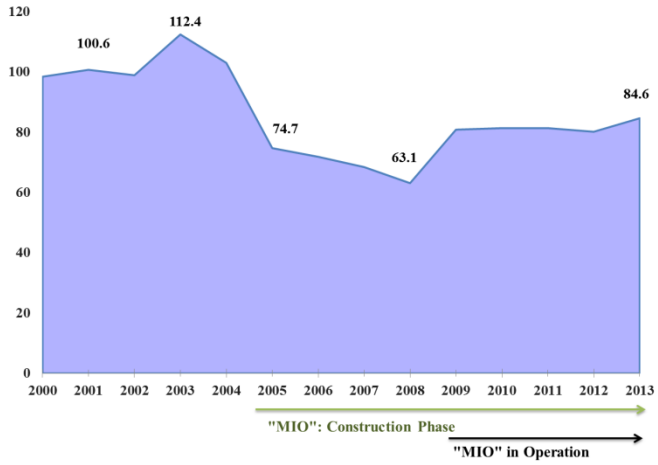
8 DANE (2005). The strata and corresponding socioeconomic status are defined by the national statistics office of Colombia as follows 1=Low-Low, 2=Under, 3=Medium-Low, 4=Middle, 5=Medium-High, 6=High. Strata 1, 2, and 3 comprise users with fewer resources, which are grantees in public utilities; strata 5 and 6 comprise users with greater financial resources.

The levels of income and wealth inequality in the city are also considerable; for income inequality, the Gini coefficient was a still a very high 0.53 in 2010 (see Poverty Analysis).[9]

2.4. **A continued urbanization process, reinforced by large influxes of displaced populations, has resulted in disorderly city expansion and the growth of informal settlements.**[10] Cali's population grew at an annual average rate of 2.3% during the 1990s, with migration (mostly displaced populations from conflict-affected regions) driving 45% of the growth (World Bank, 2002). Populating the outlying areas, internal immigrants have pushed the city limits toward the poorly served eastern areas and the inaccessible western hills. Between 2000 and 2014, successive waves of families displaced by the long-standing Colombian armed conflict, amounting to 149,867 additional individuals, flowed into the city.[11] The city almost quadrupled its size between 1973 and 2013, growing from 637,929 to 2,319,684 inhabitants. Socio-spatial segregation remains high, despite the recent decentralization of economic and service activities across the city and improvements in local service delivery.

2.5. **Cali remains among the most violent and crime-ridden cities in the world.** The number of total reported crimes jumped from 8,797 in 2000 to 26,232 in 2006 and 39,378 in 2012. Violent crime has also remained high: in 2013, Cali ranked 7th in the world in terms of homicides, despite some gains earlier in the decade (see Figure 2.2).[12] And while violent crime is widespread across the city, it peaks in the poorest neighborhoods, with extremely high homicide rates of 150 and 180, respectively, for the *Comuna 15* and *Comuna 20* peripheral districts.[13]

Figure 2.2. Homicide rate per 100,000 inhabitants



B. Urban transport challenges in Cali

2.6. **In 2004, public transport in Cali was characterized by high levels of congestion, accidents, and air contamination, compounded by a weakly enforced regulatory**

9 Data from Cali (2012). The Gini coefficient is defined in a scale from 0 to 1, where 1 can be interpreted as complete inequality in the income distribution, and 0 as complete equality.

10 The city is one of the most significant destinations for forcibly displaced people; about 38% of the population was born in another municipality; see Jaramillo et al. (2012).

11 Data from Government of Colombia (2014).

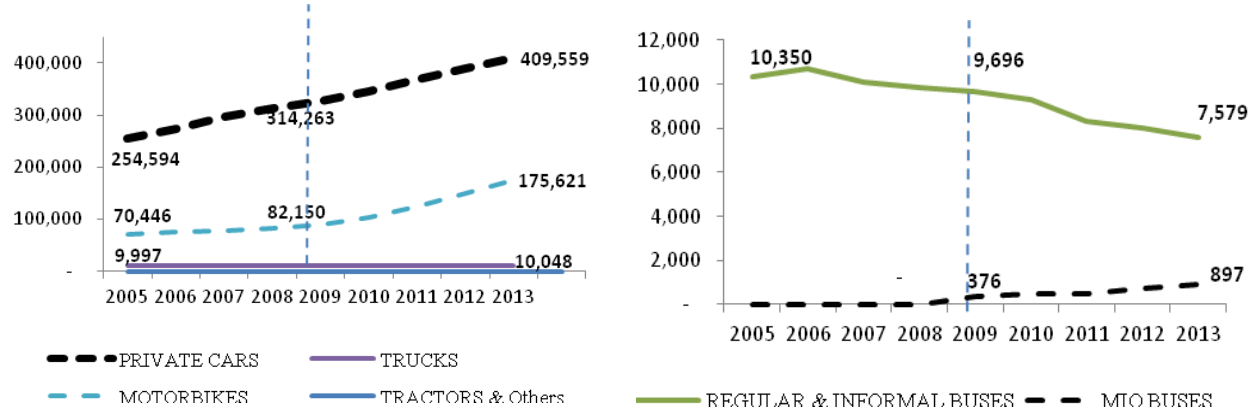
12 Cali en Cifras, 2007 and 2013.

13 OVE calculation using data from Cali's Planning Department (2013)

framework and a deteriorated road infrastructure.[14] About 3 million motorized trips were made daily in the urban area, with public transport accounting for 1.9 million of them.[15] Competition among bus drivers was fierce, and the fare was a very affordable 50-100 Colombian pesos per ride (US$0.018 to US$0.036 at the time). Business organization was weak, informality was common, and the enforcement of traffic rules infrequent. There was a lack of clear demarcation of responsibilities regarding sector regulation, further complicating coordination and oversight within the city government. [16]

2.7. **Motorization rates have been rising in Cali in the past decade.** As Figure 2.3 shows, the number of vehicles registered in Cali soared from 373,936 (2005) to 644,844 (2013), an increase of 72%. While most of the absolute growth has been in the form of private cars, motorbike ownership has skyrocketed in the past four years. Higher incomes and increased access to financing mechanisms are accelerating the rate of growth—with annual average rates of 6% and 11% per year, respectively, for cars and motorbikes from 2007 to 2010, compared with 3% growth rates earlier in the decade (Cali Como Vamos, 2011).

Figure 2.3. Public and Private Vehicle Fleet (Cali)



Source: Cali (2013).

2.8. **Finally, while road accidents have remained a challenge, transport-related pollution has been improving.** While the trend in road accidents in Cali remained stable during the first half of the 2000s, at around 16,000 accidents per year, the number of accidents rose along with motorization, to reach 24,540 accidents in 2012. Taking into account trends in vehicle ownership, that however represents a decline from 46 to 40 accidents per thousand vehicles.[17] In contrast, despite higher levels of congestion, the progressive replacement of an obsolete vehicle fleet that had little or no emission control technology has helped reduce CO_2 emissions from urban transport. A much larger vehicle fleet produced 3,151,171 tons of CO_2 equivalent in 2011, compared to 4,723,325 tons in

14 A third of the population considers the overall road system to be very bad or bad, and contamination levels exceeded the national average, especially in the north of the city (Cali Como Vamos, 2005).

15 IDB's loan proposal document (IDB, 2005) estimated the demand for public transport as 1,975,000 trips per day for 2004. That was a significant increase from a 2000 calculation estimating the demand as 1,282,202 (Moller, 2006).

16 IDB (2005).

17 Cali (2013).

1997.[18] Still, urban transport remains the city's largest contributor (87.3%) to local pollution.

2.9. **Public transport was characterized by a weak business organization and an oversupply of bus operators.** By 2004, about 3,500 bus owners were organized into 30 public transport associations (*afiliadoras*),[19] operating an aging 5,632-vehicle fleet and servicing 231 routes at an average speed of 20.5 km/h, which declined by half during rush hour.[20] A growing oversupply of public transport and lack of structured routes or bus stops had led to severe competition for passengers (with the number of passengers transported per kilometer as low as 1.37),[21] high levels of congestion, and overlapping routes. Given the low occupancy, the size and quality of buses had shrunk over time, with a surge in microbuses substituting for mid-size 30-passenger buses (Moller, 2006).

2.10. **Working in the loose *afiliadoras* associative system, operators engaged in fierce on-road competition for passengers, known as the "penny war", leading to aggressive driving behaviors, severe congestion, and high rates of public-transport-related accidents.**[22] On average, it took almost 90 minutes to cover the typical 44-km route. In addition, the routes were highly inefficient because many bus operators were providing overlapping services over long but profitable routes. Working conditions for bus drivers were reportedly extremely poor, characterized by high levels of informality and long working hours, in exchange for relatively high pay. Despite its inefficiency, public transport represented the second largest mode share of passengers after walking/biking. [23]

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18 Cali Como Vamos (2012).

19 The *afiliadoras* are companies that operate routes assigned by the Municipal Secretary of Transit and Transport. They do not have their own vehicles and charge vehicle owners a fee to operate in assigned routes.

20 Source: DANE, 2005. The average fleet was 11.6 years old (Cali Como Vamos, 2005). Also: (i) data on the traditional bus operators from Cali (2007); and (ii) rush hour data from DNP (2007).

21 Source: DNP (2007).

22 In 2005, about half of transit accidents involved public transport drivers (Cali Como Vamos, 2005).

23 For a description of the baseline data, see Figure 5.4.

III. THE IDB PROJECT: CALI INTEGRATED TRANSIT SYSTEM PROGRAM (CO-L1011)

3.1 **In Colombia, the national Government plays a significant role in defining the policy framework and funding for urban transport development in the country, with decentralized specification and implementation of the interventions.** Because the 1991 Constitution lacks clarity on the attribution of responsibilities between the central and subnational governments, the decentralization process has been characterized by the national Government's active engagement in the definition of transferred responsibilities, such as urban transport (Echevarría et al., 2002). Thus, in the last decade a series of national policies have guided the institutional features of BRT systems proposed for major cities in Colombia, on the bases of the Curitiba and Bogotá experiences. These national policies have broadly defined the required infrastructure characteristics and design, the urban transport sector reorganization rules, and the institutional organization and overall governance of the system (see Box A.2 in Annex). Local governments were allowed to collaborate with the national Planning Department in the more specific definition of the system, but the required institutional approach and final decision on funding came from the national level.[24] The fiscal and institutional constraints of Cali's local government limited the municipality's ability to independently implement alternative approaches not endorsed by the CONPES.[25] Table 3.1 shows the evolution of the policy priorities for urban transport in Cali, largely led by the national Government.

Table 3.1. Evolving Policy Framework for Urban Transport in Cali: 1990-2014

Year	Urban transport policy framework	Authority	Main purpose
1990	Road Traffic and Transport Plan	Cali	Early blueprint for a comprehensive and sustainable urban transport system.
1993	Law 105/1993	National	Central government decentralizes responsibilities to cities for managing urban transport and traffic.
1996	National Urban Transportation Program	National	The program centers the strategy on the development of BRT, less expensive than rail-based systems. Bogotá (1998) is the first pilot.
1997	CONPES 2932	National	Prefeasibility study proposes a light rail system.
1998	Local Council 16/1998 Act on the Creation of Metrocali	Cali	Creates Metrocali as autonomous entity to manage Cali's future integrated mass transport system.
1999	Local Council 35/1999 Act on the mass system financing	Cali	Approves allocating up to 70% of the gasoline tax to finance the new mass transport system.
2000	Land-Use Management Plan	Cali	Defines broad, albeit ambiguous, guidelines to optimize the long-term impact of the future system.
2002	CONPES 3166 and CONPES 3167	National	Based on Bogotá's BRT success, requires a change in technology (from light rail to BRT) and defines the BRT system features, offering up to 70%

[24] The national-level Council for Economic and Social Policy (CONPES) is headed by the President, technically supported by the Planning Department, and attended by key line ministers. Several CONPES reports progressively defined Colombia's approach to urban transport development, with very specific details on the design and approach for each city. For Cali, see DNP 1997, 2002. 2002b, 2004, 2005, and 2007.

[25] After a severe fiscal crisis in the late 1990s, in 2001 the municipality of Cali joined the Fiscal and Financial Restructuring Program promoted by the national Government. Since then, overall local fiscal management –and particularly large capital investment– requires central government authorization (MHCP, 2011).

			national contribution towards the new system.
2002	National Development Plan 2002-2006	National	Integrates the BRT strategy within the national development strategy.
2005	CONPES 3369	National	Defines the MIO key features, with IDB funding.
2006	National Development Plan 2006-2010	National	Prioritizes the replication of BRT systems in Colombia as a solution for urban transport.
2007	CONPES 3504	National	Defines an expanded infrastructure scope for MIO.
2010	National Development Plan 2010-2014	National	Provides renewed prioritization to the BRT-based "integrated mass transport systems" in Colombia.
2013	CONPES 3767	National	Approves additional funding to finalize the MIO infrastructure, conditioned on some local reforms.
2014	Land-Use Management Plan	Cali	Updates the land use planning for the next decade.

A. Urban public transport alternatives

3.2 **After several years of prefeasibility studies, the city and the national Government proposed a light rail system as a mass transit solution for Cali**. The light rail system would include 6 lines, and the initial investment plan would be for two lines, covering a distance of 23.5 km and an estimated 16% of total public transport demand by 2005 (DNP, 1997). The wider integrated mass transit system (SITM) for the city was also considered conceptually, hierarchically connecting the light rail axis to the rest of the city through radial routes and bus-based feeders.

3.3 **However, given the city's limited fiscal space to finance a light rail system, new feasibility studies, and the success of Bogotá's *Transmilenio* BRT, the national Government then proposed a BRT system as a superior alternative for Cali.**[26] An analysis of a light rail versus a BRT system, taking into consideration technical and financial criteria, found that a BRT system using articulated buses was the best option for Cali (DNP, 2002). The BRT would be more cost-effective than the light rail, would cover 97% of the geographical area covered by public transport in Cali, and would service 72% of the demand for trips.[27] In comparison, the light train would directly benefit only 20% of the city (see Figure A.1). The analysis assessed SITM's major technical-economic impacts—commuter travel-time reduction, vehicle operation costs, and particulate matter/gaseous pollutant emission reductions—and found that the cost/benefit ratio favored SITM (1.16) over light rail (0.80).

3.4 **The agreed BRT-based integrated mass transport system was aligned with the Government's policy towards urban transport challenges in Colombia.** Both the Government and the municipality agreed to invest in a BRT system (see Table 3.1, above). This proposal was aligned with the 2002 National Program for Urban Transport, which defined the features of the SITM for seven major cities in Colombia. The guidelines broadly defined the infrastructure characteristics and design, urban transport sector reorganization rules, as well as the institutional organization and overall governance of the system. Local governments were allowed to collaborate with the National Planning Department in the definition of the specificities and local approach to

[26] DNP, 1997.

[27] DNP (2002).

the SITM, but the required institutional approach and final decision on funding were made at the national level. Within this program, municipalities were granted dedicated governing bodies or institutions with autonomous budgets to develop the SITM. They received a contribution (co-financing or investments) from the State amounting to 40-70% of the public transport project. The fiscal and institutional constraints of Cali's local government limited the ability of the municipality to independently implement alternative approaches not endorsed by the CONPES.

B. Design of the integrated mass transport system (MIO-SITM)

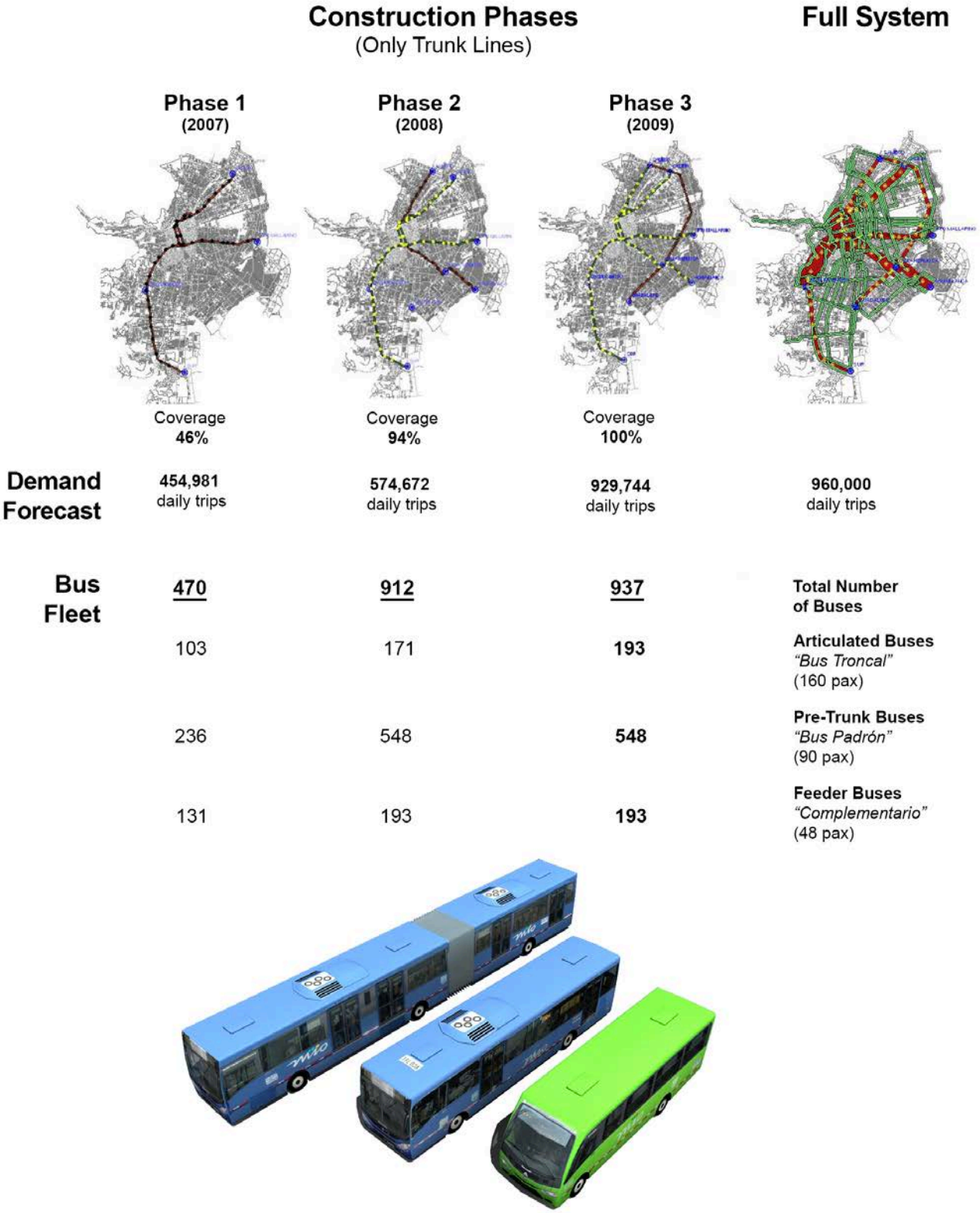
3.5 **The mass transport system, known as the MIO, was originally designed as an integrated mass transit system with segregated trunk corridors and a radial structure.** MIO comprised three primary BRT trunk lines of 49 km in length, using 180 articulated buses connected to approximately 200 km of secondary lines and complementary corridors. In addition to the corridors, MIO required the construction of 9 terminals, 78 bus stations, and complementary infrastructure for pedestrian access to stations, as well as the implementation of road safety measures along the corridors and land purchases for the construction of patios and yards. Table 3.2, below, compares key characteristics of the previous *colectivo* bus service and the proposed MIO system, and Figure 3.1, in the next page, summarizes the implementation plan for the MIO.

Table 3.2. Comparative Features of the Traditional Bus System and the MIO

Feature	Traditional bus system (2004)	MIO (target)
Public transport demand (average daily trips)	1,900,000	960,000
Number of routes	228	91
System length	10,491 km	1,434 km
Average route length	44.1 km	19.1 km
Bus fleet	5,302 (2005)	937
Seat capacity	138,140	81,040
Segregated trunk line routes	0	11
Number of operators	30	5
Index of passengers per km	1.37	8.7
Fare	900-1,000 COP (2003)	1,600 COP

Sources: Möller (2003); Metrocali (2013), Cali (2007, 2013), Contraloría (2013), BRTData (2014).

Figure 3.1. MIO: System Map and Operational Parameters



Source: OVE, using GIS layers and data from GGT's review of MIO's operational parameters (2006) and data from Metrocali.

3.6 **Designed following the city's radio centric structure, the MIO was intended to cover most of the city.** The BRT trunk lines, running on exclusive rights of way, were planned on routes where existing demand exceeded 60,000 passengers per day. The trunk lines were connected to wider areas of the city via pre-trunk lines on routes that were already transporting some 20,000 to 60,000 passengers per day. Complementary or feeder routes using lower-capacity buses were used in the further reaches of the city on less-used routes. The pre-trunk and feeder routes were planned to cover 206 km using 852 conventional buses. In total, the system was planned to cover approximately 98% of city in geographical terms, and more than 75% of the public demand. [28]

C. Project objectives

3.7 **The overall objective of the project was to develop a bus-based mass transportation system providing improved service quality, mobility, air quality, and safety in Cali – with emphasis on low-income users.** In particular, the project explicitly acknowledged that the vast majority of public transport users in Cali were from strata 1 (extreme poor) to 3 (medium-low income); therefore, there was an expectation that the mobility needs of these groups were to be given priority in project design (see Box 3.1).

Box 3.1. Project Objective

The IDB Loan Proposal described the project objective as follows: *"The project objective is to develop a modern bus transportation system that will connect the low- and middle-income areas of Cali with the areas where job-generating activities and social services are concentrated, improving service quality, reducing travel time, accidents, and pollution of the environment, and increasing service frequency and reliability. In particular, with the implementation of a modern bus transport system that will connect the low- and middle-income areas of Cali with the areas where job-generating activities and social services are concentrated, the IMTS will benefit primarily the lowest socioeconomic segments in strata 1 to 3 (low-low to medium-low), which account for 85% of the system's users, and the Afro-descendent population, which represents 26% of Cali's urban population."*

This objective was aligned with the Bank's strategy in Colombia to focus on economic development, on promoting social development, and on improving governance.

3.8 **The expected results of the project.** The IDB project proposal expected the buses to operate at an average speed of 25 km/h in the trunk corridors, reducing travel times by 22% and carrying at least 880,000 passengers per day. In addition, the project was expected to reduce emissions of CO by 39%, nitrogen oxide by 32% and volatile organic compounds by 8%, by reducing the oversupply of public transport, scrapping old vehicles, and introducing cleaner and improved technologies.[29] The project included a

[28] Cali is articulated by an 18-km north-south main axis (*Calle 5*) constructed in the 1970s along the western mountain range, and linked to the other parts through concentric rings. This integrated north-south network of uninterrupted avenues was the more developed area of the city, but it was also often congested –in sharp contrast to the eastern and western areas of the city, where roads were underdeveloped, public transport was spotty, irregular settlements were common, and people often had to resort to unsafe pick-up jeeps, popularly known as *camperos,* to cover the last mile (Pardo, 2009).

[29] Source: Environmental and Social Management Report annexed to IDB (2005)., OVE was unable to identify the studies indicating how these estimates were calculated. The pre-investment studies do not assess baseline CO_2 or other greenhouse gas emissions.

goal of reducing atmospheric pollution associated with vehicles by 5% (on average) relative to 2004. Table 3.3 describes the key expected impacts and results of the MIO.

Table 3.3. MIO System: Expected Results

Indicator	Baseline (2005)	Target
Expected development impact		
Average satisfaction levels of public transport users	Satisfaction levels with previous system: **45%**	User satisfaction with MIO: **At least 60%**
Expected Outcomes (medium-term indicators)		
Medium-term indicator Reduction of travel time among public transport users (average minutes per trip)	Full north-south travel time using the 1st phase *Centro-Sur* corridor: **60 min**	After 6 months of MIO: **48 min**
	Average waiting time at current public transport bus stops:* **25 min**	After 6 months of MIO: **15 min**
Impact indicators (at program conclusion)		
Mobility: Travel times	Full north-south travel time, between Calima and Lili terminals: **65 min**	At program conclusion: **47 min**
Mobility: Travel times **(for poor neighborhoods)**	Average travel times along the *Oriente Centro* corridors, from AguaBlanca terminal to Calle 13: **N/A**	At program conclusion: **-22%**
Mobility: Waiting times	Average waiting time at current public transport bus stops:[a] **N/A**	At program conclusion: **10 min**
Traffic safety: Accidents	Rate of accidents per vehicle/km along trunk lines: **N/A**	Rate of accidents per vehicle/km along trunk lines: **-15%**
Environment: Pollution and emissions	Average total pollution for the trunk lines measured: total suspended particles at **108 µg/m^3**, sulfur oxide at **6.8 µg/m^3**, and carbon monoxide at **4 ppm**.	Atmospheric pollution from vehicles along the trunk lines: **-5% average reduction**

[a] Stakeholders involved in project preparation could not explain how this baseline indicator was calculated. In the previous *colectivo* system, the oversupply of buses would have meant lower waiting times.
Source: IDB (2005), and Metrocali's baseline data.

D. Project finance

3.9 **The cost of the MIO system was estimated at US$300 million in 2005, with the IDB loan financing US$200 million**. Some previous infrastructure investments (amounting to US$45 million) had allowed the government to implement some corridors during the early 2000s (DNP, 2005). An IDB loan was proposed in 2004 to help finance the national Government's contribution to the final MIO project, and the municipality of Cali had previously determined to fund the local counterpart through 70% of the gas tax. The national Ministry of Transport (through the SITM Coordinating Unit) and Metrocali were established as co-executing agencies of the project. Overall, 90% of the resources approved at this stage were dedicated to the infrastructure. Table 3.4 shows the size and purpose of each of the six project components.

Table 3.4. Planned Project Cost and Components (CO-L1001)

Component	Main purpose	Cost ($ '000s)	IDB (%)	Local (%)
1. Studies and Supervision	Preparation of technical, legal, economic and environmental studies.	**16,650**	6.0%	**94.0%**
2. Improving Mobility and Urban Environment	Infrastructure construction, supervision of project execution.	**279,150**	**69.9%**	30.1%
3. Environmental Viability	Development of strategic environmental evaluation and air quality and noise monitoring systems.	**600**	15.2%	**84.8%**
4. Social Viability	Development of activities related to outreach, mitigation, and relocation and compensation of populations and stakeholders affected by the SITM.	**2,200**	**100%**	0%
5. Institutional Strengthening[a]	Capacity building of Metrocali (BRT agency) and the local Transit Department.	**1,145**	0%	**100%**
6. Financial Auditing	Auditing services.	**250**	**100%**	0%
Total	**Improving public transport service quality.**	**300,000**	66.6%	33.3%

[a] Included in this component was the establishment of specific rules and regulations for Metrocali; procedural manuals; trainings for the Department of Traffic and Transportation in regulation, planning, oversight and control of public transportation services; trainings for Metrocali; consulting services; and procurement of equipment software.

3.10 **Like other BRT system models in Latin America and the Caribbean, the MIO operation was designed as a public-private partnership (PPP).** The national and local governments co-financed the construction of the road infrastructure, stations, and terminals, while the maintenance and management of the system infrastructure and operation were full responsibility of the local government (via the executing agency, Metrocali) (DNP, 2005, 2007). The purchase, maintenance, and operation of the bus fleet were the responsibility of the MIO private operators. Bus routes were to be assigned on concession to private bus companies through a competitive bidding process, with bus operators paid by kilometers of bus service. Service levels, frequencies, and routes were to be determined by the transit agency operations center. Scrapping of bus vehicles was to be managed by the private bus companies, but the cost of scrapping old buses, along with the operational and maintenance costs of buses and bus yards, were to be funded through fares (*Fondo Fresa*, or 3% of fare collections).

3.11 **While the public sector financed infrastructure investments, the private sector was granted 20- to 25-year concessions in exchange for initial investments related to the operation.** Four private companies (originally five) signed PPPs with Cali for the operation of buses. The agreements required the companies to finance the purchase of specified buses, equipment for the maintenance workshops, and construction of the yards. These operators were also responsible for financing the bus-scrapping program. An additional private firm signed a PPP to operate the fare collection system and equip the trunk-line stations. This separate concession was implemented to ensure adequate fiduciary arrangements and proper incentives, and the awarded firm had previous experience in fare collection in Bogotá. It was expected that the system would be self-sustaining through fare revenues. Table 3.5 compares the fare distribution and related costs.

Table 3.5. Financing of MIO's Operations: Comparative Fare Distribution

	Traditional system	Costs	MIO	Costs
Bus operator	100%	Drivers, fuel, maintenance, debt service, afiliadora fee	70%	Drivers, fuel, maintenance, debt service, bus scrapping
Fare collection	0%		13%	Fare collection, stations (WC, security, customer service)
Metrocali	0%		7%	
Infrastructure	0%		7%	Patios
Fresa Fund	0%		3%	Road maintenance, system sustainability

Source*:* DNP (2005); DNP (2007)

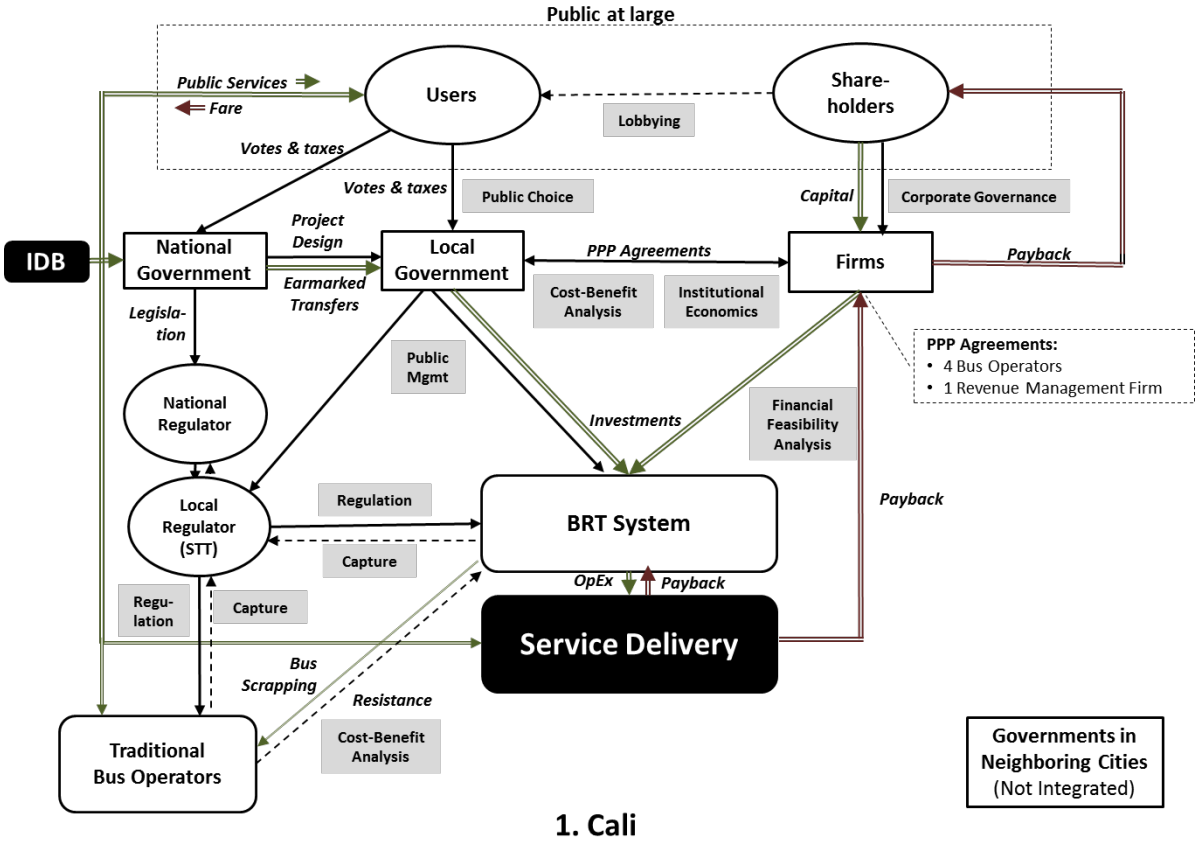
E. Project institutional and policy framework

3.12 **The national Government's leading role in defining the urban public transport strategy and governance provided initial strong technical capacity for project definition and allowed for larger investments in infrastructure.** Through direct involvement, the national Government guided technical design and the governance arrangements for urban transport operation and for fiduciary management (DNP, 2005). Central Government participation also allowed for a larger system than the municipality could have ever financed using its own resources.[30] As Figure 3.2 shows, the vertical distribution of responsibilities between the central and local governments was clear, with the central Government adopting a subsidiary role after BRT design and construction.[31]

[30] The project's total cost (US$300 million) represented an effort equivalent to 64.4% of the total municipal budget (Cali, 2005).

[31] Similarly, the national Superintendence of Ports and Transport plays a backup role in local urban transport regulation. The agency has only come into action in Cali since 2012, when issues at the local level were not addressed effectively and stakeholders escalated their complaints to higher regulatory bodies.

Figure 3.2. Cali's Institutional Context for BRT



Note: **Double lines** represent capital and business transfers (*green* for investments; *red* for returns); **solid single lines** represent contractual and legal relationships, and **dashed lines** represent informal ties and influences. The **gray boxes** indicate the types of formal/informal frameworks regulating the relationship.
Source: Authors, adapted from Moszoro et al. (2011).

3.13 **Overall, the proposed institutional framework for managing the MIO was adequate, with a well-defined allocation of responsibilities, feedback loops, and a balanced risk distribution, but with limited coordination mechanisms between different transport modes or within the metropolitan area.** At the local level, the public sector led the oversight and regulation of the system, staffing of the control center, and maintenance of the infrastructure, while the private sector organizations participating in the PPP concessions were to manage the operational business according to the contract rules. However, the governance model assumed that (a) demand forecasting models, financial feasibility analyses, and PPP contracts were adequately done; and (b) all the stakeholders would implement the agreed actions in terms of bus oversupply reduction and scrapping. The proposed institutional arrangement for BRT management in Cali ensured that all the parties shared the risk in a balanced way. Table 3.3 summarizes the distribution of responsibilities at each project stage, and associated risks.

3.14 **Two key decisions related to the allocation of risks became a challenge during implementation of the contracts**: (i) cost overruns due to issues with construction management were the responsibility of the municipality (not the national Government), which proved unable to cover these budget deviations; and (ii) operational losses due to

lower-than-forecasted demand, to be assumed by the bus operators to create incentives for performance, ended by being compensated for instead by a deterioration in service quality.

Table 3.3. Allocation of Roles, Responsibilities, and Associated Risks

			Public sector			Private sector	
				Local government			
	Activities	IDB	Nat. Gov.	Metrocali	Municipality	Bus operators	Fare collection firm
Preparation	1. Alternatives assessment		D	D, F			
	2. Public consultations			D, F; **O**			
	3. Institutional strengthening			D, F; **O**			
	4. BRT route structure		D	D; **O**; U			
	5. Demand forecasting			D			
	6. Environmental impact (EIA)	D, F		D; **O**			
	7. Social impact mitigation	D, F		D; **O**			
	8. Land purchases/resettlement	D, F		D; **O**			
Construction	1. Road infrastructure	F, FP	F	D; F; C	M, **O** (control)		
	2. Workshops and yards	F, FP	F	D, P (land), C		P, C; **O**, M	
	3. Integration terminals	F, FP	F	D, F, C; **O**, M			
	4. Stations	F, FP	F	D, F, C; **O**, M			
	5. Bikeways			D	D, F; M		
	6. Additional urban spaces (opt)			D	D, F; M		
Operation	1. PPP concession contract			D		**O**	**O**
	2. Control center	FP		P; **O**			
	3. Vehicles			D	**O** (control)	P; **O**; M	
	4. Fare collection system			D			P; **O**; M
	5. Payment trust		FP				**O**
	6. Service quality standards			D; **O** (enforces)		**O**	
	7. Fare setting				D; U		
	8. Bus scrapping program		D	D; P (finance)	**O** (enforces)	**O** (manages)	
	9. Public transport coordination			(Fragmented, undefined)			
	10. Customer service / comms.			D, P; **O**, M			

Legend: **D –** Design/preparation; **F** – Financing**; C –** Construction (and associated risk); **M –** Maintenance; **U** - Update; **O –** Operation (and associated risk); **P** - Purchases/equipment; **FP** – Fiduciary/procurement oversight

3.15 **In addition, the agreed governance arrangements and processes for the project did not actively incorporate the participation of key stakeholders, including most of the existing traditional and informal bus sector, public transport users, or the other transport authorities in Cali's metropolitan area.** The project proposed to incorporate a share of the traditional bus operators and drivers (up to 60%) into the new MIO system, but the excluded traditional bus operators (and other informal operators) were largely considered as competitors that subtracted a share of the aggregate public transport demand and fare revenues. The plan was to create a program to scrap their buses for compensation, remove their permits to operate transport routes, and retrain them for other jobs, adopting a top-down approach in defining these conditions. In the same vein, the project itself proposed outreach and consultation processes with citizens and users, but the process ended by being informative rather than consultative. The arrangements to incorporate citizen feedback once operations began were not clearly spelled out (e.g., by emphasizing a strengthened customer service unit) beyond the preparation of a final satisfaction survey, so Metrocali planned additional activities and developed a proactive

communications strategy in response to early challenges and the initial feedback from users. The policy framework also called for stronger metropolitan coordination in transport but, in practice, other large neighboring cities (Palmira, Yumbo, Jamundi) were initially excluded from the BRT governance arrangements and their intercity bus operators were perceived (and acted) as competitors, ignoring the requirement to limit their intercity travels to the border terminals (Moller, 2006).[32]

3.16 **Finally, both the national Government and the Bank limited their role to the infrastructure phase, leaving the operational design and system management to the municipal government.** The co-financing agreements between the Government of Colombia and the cities that implemented an integrated mass transit system largely focused on the broad definition of the infrastructure and the system characteristics. While some provisions were oriented toward the governance of the system operations, the implementation of the operation was largely left to the local entities –which typically had weaker institutional capacity.

[32] Given the significant delay in completing the infrastructure for the north and south terminals, intercity buses traveled de facto across Cali, creating urban transportation routes that served as express informal routes.

IV. ASSESSMENT OF PROJECT DESIGN AND IMPLEMENTATION

A. Relevance and adequacy of system design

4.1 **The objectives and scope of the proposed MIO system were very relevant to the overall transport challenges in the city.** At project inception, the interrelated challenges of high motorization and accident rates were compounded by the deterioration of the road infrastructure and the low quality of the service provided by the traditional public transport sector (Moller, 2006). The comprehensive scope of the project—aiming at serving most of the city and of the public transport demand—was coupled with the design of a proposed BRT system whose quality was comparable to that of bus systems in high-income countries. The approach was meant to raise the quality and the image of the service in the city, reverse the decline in the numbers of public transport users, and improve the overall quality of life in Cali.

4.2 **Cali's BRT system design largely met international standards in terms of BRT infrastructure design and earned a silver mark in terms of BRT standards,[33] although it had some shortcomings.** The engineering and operational design of the BRT corridors met many of the international standards for a BRT system including center-aligned rights of way, protected segregated corridors, off-board payment systems, level-platform boarding, well-placed and multiple routes, and passing lanes at most stations. However, the system had some design shortcomings, including a lack of bicycle parking at stations, severe overcrowding in peak hours, and limited user information on schedules and routes.[34] Several sources and GIS data revealed that there were too few charging machines for MIO smart cards relative to the number of bus stops or users.[35] This has resulted in long lines to charge cards, a temporary black market for trips, and a revenue loss for MIO operators. Also, until mid-2013, MIO buses lacked onboard buttons/bells to indicate when a passenger needed to stop, making the transport system less efficient by requiring buses to stop at every stop. Finally, bus stations outside terminals lack real-time information on bus frequencies, and, while different providers have recently made cell phone apps available for travel planning, these apps are of limited usefulness because they do not provide real-time information on buses or travel-time estimates, creating uncertainty for users about bus arrival times.

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33 Earning a score of 82 out of 100 total points possible on the ITDP BRT Scorecard (see ITDP, 2013).

34 System legibility has been a challenge during the past five years in operation—particularly because routes and frequencies are regularly adjusted –but it has been improving over time. OVE's analysis of user behavior indicates that users frequently consult Metrocali customer services for itinerary information. The inclusion of electronic information panels has been an important development, but it is largely limited to trunk lines. More recently, a phone app has been made available to locate bus stops and plan routes, which might particularly help users in higher income levels. However, the mobile app does not offer estimated times or bus frequency, limiting users' travel time efficiency.

35 Concession contracts with the private fare collecting firms specified that the company would install only 200 charging spots, and no provisions for alternative means of recharging modes cards were made (by phone, message, Internet, using third-party providers). There are a total of 1,450 bus stops (including trunk lines, pre-trunk, and feeders). All 65 (out of 66 planned) BRT trunk line stations have a charging machine.

4.3 **One of the MIO's explicit goals was improving the mobility of the poor, which was achieved by planning to cover most of the city, including low-income neighborhoods. That said, the project would have benefitted from stronger diagnostics and planning around the mobility needs of the poor.** While the project objectives include improving the quality of life and mobility for low income residents, the results matrix lacks specific indicators to measure to what extent the poor benefit from the program; also, little diagnosis was undertaken in the planning and technical studies to understand poor people's mobility needs (IDB, 2005). The proposed 2011 additional financing loan from IDB did include an indicator on Afro-descendent users, although it did not explicitly mention low-income users. Most of the interviewees did not seem to give much ex ante thought to issues of mobility for the poor. While Metrocali did not commission a diagnosis on how best to meet the travel needs of low-income groups, the National Planning Department did carry out an ex post impact evaluation that included an analysis of the system's use by socioeconomic stratum, as contractually required by the Bank's loan document (Steer Davies Gleave, 2013). The ex post study assesses mobility patterns and the impact of the scrapping program, but it does not assess affordability issues.

4.4 **The 2007 revision of the MIO infrastructure plans by the national and local governments expanded the system scope and enhanced the designs to adopt a more citizen-centered approach.** The intention was to enhance the potential transformative impact of the infrastructure and service on the public space around the MIO. The revised project included additional terminals and public spaces, enhanced pedestrian accessibility, and 24 km of parallel bikeways, which, overall, are deemed to be positive steps toward best practices in public transport development (DNP, 2007). The MIO could have gone a step further by adopting a transit-oriented development (TOD) strategy. Such an approach could have helped to maximize the use of transport infrastructure (by generating more demand around the system and, by implementing appropriate land use instruments, providing incentives for corridor densification, reducing trips and providing opportunities for land value capture to support the system's maintenance and overall improvement (see Hiroaki, et al., 2013, and Cervero, 2013, for discussion of TOD strategies).

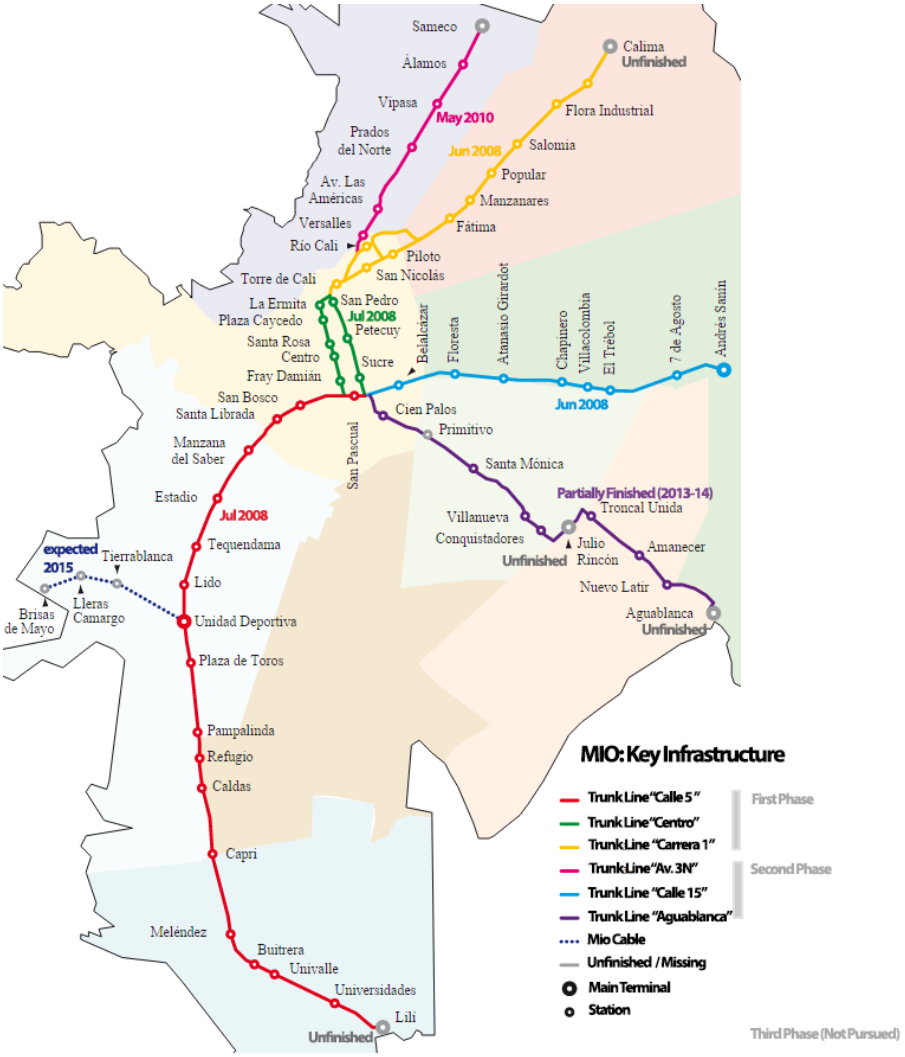
4.5 **The project envisioned a comprehensive monitoring and evaluation framework, allowing for close project supervision and the potential measurement of project impacts.** The loan proposal established frequent and detailed reporting mechanisms, with occasional supervision missions (two per year during the first phase, one a year after that) (IDB, 2005). In terms of evaluation, the project proposed a comprehensive results framework and defined most of the baseline indicators for tracking progress. A quick assessment of short-term economic impacts (to be carried out by Metrocali) was envisioned at project design, as well as a midterm evaluation at 30 months, and a final Project Completion Report within two years after project closing. Finally, there was no commitment to perform an ex post evaluation using project resources, but Metrocali agreed to allow full access to the data if the Bank decided to finance such an impact assessment.

B. Implementation: Construction phase

4.6 **The system was originally planned for delivery in three phases, beginning with the most developed north-south axis, which connected higher-income neighborhoods.** The first phase, which included three trunk lines, was to be executed between 2005 and 2007 (IDB, 2005). Although the system started piloting routes by late 2008 and was inaugurated in March 2009, a significant part of the construction took place from 2008 to 2011: 87% of planned trunk corridors and 67% of the complementary corridors were completed by the end of 2011.[36] As Figure 4.1 shows, key trunk lines –including the Av. 3N and Aguablanca trunk lines– were unfinished at inauguration, and the latter was only recently finished. Other key infrastructure (terminals, *patios* or workshops, transfer stations) was also missing as of December 2014. Overall, the delivery sequence of trunk lines was driven by the ease and political visibility of the north-south arterial corridor, while the Aguablanca trunk line was postponed to the second phase, as it entailed further resettlements and, potentially, additional construction-related challenges.

[36] Cali Como Vamos, 2011.

Figure 4.1. Delivery Sequence of Planned Trunk Corridors



4.7 **While the project began disbursing in 2005, the construction phase took eight years or three years longer than expected– and generated very large cost overruns.** Cost overruns were associated with several factors: appreciation of the peso, delays in construction, and upgrading of national regulations establishing construction standards (Steer Davies Glease, 2013). In 2012, at the Government's request, IDB approved a second loan for additional financing to finish the remaining infrastructure; however, the Government had changed its fiscal priorities and its approach to financing subnational projects, and it decided not to sign the loan contract. The overextended construction phase was related to several issues: the need to revise earlier designs, contract flaws, unplanned expansion of the project's urban landscaping, unmapped underground utility services, and (after several protests) the preservation of centennial trees that are a city landmark along the main BRT corridor. These prolonged issues caused high levels of congestion in construction zones and severe disruptions in business activities.[37] The

37 Contraloría, 2013; IDB, 2014.

project's preliminary design at loan approval allowed the flexibility to adapt to unforeseen construction issues and to respond to changing government priorities, while at the same time added uncertainty regarding final infrastructure costs. Additionally, the systems were still a comparatively much more cost effective means of providing public transit compared to rail based technology of the same scale.

Table 4.1. MIO Cost Overruns: Planned vs. Actual Costs (US$ thousands)

	Project costs (Planned)			Project costs (Actual)			
	Bank funding	**Local funding**	**Total**	**Bank funding**	**Local funding**	**Total**	**% total difference**
1. Studies and Supervision	1,000	15,650	**16,650**		25,050	**25,050**	**+50.45%**
2. Improving Mobility & Urban Environment	195,150	84,000	**279,150**	198,587	291,868	**490,455**	**+75.69%**
3. Environmental Viability	600		**600**	90.7	354.3	**445**	**-25.83%**
4. Social Viability	2,200		**2,200**	785.9	1,414.1	**2,200**	**0**
5. Institutional Strengthening		1,145	**1,145**		1.145	**1,145**	**0**
6. Financial Auditing	250		**250**	536.4	168.6	**705**	**+182%**
Total	200,000	100,000	**300,000**	200,000	320,000	**520,000**	**+73.33%**
Cost distribution	66%	33%	**100%**	38%	62%	**100%**	

Source: IDB, 2014.

4.8 **Land purchases and construction contracts also presented challenges that delayed construction.** One contributing factor was related to Metrocali's belated institutional strengthening and staffing reinforcement, compounded by rapid senior management and staff turnover (IDB, 2014). These conditions created low institutional capacity to assess the quality of engineering designs that had been outsourced to external consulting firms. In addition, the system's new bus operators were also reported to have weak capacity, so when the infrastructure was done, it took some time to get the buses running.

4.9 **The 73% increase in the project's overall cost affected the allocated resources, timeliness, and funding sources of other important components**. As Table 4.1 shows, the social and environmental viability programs and the institutional strengthening component suffered from changes in funding sources and size. The implementation of these activities—most of which were planned for 2006-2007—was also delayed as the local authorities identified alternative sources of financing. As several evaluations and monitoring reports pointed out (IDB 2011; Steer Davies Gleave, 2013), the delays in rolling out the social viability program and institutional strengthening components contributed to the very active resistance of the traditional bus operators to the MIO and the capacity shortcomings observed in some key local authorities, including the Transit Department and Metrocali.

C. Implementation: Operational phase

4.10 **The late completion of key infrastructure elements affected the accessibility of the MIO system in densely populated poor districts.** By late 2013, missing elements of the

MIO were finally being completed and the system has put in service much of its road infrastructure and stations—seven main corridors totaling 36 km, and 162 km of the projected secondary lines' 505 km goal.[38] In the poorest districts around the unfinished Aguablanca trunk line, the easternmost terminal and segment of the BRT corridor were still under construction four years after inauguration of the system. [39] These construction delays severely affected the system's performance and its accessibility to the poor, and made other modes of transport (e.g., traditional, informal, pirate, moto ownership) more attractive alternatives.

4.11 **A critical issue in implementation has been the process of downsizing and reorganizing the traditional and informal transport sector.** The Mayor's Office and the Transport Department were in charge of carrying out a plan to progressively remove the traditional *colectivo* buses from Cali's streets, through route cancellation and enforcement, bus scrapping, and compensatory measures.

- **Route cancellation.** Cali's Department of Transport and the transit enforcement authorities were in charge of removing bus route permits for traditional buses and enforce their ceasing to operate –which had significant political and social costs. The share of bus operators and drivers that were not incorporated into the new system represented a relevant social issue, as evidenced by their strong collective action capacity and their ability to carry out visible strikes that caused road and MIO system blocks (see Figure 4.2). Most of the remaining buses have continued competing against the MIO, and several other informal operators have joined. In addition, informal operators (including moto-taxis and jeeps) compete with the MIO system. [40] Given that the design of the MIO required the scrapping of a large share of bus operators, the continued presence of these operators was perceived more as a competition (instead of complementary) to the new system and thus a threat to MIO's financial sustainability.[41] As a result of the strong organization and opposition of the traditional sector, the planned reduction in traditional buses and routes was not achieved.

- **Bus scrapping.** Bus fleet renewal through a scrapping program was overseen by Metrocali, the local autonomous local agency in charge of management and control of the MIO. The citywide design of the MIO enabled ambitious goals with respect to the scrapping of old buses. Although no specific scrapping target was provided in the

38 Cali Como Vamos, 2013.

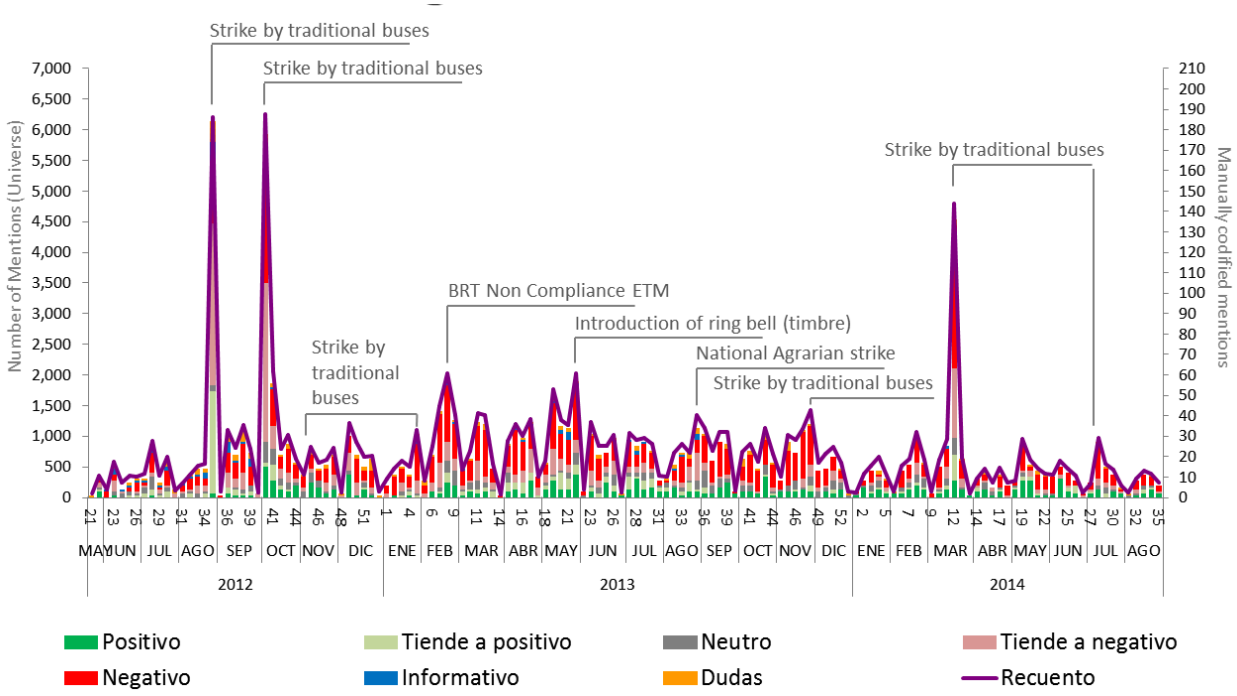
39 The sequencing in the construction of BRT trunk lines agreed between the national and local governments gave priority to high-visibility corridors and delayed the completion of the Aguablanca trunk line to the end of the second phase. By some estimates, this delay contributed to the significant initial gap in demand, since the district is the largest, poorest, and most densely populated area in Cali, concentrating a large share of frequent users of public transport.

40 Informal operators are buses that operate outside of the routes that were licensed to them (e.g. corporate or school buses) while illegal services are those that never had a license in the first place.

41 The system's design documents (DNP 2004, 2005, 2007) and most OVE interviews with government representatives, MIO bus operators, users and traditional sector bus operators pointed out to this shared perception.

loan document, the Environmental and Social Management Report (IDB, 2005) suggested scrapping all vehicles with a technology less than Euro III, and the municipal government adopted a resolution establishing the share of buses to be scrapped by each of the traditional bus operators in 2006. The MIO bus operators had to oversee the bus-scrapping process, carried out at locations across the city. The bus-scrapping process began in 2007, but resistance was strong. Finally, eight years later, the number of collective buses has been reduced from 4,350 to 1,500 vehicles.[42]

Figure 4.2. Traditional Bus Sector Resistance, Strikes, and MIO Disruptions



Source: OVE's MIO Social Media Analysis. Total dataset (N-109,298 mentions of MIO) from May 2012 to August 2014. Representative sample (manually codified): N=3,016 mentions (99% confidence interval, +/3 3.5 error margin). The "number of mentions" in the vertical axis refers to all the universe of online discussions centered around the MIO between May 2012 and August 2014.

- **Compensatory measures.** At design, the project team acknowledged the need to create a compensation and social risk mitigation component, given the political economy of the proposed sector reform. The social viability component –which included incorporating 60% of the traditional system's staff[43] and providing professional retraining and business generation strategies for excluded workers and

[42] A large number of the removed buses were owned by the four bus operators that won MIO concession contracts.

[43] The final number was 40%, below the target (Steer Davies Gleave, 2013).

fixed-price compensation for scrapped buses[44] –was completed three years behind schedule, allowing traditional bus owners and their drivers to entrench their positions against the MIO[45] (see Box 4.1) Most outreach activities to gain these actors' acceptance of the process took place too late; as a result, only a small share (10.7%) of the sector stakeholders actually participated in and benefited from the component (Steer Davies Gleave, 2013).

4.12 **The combination of implementation challenges reduced the MIO's service delivery capacity; citizens responded with low satisfaction levels and, consequently, sustained low demand.** The unfinished infrastructure and the reduced number of MIO buses in operation have prevented the system from reaching its full operational level and have generated less efficient and suboptimal performance for most of the period. As the MIO operators reacted by reducing the frequency and quality of the system, MIO users have paid the price in terms of longer travel times, bus and station overcrowding, and less than satisfactory service conditions. As a result, the image of MIO as a reliable transport alternative in Cali quickly deteriorated, and citizens have increasingly resorted to alternative (private, informal) modes of transport. Given the increasing political pressure on the situation by users' associations, citizen organizations, and the media, the Cali mayors have responded by replacing Metrocali's CEO every 1.2 years on average. This action has contributed to the instability of management teams and loss of previous capacity-building efforts. But the proposed transition for the sector has remained in stalemate.

[44] The compensation was set at 30 times Colombia's official minimum monthly wage (or a total of US$8,000, in 2014 prices). A significant number of bus owners resisted the bus-scrapping effort, arguing that the compensation did not account for factors such as age and condition of the bus, or for the economic opportunity cost of continuing to do business for the remaining time of the vehicle's life. As a result, most bus operators found the compensation to be unfair/insufficient and refused to remove the buses from the streets. To compound the situation, cost overruns during the construction phase shifted the funding responsibilities for the bus-scrapping component to local counterpart funding, which required additional time to ensure budget appropriations to finance the process. Because system demand was significantly lower than expected, the funding of this process throughout a special fund replenished by 3% of the system fare was also insufficient.

[45] As the short-term ex post economic evaluation of the MIO indicated (Steer Davies Gleave, 2013), bus drivers made significantly more in the traditional system, despite worse working conditions and job satisfaction.

Box 4.1. The Importance of Mitigating Social Risks in Urban Transport Upgrading

Photo. Cali's local police protecting MIO buses from demonstrators. © 2013, Flickr creative commons.

While the Bank's social safeguards and the proposed social viability component were planned to address all potential risks, the lack of timeliness in the delivery of the mitigation measures made the measures less effective. During project preparation, the Bank did not have a standing Safeguards Unit in place, limiting the technical support ESG could offer to the sector specialists. Thus, in the early stages of the project, these aspects were given a lower priority than infrastructure construction. Because of late implementation, most measures proved ineffective to fully mitigate the social and political economy risks of removing all the traditional bus system by decree. Some lessons emerge from the MIO experience.

(a) Overall, IDB social safeguards raise the national standards for social mitigation. In the official document approving the funding for the project, the national Government required Cali to ensure alignment with IDB's safeguards policy if the Bank cofinanced the project (DNP, 2005). As a result, the project design was aligned with the Bank's policies and incorporated a social viability component that required compensating for relocations and for scrapped buses, as well as providing retraining programs for transport sector employees who would lose their jobs to the BRT.

(b) A timely (and early) delivery of the social mitigation measures could improve the required changes in bus ownership. Part of the ineffectiveness of the social viability component measures in Cali was related to the slow implementation process.[a] By the time key activities were delivered, participation rates were just around 10% of the potential beneficiaries. An early delivery of alternatives to excluded parties avoids the organization of resistance against the new public transport system.

(c) Perceived fairness in the compensation process and ensuring the resources beforehand are crucial factors for success. Four of the largest traditional bus operators, which became part of the BRT system, contributed almost two-thirds of the planned 5,500 scrapped buses, but the remaining smaller operators and their employees deemed the compensation policies and training courses to be insufficient. With strong organizational capacity, they led several mass protests that repeatedly disrupted the BRT system during 2012-2014. In addition, part of the compensation scheme was linked to fare revenues and, because demand was lower than expected, availability of enough resources to finance the compensation scheme became an issue and slowed down the process.

(d) Intra-government coordination and ownership in contexts of fragmented responsibilities is critical for project success. The project's institutional framework made the assumption that local government entities would seamlessly coordinate; it did not account for the fragmentation of authority and for political economy problems linked to the sector downsizing process. In Cali, the local transport department and the police were responsible for preventing the traditional buses from continuing their business, assuming all the political and legal costs of the process, as well as receiving death threats. Overall, the fragmentation of responsibilities among Metrocali and the Departments of Transport, Infrastructure, and Planning generated tensions over the control of resources and regulatory space within the city that increased the transaction costs.[b] As a result, a large number of the remaining traditional buses have continued competing with the MIO, contributing to prevent the system from reaching the demand targets and achieving financial self-sustainability.

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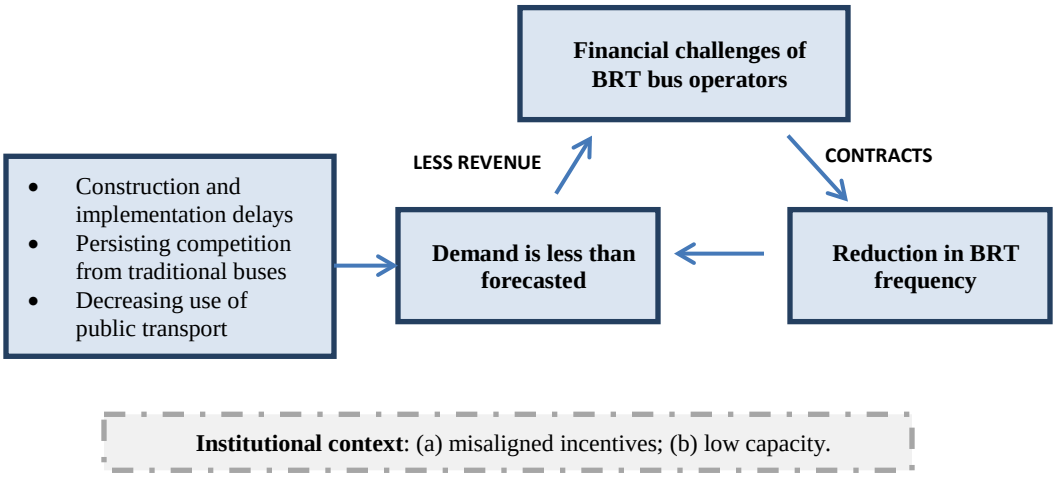
[a] ESG (2011).
[b] Source: Interviews with local authorities and review of local budget allocations.

4.13 **Although the institutional commitments for public transport re-regulation at project inception gave key responsibilities to the local transport regulator, regulatory capture by the traditional system quickly became an issue.** Given the high intensity and persistence of demonstrations from the traditional sector, the local regulator[46] was *de facto* captured by the operators and drivers. The judicialization of transport rights, labor disputes, and failed implementation of local agreements has several times sent the Secretary of Transit to prison for a few days (including during OVE's mission), or suspended him for a few months.[47] Several independent sources also indicated that local authorities in charge of carrying out the bus-scrapping process had been repeatedly threatened, discouraging enforcement.[48]

Figure 4.3. Summary: Impact of Implementation Challenges on BRT Operation



Source: Adapted from Yepes (2013).

4.14 **The distribution of risk in PPP contract design for the MIO system and the resulting implementation challenges prevented Metrocali from acting as the system's regulator and enforcing service quality standards.** It has been noted that the system demand has been far lower than predicted. As an incentive to ensure performance, the PPP contracts with the bus operators allocated all the risk of lower demand to the operators.[49] However, MIO's bus operators were unable to sustain such losses,[50] so they

46 The Transit and Transport Secretariat, with the support of the Police, is the entity in charge of regulating and overseeing transport in the city (but not within the SITM-MIO).

47 Colombia's "tutela judicial" system allows private citizens to sue authorities for failing to protect constitutional rights and can result in immediate penal responsibilities (typically counted in days) for public officers. See, for example, *El Pais* (November 25, 2013).

48 Cali's recent history of violence, with comparatively high homicide rates, gave credibility to these threats.

49 For example, while the contracts defined the distribution of fare revenues according to a rule, in the event of missing the demand target, the share assigned to each of the parties was adjusted in a way that the bus operators would bear all the losses for missing the target.

50 One operator (composed of a cooperative of small traditional bus owners) went broke earlier, and two of them have recently been bailed out by other private investors and contingency funds. See ADN newspaper (Jul 10 2014), El Espectador newspaper (Jul 8 2014).

compensated for the lower demand by decreasing bus frequency and system quality (Contraloría, 2013). As Figure 4.3 shows, the situation ended in a regulatory stalemate, since Metrocali was working to finalize the construction of the infrastructure and the local transit authorities were unable to enforce the removal of the agreed number of traditional buses in the streets without generating a political backlash.

4.15 **Ultimately, institutional weaknesses during the construction and operation of the MIO drove the system to an unsustainable state, requiring support from the national Government.** The consequences of the institutional stalemate became more evident during 2012-2014, with spiraling debt for MIO's bus operators, progressive deterioration in the quality of service delivery, regulator capture, an increasingly negative image of the city's public transport system, numerous demonstrations, judicial involvement in local transport policy, and rising political pressure for the local government. In late 2013, the national Government agreed to intervene, offering an additional US$224 million to finalize the MIO's unfinished infrastructure. In exchange, the local government authorities and the MIO bus operators agreed to take further steps to restore the planned levels of service delivery (buses in operation); improve the social mitigation plan to reduce resistance to bus scrapping and removal; and restore the optimal levels of service delivery in terms of operating buses (DNP, 2013).

4.16 **Overall, the monitoring and evaluation framework was implemented effectively, strengthening supervision when implementation issues became more pressing.** In total, the Bank team carried out the number of planned supervision missions and prepared 12 Project Monitoring Reports between 2005 and 2013 –with higher annual frequency during 2005-2008 (preparation and initial construction) and 2011-2013 (troublesome operational phase). Project expenses directly related to supervision came to US$87,200 for international missions and about US$11,870 for support missions from the Country Office. In total, the Bank devoted 169 staff-weeks to preparing, implementing, and closing the project (2003-2014), with two-thirds of the support concentrated in the preparation and first years of supervision. Bank-financed technical support through external consultants amounted to US$137,470, but it did not go beyond the project approval date. However, the Bank's transport specialists provided support both during preparation and when project implementation stalled (2008-2011), with a more occasional engagement afterwards (IDB, 2015). Finally, regarding project evaluation, the national Planning Department carried out an extensive impact evaluation of the project's different objectives (Steer Davies Gleave, 2013), and the Bank prepared a related PCR, which was discussed with government counterparts in a technical workshop during early 2014.

V. RESULTS

5.1 **Overall, the development of the MIO-SITM made progress in some important areas, while it has not met other key project objectives.** The positive impact of the project include (i) faster travel times in the BRT trunk lines; (ii) a reduction in emissions; (iii) an expansion in public spaces, further densification, and the development of 50% of planned 24 km of bikeways; and (iv) more comfortable public transport vehicles. Among the project's unintended negative outcomes: (i) decline in overall public transport frequency and service quality; (ii) unmitigated short-term negative social and economic impacts directly linked to the project; and (iii) increasing dissatisfaction with the MIO-SITM by both users and non-users. In addition, the evidence suggests that there were two additional areas with mixed results: (i) overall system accessibility improved in some geographical areas and for some groups, such as handicapped users, but declined in other areas; and (ii) the modal shift from the traditional bus system toward the MIO-SITM was significant, but the share of public transport users either declined slightly or remained stable, depending on the data sources. This section provides the details on the key results in terms of system performance, mobility, emissions reduction, accessibility for the poor, and citizens' overall satisfaction.

A. System performance

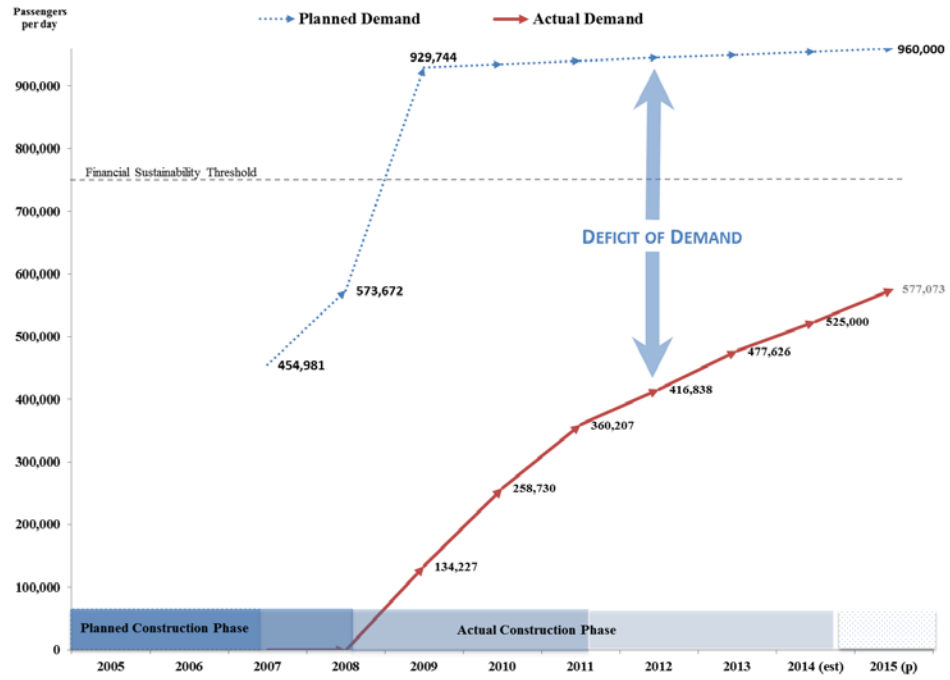
5.2 **In contrast with Bogotá's *Transmilenio* system, whose ridership quickly exceeded expectations, the MIO's ridership has been well below the demand forecasts.** While the initial forecast estimated 880,000 (IDB, 2005) and 960,000 passengers/day (Metrocali, 2006), actual demand grew very slowly. The financial/operational equilibrium ridership level is 750,000. The system was inaugurated in a pilot phase in late 2008, and by 2011 the ridership had reached 460,000 passengers per day (DNP, 2011). By 2014, the demand reached 525,000 passengers, and a slow increase is expected as demand-enhancing measures are implemented. Table 5.1 and Figure 5.1 show the deficit in demand over time.

Table 5.1. System Performance

	MIO (target)	MIO (actual)
Public transport demand (average daily trips)	960,000	525,000
Number of routes	91	90
Bus fleet (operating)	937	709
Segregated trunk line routes	11	11
Number of operators	5	5
Index of passengers per km (IPK)[a]	8.7	8.7
Segregated trunk line routes	11	11
Fare	1,500 COP	1,600 COP

Sources: Metrocali (2013), Cali (2007, 2013), Contraloría (2013), BRTData (2014), Metrocali (2015).
[a] IPK in 2004 was 3 for the whole system and 3.5 for trunk and pre-trunk lines.

Figure 5.1. MIO's Planned and Actual Demand: 2007-2015
(Average number of passengers/day)



Sources: DNP (2007); Metrocali data; Cali Como Vamos (2013).

5.3 **MIO also did not attract the modal shift from private vehicles to the extent predicted.** While the progressive transfer of passengers from the traditional bus system to MIO has been significant, the Clean Development Mechanism Report (2014) estimated a more modest modal shift from private cars of 2%, half of the 4% expected. However, their survey asked only about trips in the MIO that would otherwise have been taken in cars or motorcycles, but did not track people in private vehicles who had previously taken public transit. Other independent surveys (Cali Como Vamos, 2005-2013) show that the increase in private transport during the past decade has diminished the share of public transport users and that of non-motorized travelers. As Table 5.2 shows, approximately 22.5% of all work trips were taken on the MIO in 2012. While the MIO is estimated to be the second-highest work commute mode share next to walking and biking (29.58%), other public transport vehicles and motorcycles still present significant competition, carrying 14.9% and 14.5% of work trips, respectively (Cali Como Vamos, 2013).

Table 5.2. Changes in Modal Split (2005-2012)

	2005	**2012**		
Modal split % non motorized	35%	29.58%		
Modal split % private transport	17%	31.33%		
Modal split % public transport	48%	**38.98%**	*22.54%*	*14.99%*
			MIO	**Traditional bus**

Sources: Cali (2005a), Cali Como Vamos (2013).

B. Mobility

5.4 **Travel times along the main routes improved, particularly along the BRT segregated trunk corridors, but overall results were more limited.** Official estimates indicate that MIO is achieving a 5-minute average savings in-vehicle travel time (DNP, 2011). On the main trunk lines, MIO achieved the target of reducing in-vehicle travel times by 22%. More generally, Metrocali data for 2014 indicate that averages for bus speed (17.7 km/h) timeliness (75% of target) and frequency (52% of target) have lagged behind the original project goals.

5.5 **Because fewer MIO buses are in operation than planned, bus frequency and system overcrowding deteriorated in comparison to the previous traditional bus system.** MIO bus operators' failure to comply with timetables and the partial incorporation of the expected fleet were translated into longer wait-times for buses, service unreliability, and overcrowding on buses, particularly in peak hours (Cali Como Vamos, 2013; Metro Cali, 2012 and 2013 data). These findings were identified in yearly user satisfaction and opinion surveys from 2011 to 2013[51] as well as OVE's analysis of online user complaints for 2012-2014 (see Figure 5.6), interviews with Metrocali and bus operators and focus groups with users and OVE's survey of users living in the vicinity of the system that found that long waits for buses was the second most cited reason for preferring the traditional system.

Box 5.1. Public opinion and public transit reforms

Although intended to be more efficient and improve overall mobility for the population, large scale public transport reforms can imply dramatic changes in the ways in which public transport users were accustomed to traveling, particularly in cases where public transport was previously highly informal and deregulated and where the project takes a big bang approach, reforming the entire system such as in the case of Cali (but also as in Santiago, Chile). Such changes can include longer access times to stations (due to longer stop spacing), more transfers, the need to use bus stops rather than flagging down buses anywhere, and learning how to use electronic fare charging systems. For car owners, changes in traffic flows can cause inconveniences. In Cali, the system was revamped from decentralized ones, in which passengers could flag down minivans/colectivos in the street and in which there were long overlapping routes, to a centrally managed trunk and feeder configuration with several complementary routes. This can result in longer average access due to longer distances between stops and more transfers for users, although faster in-vehicle travel speeds along trunk lines due the exclusive corridors and other BRT design features. Stations are often placed further apart on trunk lines compared to conventional bus service (500 to 700 meters). As a result, passengers have to walk further to get to a bus stop. This in combination with the system having fewer buses in service than anticipated may have adversely affected approval ratings in Cali.

5.6 **There is a perception that access time to stations has increased for some users of the MIO compared to users of other public transit.** In interviews, public transit users that switched to the MIO complained of needing more time to reach their closest stations; this was also confirmed by surveys of poor public transit users in the area of influence of the system who cited long access times as a barrier to usage. Increased access is related to three factors: (i) the progressive (albeit

[51] DANE's Calidad de Vida 2013; Cali Como Vamos, 2011-2013; SDG, 2013.

incomplete) downsizing of the traditional bus system, which lacked formal stops but was convenient to users since they could flag down buses in the street; (ii) the introduction of trunk-organized BRT bus stops, which are, almost by definition, farther away than a street where a bus can be flagged down; and (iii) the need to walk several blocks to find one of the relatively few fare-charging stations for MIO's smart cards (See also Box 5.1).

5.7 OVE's analysis of the 2010 Origin-Destination (OD) survey finds a small but statistically insignificant increase in walking time to MIO stops compared to access for non-MIO public transit users. However, the wide variance in walking times for MIO users suggests that for those at the upper tail of the distribution, walking times are longer to take the MIO.

Table 5.3. Differences in Means and t-tests for main travel features between MIO and No-MIO users

	TRAVEL TIME		**WALKING TIME**		**WAITING TIME**		**TRAVEL COST ($ COP)**	
	NO MIO	*MIO*	*NO MIO*	*MIO*	*NO MIO*	*MIO*	*NO MIO*	*MIO*
Mean	54.41	58.34	6.95	7.15	8.92	8.68	1,241.86	1,108.18
Variance	4962	8,493	60.6	169.3	69.7	59.4	118,3151	755,250
Observations	6,448	2,067	6,448	2,067	6,448	2,067	6,160	1,948
Pooled Variance	5818.95		86.96		67.16		1,080,372	
df	8513		8513		8513		8106	
t Stat	-2.038		-0.852		1.125		4.948	

Source: Own elaboration based on Cali OD survey (2010)

5.8 **Issues with concession contracts and limited design specificities for buses affected the quality of the service.** It has been mentioned that issues with concession contracts for both the bus operators and the fare collection firm resulted in systematic underperformance on service delivery quality (Contraloría, 2013). In addition, specific design limitations in buses prevented optimizing time and energy efficiency—for example, the lack of a stop bell, inefficient calibration of air-conditioning system with bus door opening frequency, and BRT-bike integration.[52] Also, because fewer buses are available, the routes have been frequently redrawn, so the system's actual coverage is more limited than was intended. These factors affected the efficacy and efficiency of the overall system. The oversight agency has noticed an increase of illegal transport throughout the city to fill in the gaps, and local authorities have progressively accepted mixed solutions involving better complementarity with the traditional bus system.

C. Emissions impacts

5.9 **After some delay, 80% of the buses targeted for scrapping were scrapped and the emissions reductions were achieved.** The MIO project targeted 43% of the *colectivo* fleet (about 5,300), and after delays in the scrapping process, the number

[52] Moller, 2006; Mosquera Becerra, 2014.

of vehicles went down to 1,450. The non-targeted vehicles, as well as those whose owners refused to participate in the scrapping process, continued generating emissions outside the MIO system; but overall, the emissions reduction targets were achieved (see Figures 5.2 and 5.3).

Figure 5.2. $PM_{2.5}$ Emissions Savings

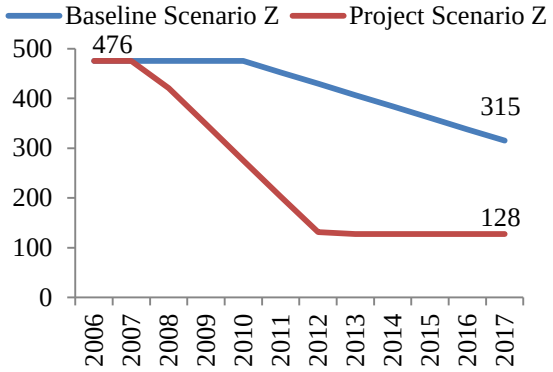
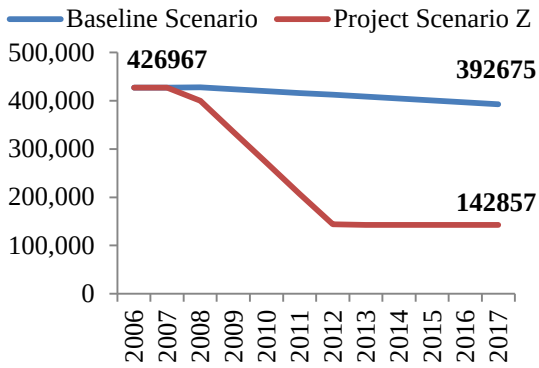


Figure 5.3. CO_2 Emissions Savings



Source: OVE's **Emissions Analysis**

5.10 **Cali's system saved approximately 65% (253,000 tons) in annual CO_2 emissions and 67-69% in both $PM_{2.5}$ and black carbon emissions in 2013-2014 relative to the business as usual scenario (see emissions appendix).** Emissions savings grew over time as the system was implemented. The savings were large because of the large scale of the project; however, they were dampened by the delays in the vehicle scrapping processes, the ongoing competition with traditional bus companies that continued to operate in parallel to the cleaner buses, and the contractual and financial issues with the bus companies that have led to suboptimal service quality. Lower-quality service has in turn led to lower-than-planned bus frequencies, and thus lower-than-expected demand and modal shifts (from private vehicles to public transit).

D. Access for the poor

5.11 **Although the project stated a particular emphasis on improving mobility of the poor, there are gaps in system coverage in poor neighborhoods remains.** The system was designed so that the trunk lines would serve the highest-demand corridors (north-south, east-west), connected radially through the city center. Although an origin-destination survey was carried out and informed the design, in practice the design of MIO's trunk lines and feeders was for the most part based on the routes used by the traditional system (IDB, 2005). The proposed route map covered most of the city as planned, although not evenly, with some areas experiencing a great oversupply of public transport and other areas having very limited options and routes (Jaramillo, 2012). The original design, approved by CONPES (DNP, 2002; IDB, 2005), was adjusted in 2007 by downgrading the easternmost trunk line to a pre-trunk corridor (reflecting a variety of factors, including updated estimates on actual demand and financial considerations). However, that eastern part of the city is characterized by very high density and the highest concentration of low-income users. Given the high density of potential

public transport users in these districts, there seems to be a broad retrospective consensus in interviews with stakeholders regarding the negative impact of these design changes on the demand and mobility improvements for the poor (see Poverty Analysis).[53]

5.12 **While the poor use the MIO, they use it at lower rates than other public transport forms, and in comparison to middle-income groups indicating a need to better tailor services to meet their mobility needs.** For example, analysis of Cali's 2010 origin-destination survey shows that 7% of the extreme poor (stratum 1) and 9% of the poor (stratum 2) use the MIO, while 43% and 29% (of strata 1 and 2, respectively) take other forms of public transit (such as conventional or informal buses). Among low- to middle-income groups, 10% of stratum 3 and 9% of stratum 4 use the MIO, while taking other forms of public transit only 21% and 10% of the time. However, in later years, as the system expanded, use by poor and very poor people increased. An ex post evaluation commissioned by Metrocali in 2013 found that the MIO is the main mode of public transport for the different strata studied. However, as Table 5.4 and Figure 5.4 show, it is more used by stratum 3 than by strata 1 and 2. The use of the trunk system is also more important in stratum 3. For stratum 1, modes such as informal *camperos* are important (close to 10%), and for stratum 3 the taxi (24%) has an important role in daily trips.[54] A survey conducted by OVE of poor (strata 1-2) public transport users within the areas of influence of the MIO confirmed this trend, finding that 26% of all the trips taken by low-income users involve the BRT. When excluding walking trips, 42% take the BRT and 58% take other non-BRT public transit.[55] The fact that the poor who live near the BRT system use it less than the traditional system indicates room for improvement of the MIO system with respect to their mobility needs, particularly given the project's objectives of full coverage and improving mobility for the poor.

5.13 **In the survey, non-BRT users in strata 1 and 2 stated that they did not use the MIO because (i) other modes of public transit were faster for their destinations (32%), (ii) the MIO buses were often delayed (18%), and (iii) lines at stations were too long (18%).** Notably, 10% of OVE's survey respondents among non-BRT (but regular public transit) users living near the feeder routes cited long walks to bus stops as a barrier.

Figure 1. Stated reasons for not using the MIO among Strata 1 and 2 public transit users who live near the MIO system but are not MIO users

53 This observation was consistently expressed by very different stakeholders, including academics from three local universities, civil society groups, city planning specialists, user groups, and some MIO bus operators.

54 The ex post evaluation shows that the number of users from the poor areas is close to 260,000 for stratum 1 and 211,000 for stratum 2.

55 Survey and analysis conducted in collaboration with Juan Pablo Bocarejo, Universidad de los Andes, and Daniel Oviedo.

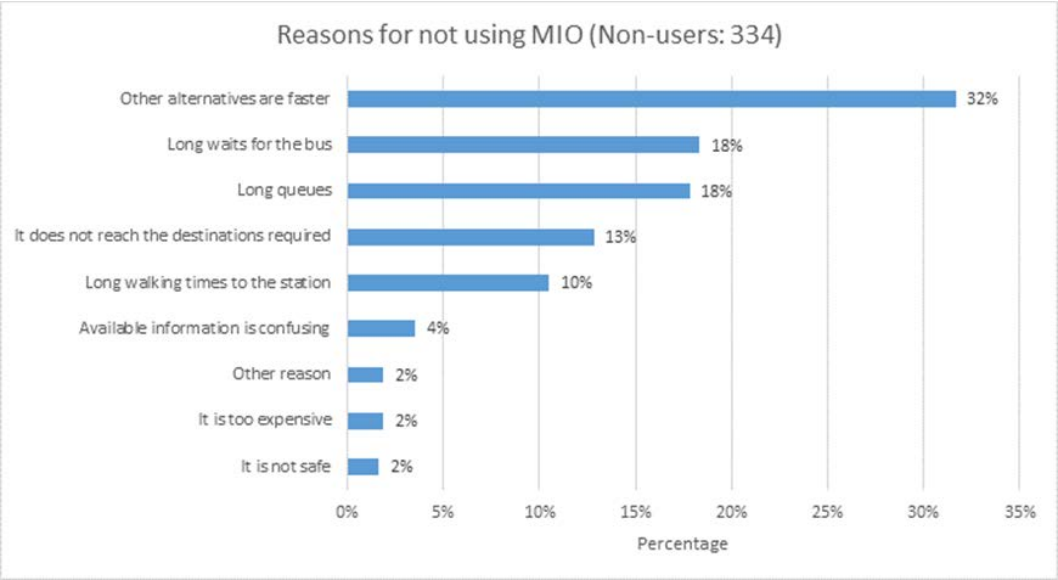
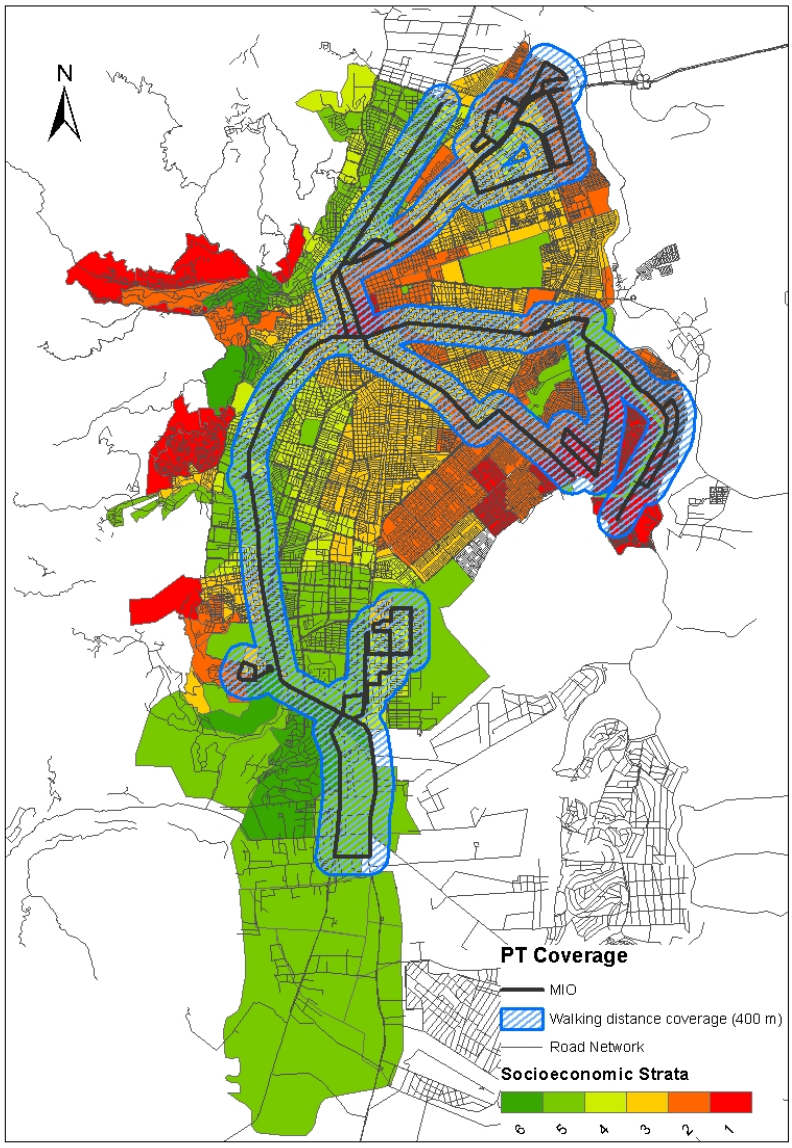

Reasons for not using MIO (Non-users: 334)
Other alternatives are faster
Long waits for the bus
Long queues
It does not reach the destinations required
Long walking times to the station
Available information is confusing
Other reason
It is too expensive
It is not safe
32%
18%
18%
13%
10%
4%
2%
2%
2%
0%
5%
10%
15%
20%
25%
30%
35%
Percentage

Figure 5.4. Coverage of the MIO (Walking Distance) and Socioeconomic Strata



Source: Own calculation using DANE (2012) and Metrocali (2013) geo-spatial data.

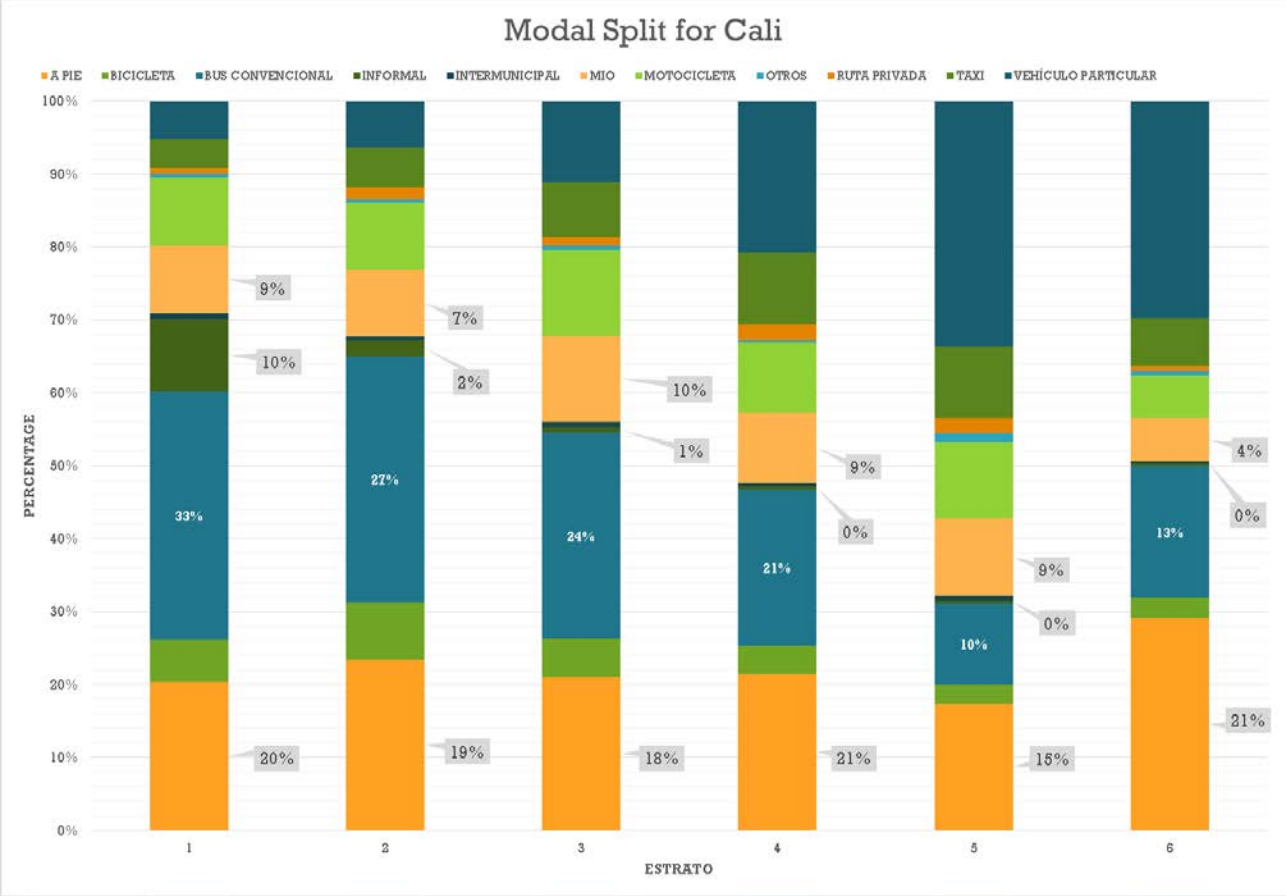
Table 5.4. Public Transit Mode Shares by Socioeconomic Strata: Low-Middle Stratum (3) to Poorest Strata (1 &2)

	Stratum 1 (Lowest)	**Stratum 2**	**Stratum 3**
MIO (trunk)	54.3% (34.6%)	62.5% (41.9%)	66.8% (44.7%)
Traditional buses	24.9%	23.2%	12.1%
Other	20.8%	14.3%	21.2%

Source: OVE estimates using Steer Davies Gleave (2013) data.

5.14 **Moreover, several diagnostics identified zones where the connections in the neighborhoods are inadequate, particularly in low-income hilly zones**.[56] While some of these issues will be mitigated with the construction of the delayed MIO cable to *Comuna 20* district, other hilly districts will continue experiencing limited access. The streets are narrow, curvy, and steep, and MIO feeder buses are often unable to negotiate them. Metrocali reported that it is working to integrate the informal jeep system into the MIO network, and some steps have recently been observed in that direction.

Figure 5.4. Modal Split by Socioeconomic Stratification



5.15 **System legibility also emerged as a challenge for the poor.** Given the complete overhaul of the transport experience with the new system (established stops vs. on-demand stops; charging and payment with smart cards; system fare integration; interpretation of coding and mapping), it was reportedly very difficult for low-income groups to understand the system and trust some of its features (see Box 5.1, below). Different sources, including Metrocali, reported that the initial maps and instructions were overly complex and difficult to understand.

[56] Cali, 2008; Mosquera Becerra, 2014.

Box 5.1. From Cash to Smart Cards: Challenges in the Transition

The use of smart cards for the payment systems generated unanticipated challenges related to slow culture change and logistics. The MIO system did not transform just the infrastructure and organization of public transport in Cali, but also the whole service delivery experience and employee-user interaction:

- **The impact and culture transition from cash-based transactions to electronic payment is often underestimated.** While fare payment under the traditional system was based on cash, allowed bargaining according to the distance of the desired itinerary, and involved predictable transactions, the introduction of smart cards resulted both in a steep learning curve for low-income users—most of whom had to interact with machines for fare payment for the first time—and a challenge in terms of payment logistics, because of the limited number of recharging machines in the city (GGT, 2006).
- **While outsourcing revenue management to an independent external party may mitigate corruption and ease the adoption of new technologies for fare collection, the quality of the contract is critical to ensure efficiency and user satisfaction.** The PPP contract with the private revenue management firm did not allocate risks adequately, and there was a lack of incentive for the firm to cooperate with the other public/private stakeholders to enhance the system's service delivery. Giving a literal reading of the long-term concession contract with Cali, the firm resisted expanding the number of MIO's recharging machines beyond the contracted 200 locations. Later on, the system agreed to outsource additional recharging locations to third parties (*Gane* locations), which has slightly improved the situation (Yepes et al., 2013).

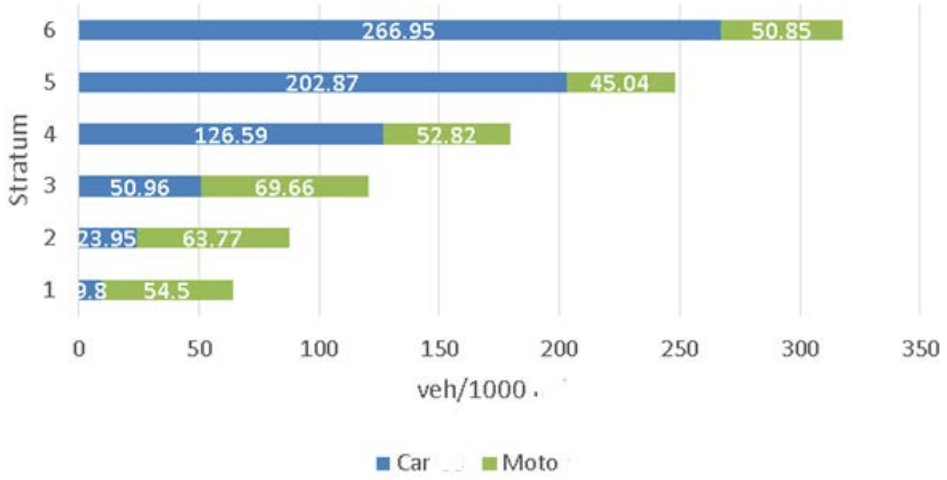
These barriers were compounded by a limited educational outreach by the project regarding how to use the system, and only a very belated adoption of technologies to facilitate other alternatives of fare payment and smart card recharges.

Source: Own elaboration based on Cali's Origin-Destination Survey (Cali, 2010a).

5.16 **Among the poor (strata 1 and 2), travel times for BRT are 4 minutes (7%) higher, on average, while travel costs of MIO users are on average 130 COP (11%) lower in comparison with costs to users of *colectivo* transport.** Integrated fares and the introduction of feeder routes that replace the need for two or more transfers in traditional transport at full fare cost are factors that likely explain the lower costs for MIO users (OVE survey, 2014). Similarly, given the trunk-feeder configuration and reduced stop spacing in segregated corridors, the BRT would have a comparative advantage for longer trips, a possible explanation for longer average travel times on the BRT.

5.17 **Competing private modes of transport are becoming more accessible across the income spectrum, posing a real challenge to public transport.** Figure 5.5 shows, by socioeconomic stratum, the rates of ownership of private motorcycles and cars. Although the city of Cali has marked differences in its socio-demographic distribution, motorcycle ownership rates do not decrease with decreasing strata. Thus, motorcycles are the most significant competition with the MIO among lower-income groups in Cali.

Figure 5.5. Vehicle Ownership per 1000 inhabitants, by Socioeconomic Stratification



Source: Own elaboration based on Cali, 2010.

5.18 **Private motor vehicles, in particular motorbikes, have been growing exponentially in Cali during the period of study**. Competition from growth in motorcycle ownership and moto-taxis is reducing demand. As shown in Figure 2.2 and 5.5, growth in ownership of private vehicles, but particularly exponential growth in motorcycle ownership, growing from 50,000 to 150,000 registered motorbikes in the last four years. Different sources indicated that rising incomes, peso appreciation, lower import tariffs, and deeper credit markets penetration were among the factors driving this modal shift. These multiple sources indicated that, for the average user, the medium-term cost of small private vehicles (such as motos) was lower than the accumulated cost of public transport, but without the uncertainties related to travel times and reliability. Modal shares have been shifting from public transit to private motorized transport. Public transit shares declined 5 percentage points, while that of private transport increased by 4 percentage points, between 2011 and 2013 (Cali Como Vamos, 2013).

E. User perception and satisfaction

5.19 **The project's expected impact was to increase the satisfaction ratings of public transport users to above 60%, but user satisfaction has been declining since the 2009 inauguration of the MIO.** Independent citizen surveys have been tracking the quality of local public services in Cali since 2005. The results of these yearly large-sample surveys, summarized in Table 5.5, reveal that the satisfaction levels with the MIO reached an all-time low of 25% in 2013, far from the project's target of 60%. Since 2012, a majority of citizens are reporting that their quality of life has deteriorated because of the introduction of MIO; and since 2013, a majority also thinks that the traditional bus system was better than the current MIO. The perception data is consistent with the reported decline in objective performance of the system (Contraloría, 2013).

Table 5.5. Citizen Satisfaction and Perception of the MIO

	2009	2010	2011	2012	2013	Project Target
Satisfaction with MIO	56%	47%	48%	37%	25%	**60%**
Quality of life is <u>better</u> with the MIO	**45%**	**47%**	**42%**	36%	35%	
Quality of life is <u>worse</u> with the MIO	32%	18%	15%	**43%**	**41%**	
MIO is …. than the traditional transport system						
Better	**47%**	**48%**	**52%**	**37%**	30%	
Same	28%	33%	34%	27%	24%	
Worse	23%	19%	14%	36%	**46%**	

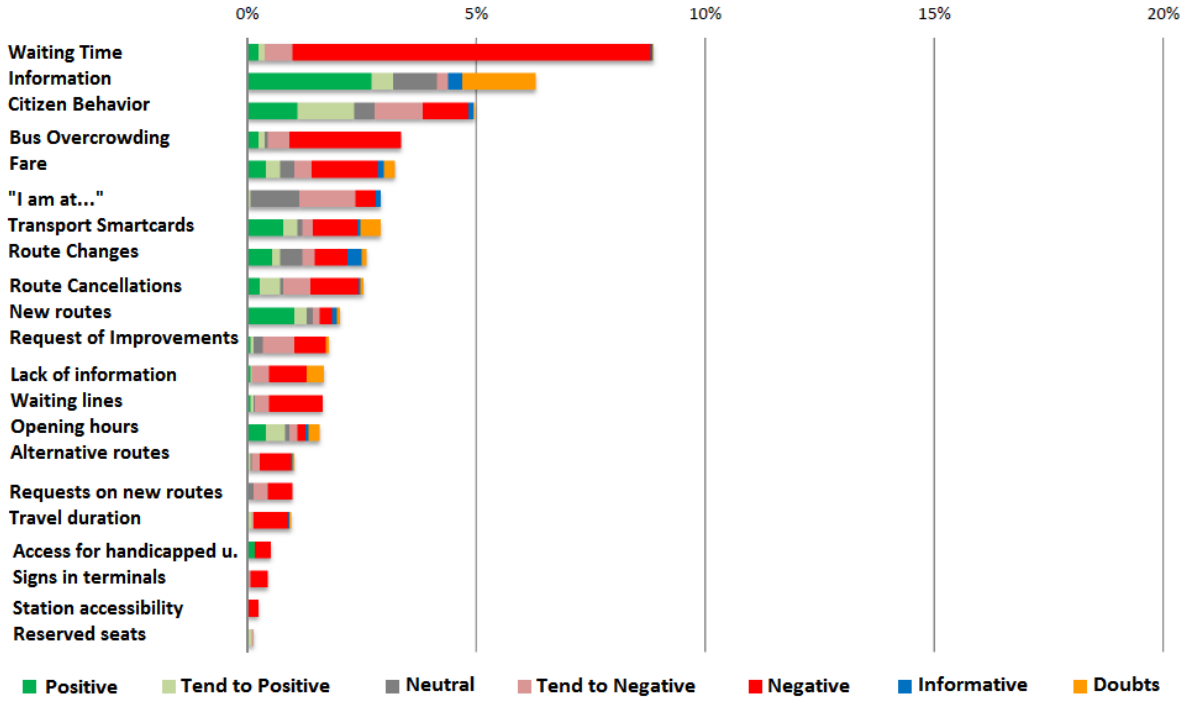
Source: Cali Como Vamos (2009-2013 surveys).

5.20 **Earlier surveys carried out by the project during 2011 offered a more positive picture, reflecting the positive performance in the operation at inception.** According to surveys conducted by the national government, during the first two years of operation users rated the system on average 7.3 on a scale from 1-10, with 87% stating that they felt it had improved mobility in the city (DNP, 2011). Ratings were slightly lower among the lowest socioeconomic group (stratum 1), 6.98 on average compared to 7.60 (for Strata 2-6). When asked what aspects of the system needed improvement, respondents identified the coverage of feeder routes (37%). A survey commissioned by Metrocali in 2013 found that, on average, 71% of low-income and poor user respondents were satisfied with the system's basic physical characteristics such as station placement, distance between stations, and ease of station access. Slightly over half of these users were satisfied with travel times on the new system (52% in 2013 versus 47% with the old system in 2004; Steer Davies Gleave, 2014; IDB, 2005). However, less than half of this group of respondents was satisfied with wait times for buses (45%, 7 percentage points lower than the baseline approval rate of 52%). The earlier survey by DNP found even lower ratings for improvements in travel time of the system, with only 34% of respondents stating that travel times had decreased with the new system. Significantly more respondents in the same survey thought that the system had improved air quality (60%), and 48% said it had improved the overall quality of life.

5.21 **Most user complaints revolve around the system's low performance in terms of frequency and overcrowding, incomplete infrastructure, and accessibility issues – related either to the infrastructure design or to the limited availability of recharge stations for smart cards.** Public transit users have complained that, in addition to the longer wait times, they have to walk long distances to get to the stations or bus stops and have to wait in long lines to recharge cards; places to charge cards are too few and distant; and the buses are often overcrowded and they need to make more transfers than in the previous system (Target-Empirica, 2014). Based on the qualitative analysis of a very large dataset tracking online discussions around the MIO's performance, Figure 5.6 identifies users' level of concern regarding different issues affecting the MIO during

2012-2014 adjustments in the route map, smart cards, and the 2012 price hike –have consistently been among the top sources of concern and frustration regarding the MIO, driving the negative image of the system. In contrast, Metrocali seems to have been diligent in addressing information requests from users and, secondarily, in promoting civic values regarding the use of public transport in the city. [57]

Figure 5.6. Key Aspects of MIO Users' Public Feedback



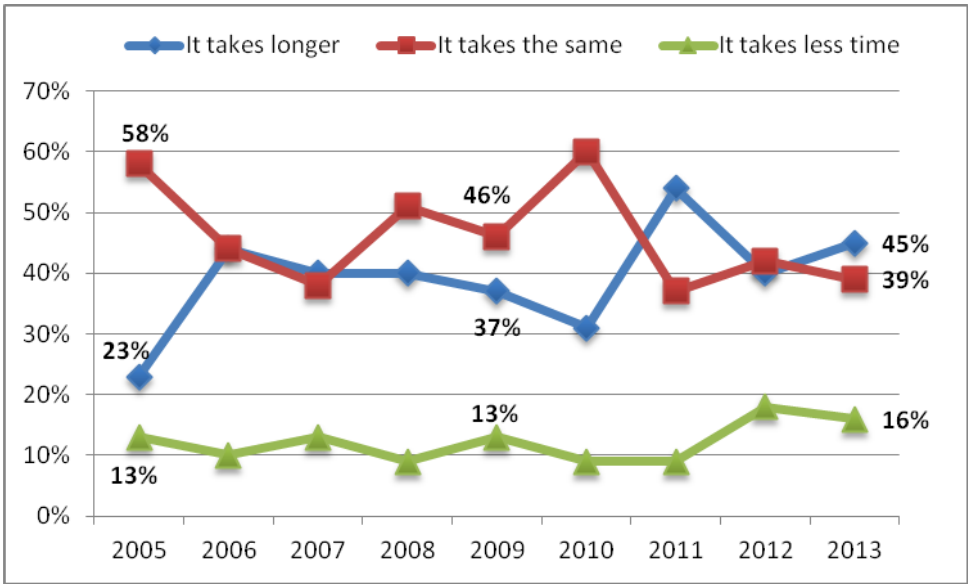
Source: OVE analysis of a representative sample of 103,405 Internet discussions related to the MIO Cali, gathered between May 2012 and August 2014. Manually-codified representative sample of N=3,016.

5.22 **Driven by a perception of declining effectiveness of MIO and by a perceived decline in overall mobility, citizens continue to report increases in travel times.** Different measures of mobility, for both MIO users and non-users, consistently indicate that the perceptions of longer travel times in the MIO increased. [58] As Figure 5.7 shows, year-to-year citizens' perceptions of travel times have been deteriorating, particularly since 2011. Given that the success of urban public transport systems requires creating the perception in citizens that these systems are a fast and effective mode of transport, these trends seem consistent with MIO's difficulties to reach the expected demand threshold and the rise of private motorbikes and cars.

57 A summary to the full study is available at http://www.iadb.org/document.cfm?id=39541506

58 Data for several waves of the locally run survey Cali Como Vamos, 2005 to 2013.

Figure 5.7. Perceived travel times on public transport (2005-2013)



Source: Cali Como Vamos 2005-2013. Average yearly sample size=1,400

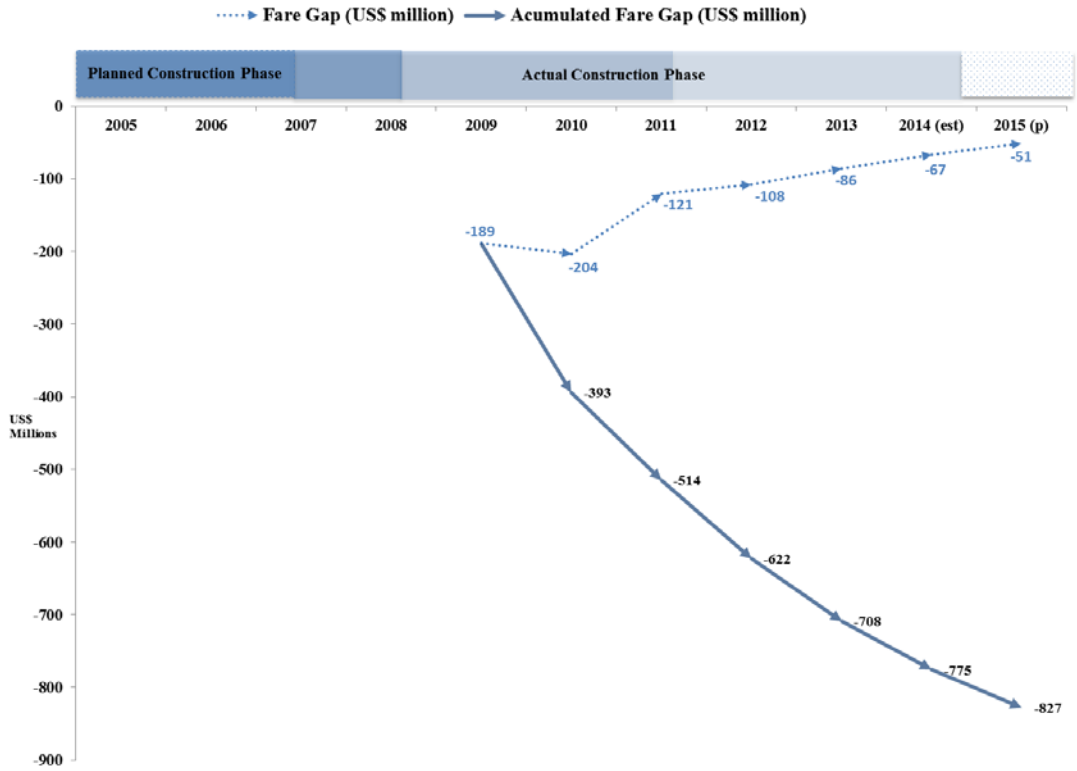
F. System sustainability

5.23 **Financial sustainability has been the critical factor affecting the quality of service delivery and the survival of bus operators.** As the system has not reached the expected demand, all four of the remaining MIO bus operators are reported to be heavily indebted and struggling financially (Contraloría, 2013). Two of them were bailed out by private investors in the past two years. Bus operators have been cutting operational costs (number of operating buses, purchases, etc.), particularly during 2012 and 2013. Because of the concessionaires' financial difficulties, around 550 buses are operating instead of the planned 720 units (Contraloría, 2013). The inability to meet fuel and maintenance expenses has translated into a deterioration of the operational fleet, affecting service quality and frequency. MIO private operators also bore the cost associated with the protests by the traditional public transport sector. At the time of the frequent protests by traditional operators in 2012-2014 –which increasingly involved vandalism and the destruction of MIO buses– Metrocali compensated users for the impact they experienced by allowing all citizens to use the system for free during protest days. These costs represented additional losses to the bus operators.

5.24 **In a vicious circle, the system has reached neither its expected demand, nor the expected return to the operators.** Part of the lower demand is due to the lack of buses in the MIO system and the consequent need to keep part of the traditional bus fleet operating. In addition, the delays in scrapping traditional buses and the surge in informal and pirate operators that are not effectively regulated by the local authorities have diverted public transport users to these alternative modes of transport. Figure 5.7

estimates the accumulated financial loss to the MIO system that is due to the failure to meet the demand threshold to break even and ensure financial sustainability.[59]

Figure 5.7. Estimated Accumulated Losses in Expected Revenue Due to Low Demand
(vs. 750,000 passengers/day threshold for financial sustainability)



Source: OVE calculations based on integrated fare values and data on average daily passengers (target vs. actual). Data from DNP (2007); Metrocali; Cali Como Vamos (2013); Contraloría (2013).

5.25 **Although fare integration and very stable fare pricing may have improved MIO's affordability over time, it may also have affected the system's financial sustainability.** While the original commitment from the municipality to MIO operators involved annual fare reviews, the fare has been increased only once since 2009: in mid-2013 it was raised from 1,500 to 1,600 Colombian pesos (about US$0.75).

5.26 **Finally, the financial sustainability of the system is also necessary for the continued availability of funds to maintain MIO's key infrastructure.** The maintenance of the system's roads, terminals, and environmental monitoring stations requires meeting the financial sustainability target, as the funds are linked to 3% of the fare. While the current demand has provided about 1.1 million pesos per year, IDB calculated the actual need as 2.09 million pesos –a significant and persistent gap in maintenance funds (IDB, 2014).

[59] Metrocali estimates the threshold for the operational financial sustainability of the MIO system at 750,000 passengers per day (resorting exclusively to fare revenues, without any subsidy from the public sector).

VI. CONCLUSIONS AND LESSONS LEARNED

A. Conclusions

6.1 **The integrated mass transport system MIO was proposed as a comprehensive upgrade of public transport in Cali, through a distinctive approach that involved replacing a deregulated and inefficient bus network by a sophisticated BRT system.** The US$300 million project was conceived as a key component of the new National Public Transport Program to mitigate the negative externalities of the traditional bus system in Colombia's major cities. The national policy established the limits, funding, and characteristics of the new BRT-based system, while the local government led the implementation. The construction started in 2006, and inauguration was planned for 2009.

6.2 **The active participation of the national Government provided a larger initial investment and allowed for an expanded scope for the infrastructure design and system coverage.** Although the national Government's participation required the local government's alignment with the overall strategy for urban transport defined in Bogotá (including substituting a BRT-based solution for the original light-rail plan), the resources available for capital investments greatly exceeded those of comparable BRT projects in Lima and Montevideo, allowing for a very comprehensive project.

6.3 **While the objectives and scope of the proposed intervention addressed Cali's key development challenges in urban transport, the project exceeded the city's local capacity for implementation.** The proposed project aimed at mitigating congestion, accidents, and emissions in Cali, while improving overall mobility and the access of the low-income strata –all key issues in Cali. The design of the system also met most international BRT standards. Yet, some shortcomings in capacity to manage very large and complex infrastructure projects became evident early on, with impacts in terms of implementation delays and project final cost. These factors were compounded by particularly short political cycles without reelection, rapid turnover in managerial and technical positions in the executing agencies, a weak link between city planning and the design of the MIO, and delayed implementation of key components on institutional strengthening and the social viability program. Some preliminary technical studies used to approve the project had to be adjusted once the infrastructure phase was well advanced, when deeper studies were prepared. Issues with infrastructure designs, coordination between Cali´s different planning and utility services, and the preparation and oversight of some construction contracts increased both the cost and implementation time of the project (four extra years were needed to complete the infrastructure). Finally, the weak link between urban planning and the project meant a lost opportunity in terms of transport-oriented development, which would have enhanced the sustainability of the system and strengthened value capture.

6.4 **The project design emphasized the infrastructure, and the proposed arrangements for system operation had significant weaknesses, compromising the overall performance and results of the MIO.** The demand forecasting exercise was optimistic – something that is particularly risky for a project that is expected to be fully sustained by fare revenues. Similarly, the weaknesses in the locally prepared PPP agreements were exposed by the complexity of the project, and the local government would have

benefitted from additional technical support from national and international agencies. The proposed broad replacement of the operators of the old bus system was a difficult task, and it was not accompanied by the timely delivery of the social mitigation component that would offer practical alternatives to the losers. As a result, the previous sector was only partially integrated into the new system. The excluded operators have increasingly posed organized resistance to the MIO, leading numerous demonstrations and actions, and causing significant costs both to the system and to Cali's citizens. In addition, the bus-scrapping program is taking longer than expected, and continued competition from the previous system has contributed to failed demand forecasts and compromised MIO's financial sustainability. Finally, the local governance for project management would also have benefited from a more centralized structure: while institutional capacity in Metrocali improved over time, the fragmentation of the transport authority within the municipality generated permanent coordination challenges that worsened over time. Only after the intervention of the national Government in late 2013 did the situation change, and system performance indicators and demand have begun to slowly improve. Overall, the unbalanced allocation of responsibilities and risks created a deadlock.

6.5 **While MIO has represented a significant infrastructure and operational upgrade of Cali's public transport, the project still falls short of delivering most of the expected results.** On the positive side, the system contributed to emissions reductions and improved the comfort and safety of buses. Although the number of accidents in the city remained stable on a per capita basis, MIO contributed to improved safety within the system. Travel times improved along the main corridors and in some areas, but the results are mixed when reported overall citizen mobility is measured, and most performance indicators for the MIO (frequency of buses, timeliness, occupancy, average speed) are significantly below the expected project outcomes. Satisfaction rates for MIO started high during the first months of operation, but, because of the system's underperformance, they quickly declined to 25% in 2013. In parallel, Cali citizens have progressively moved toward private modes of transport, with the overall public transport share declining over time.

6.6 **The project's final cost greatly exceeded initial estimates.** Initial plans estimated the MIO cost at US$495 million, with about US$400 million being funded by the two levels of government and US$95 million by the private sector (DNP, 2002). According to recent assessments by Colombia's supreme audit institution and the national Government (Contraloría, 2013; DNP, 2013), the final cost has increased to US$1,111.7 million for the public sector and US$370 million for the private operators, at 2012 US dollar prices. However, the total cost is still significantly lower than that of a rail based system of a similar scale.

B. Suggestions for the future

6.7 **Some key lessons for the IDB emerge from the case of Cali's MIO.** IDB's role was limited to the provision of funding and technical advice for the implementation of the system's infrastructure (as originally envisioned in 2004). However, to ensure the achievement of the project objectives, future interventions on the scale of the MIO could benefit from a stronger IDB role in providing technical advice in such key areas as the following:

(i) Strengthening overall urban planning capacities and linking the transport intervention to a broader plan;

(ii) Ensuring high quality standards for preliminary economic and technical studies to avoid costly infrastructure redesigns later;

(iii) Improving institutional and governance diagnostics to ensure proper management of infrastructure and operations, taking into account the city's capacity limitations, the institutional context, and the political dynamics;

(iv) Giving priority to the timely delivery of the social, environmental and institutional components to prevent negative impacts from the project, promote broad ownership, and ensure smooth implementation;

(v) Supporting BRT agencies in the design of PPP agreements and risk-sharing mechanisms, and in the overall definition of the system operation;

(vi) Considering innovative public transit reforms to complement BRT systems to better incorporate incumbent private bus operators (e.g., *colectivos*, minivans, paratransit);

(vii) Deepening the diagnosis of mobility needs of the poor in the planning and feasibility stages—including analyses of issues around access, spatial mismatches between skill-appropriate jobs and housing, travel patterns, and affordability –to inform Bank urban transport projects; and

(viii) Encouraging TOD planning around BRT stations, possibly in coordination with the Bank's Urban Development division.

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Box A.1. Case Study Methods and Source of Evidence

Methodological Approach

For the preparation of this case study, the evaluation team used a mixed-methods approach (Johnson, Onwuegbuzie, and Turner, 2007). This approach involves (i) focusing on evaluation questions that call for contextual understanding and multilevel perspectives; (ii) using both rigorous quantitative research methods and qualitative methods to assess the magnitude, impact, and meaning of the factors driving project performance and results; (iii) intentionally integrating or combining these methods to draw on the strengths of each; and (iv) framing the evaluation analysis within the most theoretical and empirical literature.

Sources of Evidence

In the preparation of this case study, the team gathered and analyzed information from the following sources:

- **Project-related documents, evaluations, and progress reports,** available in the Bank's and local authorities' document repository systems. Among others, the team reviewed the project's establishment documents; government planning documents; progress reports; DNP and Ministry of Finance reports; Metrocali's official documentation; budget and financial statements; ex ante impact assessments; ex post evaluations and project completion reports; and MIO-related judicial sentences.
- **Interviews/focus groups with project implementers, government authorities, private sector, beneficiaries, users, academia, civil society groups, and Bank staff and other key informants in Cali, Bogotá, and Washington.** The list included the Transport Specialists and Country Operations Chief at IDB's Country Office; at the national level, the Ministry of Transport, the National Planning Department (DNP) ,and the Superintendent of Transport's office; and at the local level, the city of Cali, the executing agency (*Metrocali*), and the departments of Transport, Infrastructure, and Planning within the mayor's office (*Secretaria de Transito y Seguridad Vial*, *Secretaría de Infrastructura y Valorización*, y *Secretaría de Planificación*); the bus operators; an association of BRT users (*Liga de Usuarios del MIO*); the main bus drivers' union; an association of traditional bus owners (*ASOPOTRANS*) who were excluded from the MIO system; a civil society accountability group that monitors public services (*Cali Como Vamos*); and several academic experts at the Universidad Libre, Universidad de los Andes, and Universidad del Valle.
- **Data sources.** The team collected key longitudinal data related to (i) public transport characteristics over time; (ii) MIO system performance; (iii) mobility patterns; (iv) impacts on the poor; and (v) traffic safety time series. It also used data from the following sources: (i) emissions estimates; (ii) financial data; (iii) origin-destination survey (2010); (iv) public opinion surveys on quality of life (2008, 2013; N=38,240); (v) existing research papers on the system, including the socioeconomic impacts of the BRT (Steer Davies Gleave, 2013); and (vi) two original sources of data collected by the team: (a) a survey of poor and low-income populations living within the area of influence of the system (N=500); and (b) a dataset on all the MIO-related social media information for 2012, 2013 and 2014 (N=103,000).

Box A.2. Framework Regulation for Urban Mass Transit Systems in Colombia

National Requirements

The Government of Colombia made national funding for the construction of integrated mass urban transport systems conditional to a series of requirements, including:

(i) implementation of mechanisms to reduce traditional bus service oversupply (i.e. bus scrapping);

(ii) reorganization and cancellation of routes for the traditional system, to ensure demand for the new system;

(iii) alignment with the procurement rules and the environmental and social safeguards of the multilateral banks;

(iv) strengthening coordination mechanisms among the entities in charge of local urban planning (Secretaría de Planeación), transport planning and regulation (Secretaría de Tránsito), construction, maintenance and oversight of the new system (Metrocali), to smooth the process of reforms and approvals during implementation;

(v) modifying the institutional framework to ensure managerial autonomy and independence of Metro Cali for the management of the resources contributed by participating entities;

(vi) ensuring local budget allocations in certain amounts for 2005-2007 to finance the institutional strengthening of Metro Cali, Department of Transit and the Police, in line with IDB's requirements;

(vii) adjustment to practices in traffic management to ensure smooth construction and operation of the system within the city's overall traffic;

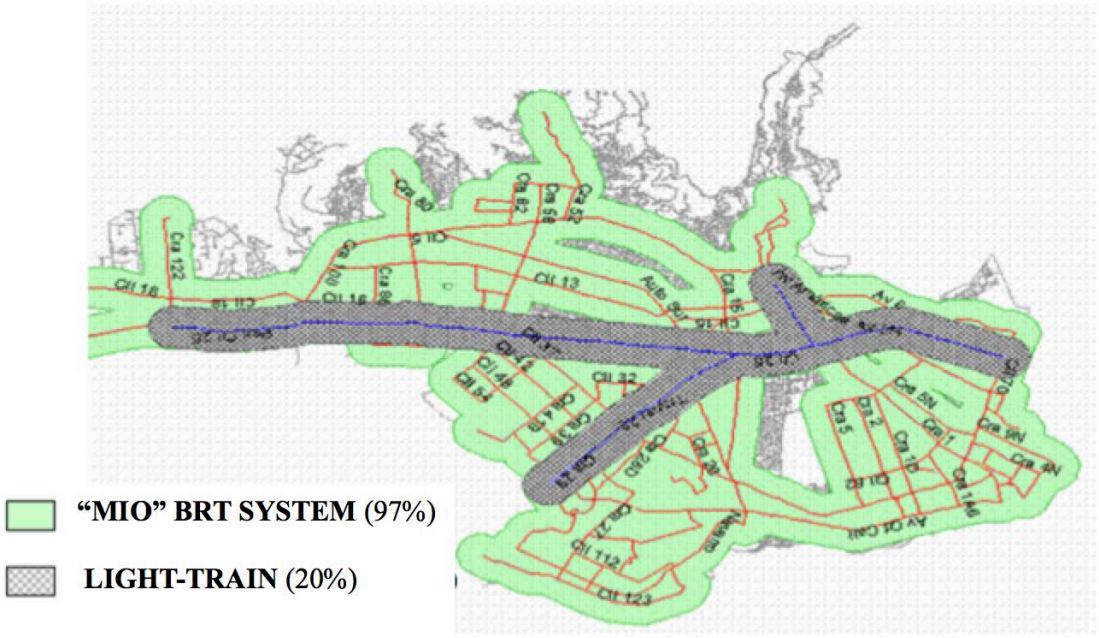
(viii) exploring land use rezoning around the system to maximize value capture and demand;

(ix) reduction of oversupply of public transport (in general) within the percentages suggested by technical studies carried out by Metro Cali, taking into account overall economic trade-offs; and

(x) alignment with other conditions described in the overall national urban transport plan

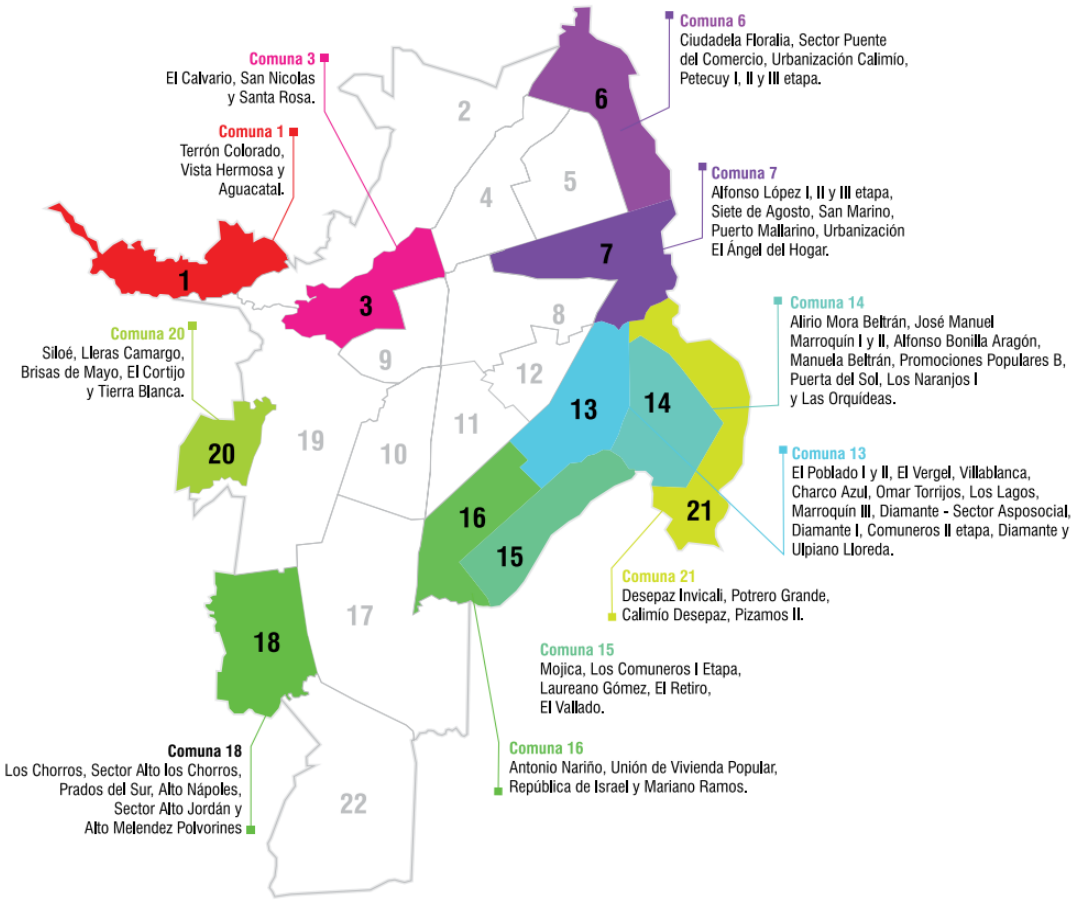
Source: DNP 2007: 9-10.

Figure A.1. Comparison of Alternatives: BRT vs Light Train in Cali (Coverage)



Source: DNP, 2002.

Figure A.2 – Administrative division of Cali: Poorest Districts



Source: Alcaldía de Cali, 2012.

Table A.1. Revised 2011 Project Results Matrix (CO-L1100)

Outcome indicator Number of passengers transported by the system (#passenger/year)	2005: 0	2014: 162 million/year
Outcome indicator Afro-descendent population with access to sustainable mobility (Afro-descendent passengers transported)	2005: 0	2014: 550,000 persons
Segregated corridor	0 km	39 km
Secondary and feeder routes	0 km	243 km
Bikeways	0 km	50 km
Improved public space (additional)	0 m^2	400,000 m^2
Tree planting (additional)	0 units	15,000 units
Green space (additional)	0 m^2	170,000 m^2
Reduced travel time	TBD	-20%
Reduced CO_2 (2014)	0 tons/year	270,286 tons/year

Source: IDB, Loan Document L1101.

Table A.2 – Consolidated Results Matrix Targets: CO-L1100

Indicator	Baseline	Project
Impact indicator Reduction in CO_2 (tons/year)	2009 335,106	2014 270,286
Outcome indicator Increase in satisfaction levels among public transport users (Increase in %)	2005 45%	2013 60%
Outcome indicator Reduction of travel time among public transport users (average minutes per trip)	2005 Centro-Sur corridor: 50 min Norte centro-Sur: 65 min	2010 Centro-Sur corridor: 40 min 2011 Norte centro-Sur: 50 min
Outcome indicator Reduction of waiting time in bus stops (average minutes waiting)	2005: 15 minutes	2012: 12 minutes
Outcome indicator Number of passengers transported by the system (#passengers/year)	2005: 0	2014: 162 million/year
Outcome indicator Afro-descendent population with access to sustainable mobility (Afro-descendent passengers transported)	2005: 0	2014: 550,000 persons

Source: IDB, Loan Document L1101.

Figure A.3. Cali: Urban Density and Available Public Space
Density: Yellow (very low) to Dark Brown (very high)*;* ***Public Space:*** Green**.**

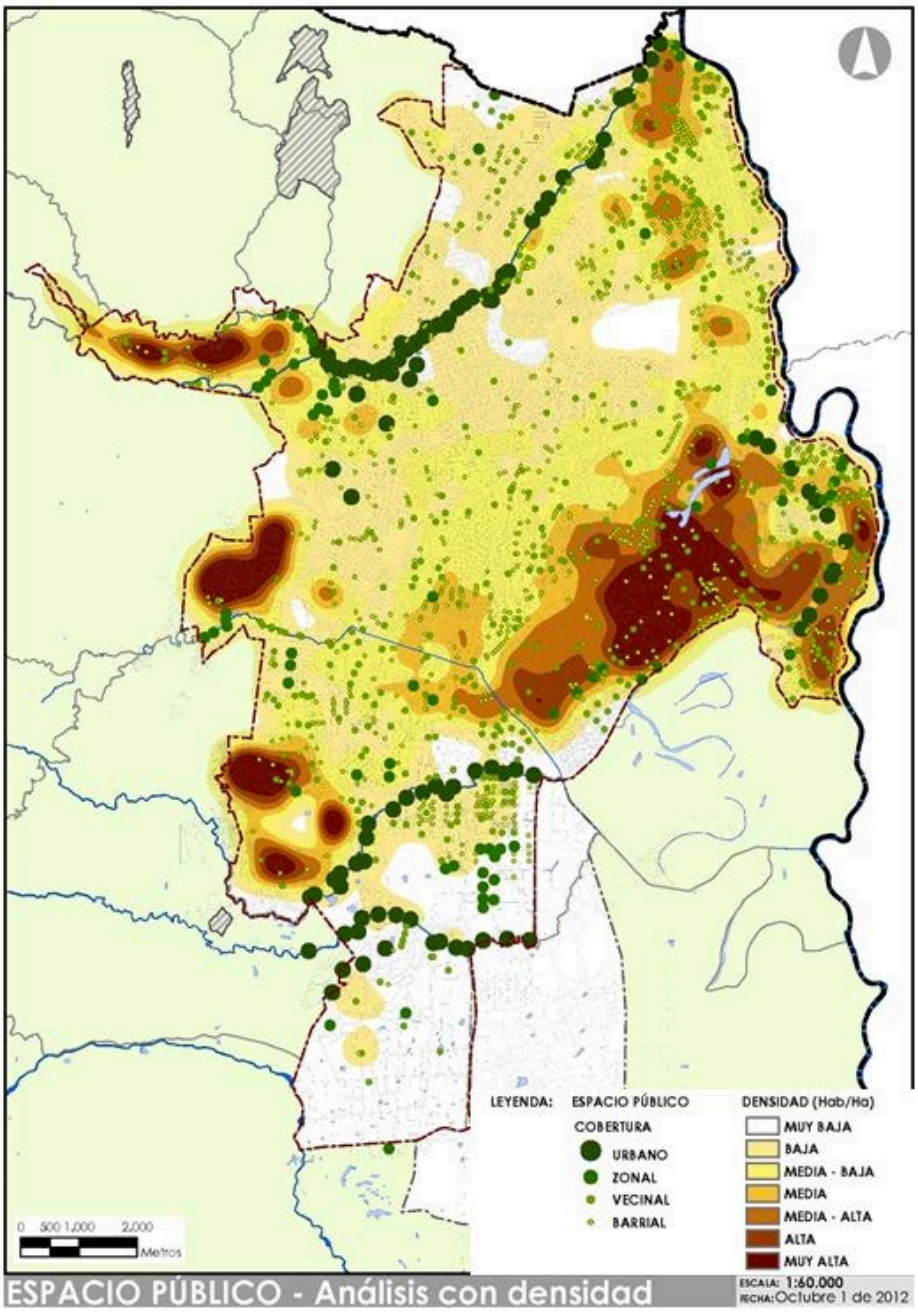


Table A.3. Comparison between Cali's BRT and the BRT Standard: 2014

	Country	**Colombia**
	City	**Cali**
	System	MIO
	Corridor	1st phase (all corridors)
	Max score	Score
BRT Basics - Minimum score of 18 points needed	**33**	**33**
Busway alignment	7	7
Dedicated right-of-way	7	7
Off-board fare collection	7	7
Intersection treatments	6	6
Platform-level boarding	6	6
Service Planning	**24**	24
Multiple routes	4	4
Peak frequency	3	3
Off-peak frequency	2	2
Express, limited, and local services	3	3
Control center	3	3
Located in top ten corridors	2	2
Demand profile	3	3
Hours of operations	2	2
Multi-corridor network	2	2
Infrastructure	**14**	10
Passing lanes at stations	4	3
Minimizing bus emissions	3	0
Stations set back from intersections	3	3
Center stations	2	2
Pavement quality	2	2
Station Design and Station-bus Interface	**10**	10
Distances between stations	2	2
Safe and comfortable stations	3	3
Number of doors on bus	3	3
Docking bays and sub-stops	1	1
Sliding doors in BRT stations	1	1
Quality of Service & Passenger Information Systems	**5**	4
Branding	3	3
Passenger information	2	1
Integration and Access	**14**	5
Universal access	3	3
Integration with other public transport	3	0
Pedestrian access	3	2
Secure bicycle parking	2	0
Bicycle lanes	2	0
Bicycle-sharing integration	1	0
TOTAL 100	**100**	**86**
BRT BASICS (MINIMUM NEEDED 18)	**33**	**33**

Point Deductions	**-36**	**-4**
Commercial speeds	-10	0
Peak passengers per hour per direction (pphpd) below 1,000	-5	0
Lack of enforcement of right-of-way	-5	-1
Significant gap between bus floor and station platform	-5	0

Table A.3. Comparison between Cali's BRT and the BRT Standard: 2014

	Country	**Colombia**
	City	**Cali**
	System	MIO
	Corridor	1st phase (all corridors)
	Max score	Score
Overcrowding	-3	-3
Poorly-maintained busway, buses, stations, and technology systems	-8	0
Total score	**100**	**82**
	Gold, Silver, Bronze, or Basic BRT	***Silver***

Source: Gerhard Menckhoff, ITDP, 2013.