



## Approach Paper

Comparative Case Studies:  
**IDB Supported  
Urban Transport  
Projects**





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## TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. IDB SUPPORT FOR URBAN TRANSPORT.....	5
III. OBJECTIVES. ....	7
IV. EVALUATION QUESTIONS.....	8
A. Relevance: Diagnosis and project design .....	8
B. Efficiency: Implementation and coordination .....	9
C. Effectiveness: Project results and impact .....	9
D. Project sustainability.....	11
V. METHODS .....	11
VI. TIMETABLE.. ....	15

### REFERENCES

Annex 1	<u>COMPARATIVE CASE STUDIES IDB SUPPORTED URBAN TRANSPORT PROJECTS</u>
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## I. INTRODUCTION

- 1.1 Efficient urban transportation systems are critical to the economic vitality, development and overall competitiveness of cities. In cities where millions need to access their workplaces and schools, an efficient and affordable urban transport system reduces time spent commuting, increasing access and mobility. Moreover, through its effects on transport costs, the quality of transport infrastructure and services has a high degree of influence on the location decisions of residents and firms, and subsequent urban spatial patterns and development. Urban transport systems also have social implications: more efficient and inclusive systems have the potential to provide more affordable mobility and access for the poor, potentially reducing poverty and inequality.
- 1.2 A significant share of passenger travel in LAC cities is conducted by public transit, foot, or bicycle, accounting together for approximately 70% of the overall mode share on average -with 28% of trips made by bicycle or foot, and 43% made by collective transport on average (CAF-OMU, 2007). However, the public transport sector in Latin America is often characterized by numerous small private operators, many of which operate informally, significantly contributing to chaotic and unsafe conditions as well as increased levels of congestion and pollution, particularly in lower to middle income LAC cities<sup>1</sup>. In these cities, over-entry of public transit firms into the market has spurred intense on-road competition for passengers and cost minimization behavior. This informality has greatly contributed to high congestion levels, and increased pollution from aging vehicles, increased traffic accidents, and lower passenger-occupancy-to-vehicle rates in transit vehicles and a general deterioration of the quality of service in Latin American cities.
- 1.3 Moreover, rapidly growing vehicle ownership, driven by rising incomes and increasing urbanization in Latin America, have led to an increasing number of problems associated with urban transport, including high levels of congestion and accident rates and severe air pollution, having significant adverse health and economic implications for populations in LAC cities. Urbanization rates in LAC have grown from 50% of the population in 1970 to 80% by 2013 (United Nations, 2011). In addition, rising incomes have led to a surge in motorization rates in the past two decades.<sup>2</sup> Additionally, recent growth in motorcycle ownership rates has surpassed that of autos in many cities, comprising 10% to 49% of the vehicle fleet in LAC cities, leading to a number of safety and environmental concerns. Given current trends in income and economic growth continue, motorization rates are expected to more than double by the year 2030 (relative to 2002).

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<sup>1</sup> Source: WHO Report on Road Safety Injury Prevention, 2004

<sup>2</sup> In 1990, the *average* per capita auto ownership rates for 10 LAC countries<sup>2</sup> was 0.09; by 2008 had risen to 0.20 motor vehicles per capita.

- 1.4 In the absence of adequate financial and institutional capacity to employ an effective set of demand and supply side measures, these factors have led to high levels of congestion, accidents, and air pollution, in urban areas. The average one-way commute time reaches up to 2 hours in some cities, imposing significant time and monetary costs to both freight and passenger transport (UN-Habitat, 2010). In addition, each year, approximately 142,000 people die in LAC of injuries incurred in road traffic accidents and approximately five million people are injured, with the highest prevalence in countries of low and medium economic development<sup>3</sup>. The Latin America and the Caribbean Region reported an average rate of 25.3 fatalities per 100,000 inhabitants, compared to 16.1 deaths per 100,000 inhabitants for high income countries in North America (2010).<sup>4</sup> The majority of deaths (about 50% of the victims) are among vulnerable road users: pedestrians, passengers, cyclists, users of motorized two-wheelers, and occupants of buses and minibuses who also tend to be low to very low income.
- 1.5 Urban transport is the largest source of air and noise pollution in LAC cities (UN-Habitat, 2012). Air pollution levels in many cities exceed WHO guidelines for major pollutants<sup>5</sup> (CAI, 2013), posing significant adverse costs to human health, life expectancy and productivity in LAC cities. Despite some recent progress, air pollution from transport remains as a major public health challenge in many cities (Clean Air Institute, 2013)<sup>6</sup>. Estimated costs of transport related air pollution in LAC cities range from US\$31 million to US\$920 million for 2007 (CAF, 2009). Although CO<sub>2</sub> emissions from LAC urban transport are small relative to OECD countries in per capita terms, the share of energy-related CO<sub>2</sub> emissions in urban areas from the transport sector in LAC is 38%<sup>7</sup> (29% of total from transport in LAC)<sup>8</sup>. Given current trends<sup>9</sup>, the IEA has predicted that emissions from transport are likely to increase by 80% by 2050.
- 1.6 Finally, disparities in the distribution of costs and benefits of transportation systems contribute to and reinforce the already high levels of inequality in LAC. Indeed, low-income populations often bear the highest burdens related to negative transport externalities in cities, including longer travel times and higher exposure to pollution and risk of traffic accidents<sup>10</sup>. Lack of access to affordable and

<sup>3</sup> World Health Organization (2009), *World report on road traffic injury prevention*.

<sup>4</sup> Vinand M. Nantulya & Michael R. Reich (2003): Equity dimensions of road traffic injuries in low- and middle-income countries, *Injury Control and Safety Promotion*, 10:1-2, 13-20.

<sup>5</sup> Major local pollutants include NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, O<sub>3</sub>.

<sup>6</sup> Source: <http://www.cleanairinstitute.org/calidaddelaireamericalatina/summary-airquality-la.pdf>

<sup>7</sup> Significantly higher than the worldwide average share from all transport of 25% (IEA, 2009).

<sup>8</sup> Walter Vergara *et al* (2013). *The Climate Change and Development Challenge for Latin America: Options for Climate-Resilient, Low-Carbon Development*. Washington, DC: IDB, ECLAC, WWF.

<sup>9</sup> Based upon past and current trends of increasing car ownership and travel.

<sup>10</sup> *The Urban Poor's Vulnerability to the Impacts of Climate Change in Latin America and the Caribbean: A Policy Agenda*, Lucy Winchester and Raquel Szalachman, Economic Commission for Latin American and the Caribbean, United Nations (ECLAC/UN)

- efficient transport generates social exclusion and impedes accessibility to employment and education, health services, and markets for low-income groups.
- 1.7 A range of supply- and demand-side oriented strategies can be used to solve urban transportation problems. These include investments in the supply of new transport infrastructure and a set of demand-side management measures aimed at increasing the efficiency of the use of existing road space, increasing access and transport efficiency through the coordination land use and transportation services, and reducing emissions and accidents associated with transport through policies to improve vehicle technology and shift travel to collective modes (Mitric, 2011: 13-15; Suzuki, Cervero and Iuchi, 2013). Best practice calls for an integrated multi-modal transportation and land use planning approach (Dittmar and Poticha, 2004; Suzuki *et al*, 2013: 39-41; Rodriguez and Vergel-Tovar, 2013). This approach should prioritize investments in physical infrastructure and system design adopting a comprehensive view, based upon multiple stakeholder input and sound technological, policy and financial analysis.
  - 1.8 Given the high share of trips taken by public transit and non-motorized modes (walking and bicycling), and the environmental costs associated with increasing motorization, several LAC cities have begun to prioritize investments in public transit infrastructure over traditional approaches of widening and expanding roads and highways. These investments are often coupled with policy reforms to re-regulate public transportation provision through various contracting schemes and, in some countries, by using a mix of centralized planning and private investment and in several cases investments in multi-modal integration of the system (Estache & Gomez-Lobo, 2004). In particular, the implementation of integrated Bus-Based Rapid Transit systems (BRT), designed to emulate a traditional light-rail system at significantly lower cost, have grown rapidly around the world, with more than 156 cities adopting BRT systems by 2013.
  - 1.9 Generally, BRT systems involve several design elements aimed at increasing the operational efficiency and quality of bus operations, including: 1) the elimination of several mixed traffic lanes to provide segregated bus lanes, 2) signal prioritization for buses at intersections, 3) off-board payment of fares, and 4) level boarding platforms. In comparison to rail based systems, they require significantly lower initial capital investments,<sup>11</sup> lower operating costs, and much shorter start-up times on average. In addition, the implementation of BRT systems are often coupled with measures aimed at improving the efficiency of the wider public transportation system network by replacing a variety of transportation services by a single operation agency, common standards for drivers and vehicle maintenance, and an integrated fare system, improving feeder bus systems, and

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<sup>11</sup> Capital costs for systems range between US\$2.4-3.5 million/km as for the systems developed in Curitiba, Mexico City or Guayaquil (minor physical improvements) to US\$3.8-12.5 million/km like in Bogota or Pereira (for instance because of the reconstruction of corridor roadways). (EMBARQ)

infrastructure for pedestrians and bicyclists. Latin America has been the fastest-growing region with respect to BRT system adoption, with 56 major cities adopting BRT systems to date, and moving up to 16.3 million passengers daily (64% of total BRT passengers worldwide)<sup>12</sup>.

- 1.10 Prior studies on the impacts of BRT systems have found positive benefits in terms of increased operational efficiency of the transport system, as well as reductions in accidents, air pollution. In general, BRT systems attain significantly higher average speeds and productivity compared to conventional buses. Average speeds of BRT systems in LAC cities range from 18-28km/hour, with Bogota's *Transmilenio* system being the first system to reach operational productivity levels<sup>13</sup> equivalent to a metro<sup>14</sup>. In contrast, average speeds of conventional buses in traffic typically fall within the range of 7-14 km/hour in major cities.<sup>15</sup> To the extent that these systems successfully improve the organization and flow of traffic and incorporate infrastructure designed to enhance pedestrian safety, they also have the potential to significantly reduce accidents in treated corridors with estimates of decreases in fatality rates of 60% in Bogota's Avenida Caracas after the *Transmilenio* operational and by 46% in Guadalajara's principal BRT arterial as two examples<sup>16</sup>.
- 1.11 Integrated public transport systems that reduce congestion and shift travel to less polluting modes, also have a significant potential to improve air quality<sup>17</sup>. For example, the Clean Air Institute estimated a 74% reduction in for PM<sub>2.5</sub> emissions/passenger and a 20% reduction in emissions of CO<sub>2</sub> attributable to the implementation of Bogota's *Sistema Integrado de Transporte Público* between 2008 and 2018<sup>18</sup>. A study on Mexico City's first BRT line found a reduction in CO<sub>2</sub> emissions of 10% in the corridor, due to modal shifts to the BRT

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<sup>12</sup> Source: [www.brtdata.org](http://www.brtdata.org)

<sup>13</sup> Operational productivity is defined as the number of passengers carried per lane per direction per hour on the system.

<sup>14</sup> Bogota's *Transmilenio* carries 40,000 passengers per direction per hour (meeting operational carrying capacity of a metro) at a commercial speed of 28km/h.

<sup>15</sup> Sources: Embarq (2006). "Metrobus: Welcome Aboard". *Sustainable Mobility, vol. 1, October 2006*. NYC Government (2013). "[34<sup>th</sup> Street Select Bus Service](#)". New York: New York City Local Government Report.

<sup>16</sup> The construction of dedicated BRT lanes and particular infrastructure (secured pedestrian crossings, guardrails, intersections, station access and platform boarding) are key design features to improve safety. Conversely, lack of adequate design for pedestrians or intersections can relocate crashes to nearby streets or particular intersections. For instance in Guadalajara, the intersection between Siete Colinas and Circunvalacion crashes increased from 17 to 42. Source: EMBARQ (2012), Traffic safety on Bus Corridors, Guidelines for integrating pedestrian and traffic safety into the planning, design and operation of BRT, Busways and bus lanes

<sup>17</sup> This potential is determined by a number of factors, including the coverage of the BRT system, ridership levels, the degree of modal shifts from private automobiles<sup>17</sup>, and the emission standards of the buses, among other factors.

<sup>18</sup> Joint Presentation by the Clean Air institute and Universidad de los Andes.

from private cars, improvements in bus emissions and energy standards, and a general increased energy efficiency of travel in the corridor (Schipper, *et al*, 2009).

- 1.12 Promoting access and mobility for low-income populations is increasingly a stated objective of many public transport systems investments. However, while mass transit system investments can increase overall mobility through reductions in average travel times in the system, the centralization of previously decentralized transit systems can result in a need for lower income groups to make multiple transfers and travel longer distances for the same trips. In addition, fares on such system may be unaffordable given that the poor more often commute from the outlying peripheries of cities into job centers. A study of Bogota's *Transmilenio* system for example, found that while all income groups benefited from decreased travel times on the system, the transit fares and distances between low-income neighborhoods and employment centers presented significant barriers to access for the lowest income groups (Bocarejo & Oviedo, 2012).

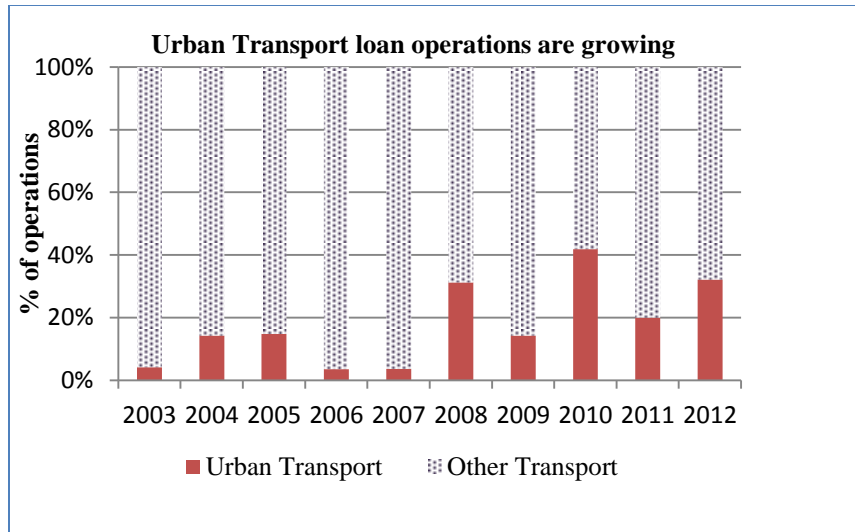
## **II. IDB SUPPORT FOR URBAN TRANSPORT**

- 2.1 The IDB's support for Urban Transportation projects in Latin America has grown rapidly in recent years, with annual lending volume for the urban transport sector growing by 36% from 2005 to 2012, comprising more than 20 percent of the transport sector lending portfolio by 2012. Most IDB-financed urban transport loan projects seek to achieve multiple objectives. The primary project objectives most often include, (i) improving mobility and overall transport system efficiency (ii) reducing pollution (both local and CO<sub>2</sub>), (iii) and reducing accidents, and in some cases (iv) improving access to transport for the poor (poverty), and (v) overall urban development are additional stated objectives<sup>19</sup>.

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<sup>19</sup> Source: OVE's review of the Transport and Urban Development portfolio using OPS, 2003 to 2012.





- 2.2 Urban transport projects can be managed from both within the urban development division (FMM/DU) and the transport division (INE/TSP). Among all urban transport-related loan projects 54% are related to the development of pedestrian and bicycle facilities, local roads and street scape upgrades, in addition to urban plazas. However, most mass transit projects, are developed and managed by the Transport Sector (most from INE/TSP and two from SCF), (including multi-modal infrastructure for bikes and pedestrians, feeder bus routes, in addition to BRT, metro and light rail, and technical assistance related to public transit). A majority of these projects are for BRT systems (57%), followed by metros (11%), and other public transit related loans, (14%) involving a mix of mass transit technologies (e.g. BRT with feeder buses, or metro with feeder buses).
- 2.3 Many Bank financed urban public transit systems have been complemented with a range of measures to support the transit system ridership and efficiency, and the achievement of environmental and social goals. These complementary measures tend to include technical and feasibility studies; infrastructure for bicyclists and pedestrian, that serve as low cost feeders into the system; major reorganization of private bus sector; in some cases financing for scrapping of old polluting buses and purchase of cleaner vehicle technologies; fare policy restructuring, institutional strengthening; public outreach, and land use planning.
- 2.4 IDB's support for Urban Transport is likely to become increasingly important in the coming decade due to several institutional commitments, new programs, and sector strategies, including the GCI-9 agreement, the Sustainable Transport Action Plan (REST-AP), the Sustainable Cities Program, and the Rio+20 Commitments. The GCI-9 identifies increasing investments in sustainable transport alternatives in urban areas as a specific area for development within the Infrastructure for Competiveness and Social welfare priority, one of five sector priorities for investments aimed at reducing poverty and inequality and promoting

sustainable development in the Latin American and Caribbean (LAC)<sup>20</sup> and sets a target for 25% of the operations to address Climate Change mitigation and adaptation. In addition, the GCI-9 calls for IDB projects to promote social inclusion and reduce inequality. Finally, in the Rio+20 meetings, eight major Multi-Lateral Investment Banks, including the IDB, committed to investing US\$175 billion in total over the next decade toward Sustainable (environmental and social) Transportation (both Urban and Rural). The IDB portion of this commitment is US\$17.5 billion over the 10-year period<sup>21</sup>

### III. OBJECTIVES

- 3.1 The objective of these comparative case studies is to identify lessons learned from Bank supported integrated mass transit projects involving bus rapid transit (BRT) systems as a central component. In light of the growing importance of urban transport sector in the region and in the Bank's portfolio, the evaluation findings will help identify factors that affect the successes, challenges, and barriers to effective implementation Bank supported integrated urban transport system projects and inform future Bank urban transportation operations, as well as identify possible future urban transportation evaluation needs. In addition, the evaluation will assess the extent to which the projects were able to achieve a subset<sup>22</sup> of key objectives, including improving mobility and access for the general population and for low-income populations, reducing local and global pollution<sup>23</sup>. OVE proposes to focus on a subset of objectives in order to focus more deeply on key questions within the given time frame including 1) how to effectively include low-income populations in the mobility benefits of such projects and 2) how to design projects to most effectively reduce environmental externalities, including greenhouse gas emissions and local air pollutants. By

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<sup>20</sup> The term "sustainable development" was first coined in the Brundt report (1987) and is the most widely used definition of the concept today. The report stated: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." World Commission on Environment and Development. "Our Common Future, Chap.2: Towards Sustainable Development". IDB defines sustainability similarly but with an added emphasis on sustainability as a means to develop and maintain levels of natural and social capital that enable LAC societies to better benefit from the fruits of economic development in the long-term: <http://www.iadb.org/en/topics/sustainability/sustainability,1510.html>. The REST-AP defines sustainable transport policies and practices as: "*accessible transport (physically and economically), efficient, environmentally friendly and safe, for present and future generations.*" (Source: IDB Internal Presentation of the REST-AP).

<sup>21</sup> However, such rapid growth may be difficult given restrictions on lending to cities as opposed to national governments who may prioritize regional integration, rural and inter-urban roads over cities.

<sup>22</sup> OVE proposes to evaluate a subset of project objectives in order to focus more deeply on key questions within the given time frame including: 1) how to best include low-income populations in the benefits of such projects, and 2) how to design projects to most effectively reduce environmental externalities, and 3) derive lessons learned from implementation experiences.

<sup>23</sup> While reducing accidents is often state and 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.

examining the measures used by the IDB to reduce greenhouse gas emissions from Urban Transport, the evaluation will also provide input to the larger Climate Change evaluation that is simultaneously being conducted by OVE.

- 3.2 We choose to focus on integrated urban transport projects that include a BRT system investment as one component for several reasons. First, focusing on projects that implement a common intervention provides a common point of comparison among cases. Second, although the IDB urban transport portfolio entails a range of investment types, urban transport projects that include BRT systems figure prominently in the transport sector's urban transport portfolio in terms of the share of lending operations and volume. In addition, given the relative cost-effectiveness of BRT over rail-based urban public transit in meeting mobility and other objectives, the demand for lending for such systems from LAC cities is likely to continue to grow<sup>24</sup>. Therefore, reporting on lessons learned from the Bank's experience with urban transport projects involving BRT systems as a component will provide valuable input for future such urban transport projects.

#### IV. EVALUATION QUESTIONS

- 4.1 The evaluation will follow the general OECD-DAC criteria of assessing the: 1) relevance, 2) effectiveness, and 3) efficiency and 4) sustainability of the project implementation and outcomes, while also examining the challenges and opportunities confronted during implementation. Within this framework, the evaluation will take into account the political, economic and public policy context in which each of the IDB urban transport loans were approved. For example, it will analyze how key national and sub-national public transport and finance policies may have influenced the project's content, approval and scope. Moreover, the role that local and national institutions governing urban transport planning, finance and operations played in the design, execution, effectiveness and sustainability of the project results will form a central thread throughout the evaluation. Possible specific evaluation questions for each dimension are described below:

##### A. Relevance: Diagnosis and project design

- 4.2 The evaluation will assess the relevance of the urban transport system project design and objectives with respect to the passenger<sup>25</sup> transport needs of the city with a focus on low-income populations in cases where serving the poor was an

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<sup>24</sup> It is worth noting that the type of transport investments chosen by a city should be determined by the unique context of each case. While BRT is a very flexible low cost technology it may not be the right investment for every context. Accurate and objective alternatives analysis on a case by case basis is an important step in making such investment choices.

<sup>25</sup> Although freight transport is a very important component in both transportation costs and benefits within urban areas, the scope of this evaluation is only with respect to passenger transport and in particular public transport projects.

explicit objective. In the context of the local urban transport problems and needs and taking into account the policy, institutional, political, and economic, context leading up to the IDB involvement, how was the BRT system designed to meet the project objectives of improving mobility, access for the poor and reducing local and global emissions from transport? Possible questions under this category may include: i) What are the major sources of congestion, accidents, and pollution and does the project design seem to address the causes of these problems?; ii) is the demand for public transit trips in the corridors high enough to support adequate ridership levels or are land use plans in place to generate such demand?; and iv) Did the urban transport system design include planning for multi-modal and fare integration (pedestrian access, bus transfers, and fare payments when transferring between modes, etc.) and how did the project design take into account travel patterns and needs of low-income populations (e.g. project alignment and fare policies)?<sup>26</sup>

## **B. Efficiency: Implementation and coordination**

- 4.3 Implementing large infrastructure projects of any kind, including BRT systems, often requires tackling several challenges, including those related to coordination of multiple agencies, weak institutions, and contract design issues related to public private partnerships (PPPs). The evaluation will seek to provide insights that might be useful for operations by identifying the challenges, opportunities and lessons learned in implementing the projects with respect to achieving the objectives of focus for this evaluation (poverty and environmental). Possible questions under this category may include: i) What execution problems did the project face and how did they address them?; ii) In the case of projects that addressed the problem of the informal or private transit sector, what were the challenges and opportunities of formalizing the sector into the new system or with compensation of drivers? How did changes to the informal sector affect the affordability and access to transport services for the poor?

## **C. Effectiveness: Project results and impact**

- 4.4 Next, the evaluation will examine to what extent the projects appear to be achieving their stated objectives and expected outcomes, taking into account their relative importance including unanticipated outcomes both negative and positive. The team will examine the logical linkages between the project activities, the institutional context and policy environment, outputs, and outcomes and gather data to support the extent to which these have been achieved relative to the expected results. Although IDB urban transport projects aspire to achieve a wide range of objectives, the team will focus on a subset of typical project objectives in

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<sup>26</sup> Does the level of transit demand and land use support the choice of project technology? i.e. a BRT in a very low density area with a high degree of urban sprawl were planned with no plans for densification or land use to support the ridership, then the level of demand for the system may not justify the costs.

order to make the scope of the evaluation more manageable. Questions related to the objectives of the IDB urban transport system projects include:<sup>27</sup>

- a) ***BRT System performance:*** How well is the BRT system performing with respect to daily ridership (peak and off peak) and system productivity (passengers per lane direction hour) in comparison to expectations?
- b) ***Mobility and accessibility:*** To what extent have projects increased system reliability and decreased travel times in the corridor and area of influence of the corridor relative to expectations?
- c) ***Poverty and equity/social inclusion:*** BRT systems that target the poor might do so in several ways, including aligning the service corridors to connect to low-income neighbors, and implementing pro-poor fare and transfer policies. The evaluation will seek to answer the following questions *to the extent that data availability and reliability allow*: i) to what extent do low-income groups utilize the BRT?; ii) how does the income distribution in the catchment area of the public transit project compare to that of the riders and to the city at large?; iii) provided data is available, to what extent are average travel times for low-income populations in the area of the corridor improved?<sup>28</sup>; iv) are there any unintended costs for potential low-income riders or beneficiaries such as fare increases and therefore affordability issues?; and v) are there any gender issues related to the BRT system utilization, and if so, what are sources and nature of these issues<sup>29</sup>.
- d) ***Environment impacts:*** BRT systems are hypothesized to reduce global and local emissions through several paths including: i) increased energy efficiency of the public transport sector by reducing congestion (through the provision of exclusive lanes), ii) improvements to the emissions standards of the public transit fleet (in some cases this also entails scrapping and retiring of old polluting vehicles), and iii) inducing modal shifts from private automobiles or more polluting modes public transit, to the BRT system and its feeders (both non-motorized and public transit modes), and/or maintaining high public mode shares to public transit through the increases performance of the transit system (reduce travel time costs). Therefore, the evaluation will seek to assess what the effects on the local and global pollutants from the transport sector in the project

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Based upon a basic review of the portfolio in the past ten years, these objectives typically include improving mobility and access for the general population and in some cases specifically for low-income populations, while reducing negative externalities associated with transportation, such as traffic accidents and emissions of local and global pollutants, including criteria pollutants and greenhouse gases. In addition, IDB's BRT projects have typically provided a prior institutional diagnosis and include a component aimed to address detected gaps in technical capacity or institutional coordination. Finally, IDB supported BRT projects usually have an analysis of the expected performance of the BRT system, such as expected peak and off-peak ridership.

corridor and area of influence. For example: i) *If air quality monitors are in use along the corridor*, is air quality improving in the area of influence of the corridor?; and ii) *If reducing CO2 emissions was a measured objective*, what are the estimated changes in aggregate global pollutants (greenhouse gases) from travel in or near the corridor, including emissions of black carbon<sup>30</sup> and CO<sub>2</sub><sup>31</sup>. This will be assessed using available models and data or through review of such assessments that have already been completed<sup>32</sup>.

#### **D. Project sustainability**

4.5 Finally, the team will examine whether the project appears to be institutionally and financially sustainable. Possible questions could include: Do the institutional arrangements and regulatory framework support the effective implementation and management of the BRT system? Is the revenue management model implemented in the project effectively supporting operations and maintenance of the BRT system?

### **V. METHODS**

5.1 To answer the questions outlined above, the team will conduct a set of in-depth comparative case studies of a small sample of IDB supported BRT projects.<sup>33</sup> Criteria for selecting potential cases to evaluate include: i) loan projects for urban transport infrastructure that are 75% or more disbursed; ii) in operational phase (i.e. the BRT system is in service); and ii) approved within the past 10 years. Four projects meet these criteria (note projects are ordered by completion date, less recent to more recent):

- “Urban Transport in Lima” (PE-0187)
- “Cali Integrated Transit System” (CO-L1001),

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<sup>28</sup> Assessment of this factor will depend upon whether travel surveys were conducted before and after the project.

<sup>29</sup> Note: Gender equality was not a stated objective in any of the documents we reviewed so far; however, there is an increased interest in promoting gender equality through Bank operations, with the Gender Policy and Action Plan. Therefore, this analysis would inform for projects going forward rather than evaluate them based on these criteria.

<sup>30</sup> Black carbon is also a local pollutant that causes significant adverse health impacts.

<sup>31</sup> CO<sub>2</sub> emissions are proportional the carbon content of the fuels burned for transport, the total passenger kilometers traveled, and the amount of fuel burned per passenger kilometer traveled.

<sup>32</sup> TEEMP spreadsheet models developed by ITDP can be used to estimate net emissions, using estimates of modal shifts (from private vehicles or higher emissions private micro buses) to the BRT system, energy efficiency of vehicles, fuel used by BRT buses and their respective carbon factors (IPPC), and ridership on the BRT.

<sup>33</sup> Methodologies for case studies will draw upon methods in: Yin, 2009; GAO, 2000, Blatter & Haverland, 2012.

- “Urban Transportation Curitiba II” (BR-0375), and
  - “Montevideo Urban Transportation Program” (UR-L1025).
- 5.2 The team will analyze a minimum of two cases from this list, prioritizing case studies based upon: i) data availability, ii) the degree of common objectives (in order to maximize comparability between cases), and iii) whether the project has a second phase in the pipeline or in execution. Examining those that have multiple phases will serve to provide input to subsequent IDB investments in a given city. The evaluation, the team will begin by assessing the cases of *Urban Transport in Lima* and *Cali Integrated Transit System* and, then, resources permitting, will evaluate the *Montevideo Urban Transportation Program*. We decided not to include the Curitiba case at this time because, the main objectives and context are somewhat different than the other cases and the urban transport system has been the subject of extensive study already.<sup>34</sup> The work that has already been done related to the system in Curitiba will inform our other case studies, however.
- 5.3 The integrated urban transport projects in Lima, Cali, and Montevideo, provide a range of contexts in which to study the implementation of IDB supported BRT systems projects. For example, the initial conditions of *Lima* and *Cali* were characterized by low levels of overall mobility, traffic congestion, oversupply of vehicles, high pollution, accessibility issues for low-income populations, and significant informality in the public transport sector. In comparison, *Montevideo* had a more developed public transport sector, but increasing car ownership and urban sprawl were quickly contributing to undermine the effectiveness and sustainability of the transport system in the city and contributing to high levels of air pollution and a rising number of accidents.<sup>35</sup>
- 5.4 These urban transport projects pursued the common objective of improving mobility conditions, while also expecting to have indirect positive impacts on accessibility, safety and sustainability of the transport system. Although the approaches were generally comparable, they also reflected the differences in the initial conditions in each city: (i) *Lima* focused on creating a north-south BRT single corridor, improving feeder roads, and creating cycle and pedestrian infrastructure, while trying to formalize the informal transport sector (through vehicle scrapping and hiring of drivers into the new system) and emphasizing low-emissions buses; (ii) *Cali* adopted a more comprehensive approach by creating 3 BRT trunk lines, investing in feeder bus routes, secondary roads, and cycle/pedestrian parallel infrastructure, while working to integrate informal drivers into the system; (iii) *Montevideo* financed two busway corridors (with dedicated BRT lanes in high demand segments), while placing a greater focus on

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<sup>34</sup> The Green Line project funded by IDB has been discussed in the book *Transforming Cities with Transit*, 2013, as well as the subject of a recent TRB Report by Lindau, Hidalgo, et al, 2010.

<sup>35</sup> See <http://www.iadb.org/document.cfm?id=37808600> Annex for more details on initial conditions and for a description of the three project.

restructuring routes, streamlining services, upgrading ICT and engineering for fare, traffic lighting, and fleet management.

- 5.5 Evidence used for the evaluation will include document review (from multiple sources), interviews, field-visits, and data analysis. The team will conduct a literature review of research and case studies related to the evaluation questions, including literature on BRT case studies in other cities, research on measuring impacts of urban transport projects on mobility, poverty, and emissions. Information and data reported in project-related documents as well as multiple other sources will be used to assess the relevance, implementation and effectiveness of each project. These documents include but are not limited to: PCRs, PMRs, project related TCs, Loan Proposals, and pre-approval economic analyses and feasibility studies. The team will validate the information in the reports through field visits, gathering of data from other sources, and interviews with multiple stakeholders. In addition, the team will analyze data collected on project results by the executing agency and the IDB project team. Finally, the team will conduct interviews with key stakeholders in the city/country, including government, transport system users, and private sector transport providers, IDB transport sector specialists and other relevant IDB staff. The information obtained from interviews will be cross-checked and verified –whenever possible– with data and printed documentation.
- 5.6 *To the extent that data is available*, additional analysis will be conducted to identify more nuanced results. The team will also gather and analyze information from local and national planning departments, including census data, household surveys, data on environment, mobility outcomes, including data from origin destination surveys, BRT user surveys and opinion polls, and air quality monitoring data, to the extent these data are available and reliable for each case.



		<b>Cali</b> <b>CO-L1001</b>	<b>Lima</b> <b>PE-0187</b>	<b>Montevideo</b> <b>UR-L1025</b>
	<b>Year Started - Completed</b>	2005-2010	2003-2010	2008-present
	<b>% disbursed</b>	100	100	86
	<b>Total approved budget (US\$ million)</b>	IDB: 200 Local: 100 <b>Total: 300</b>	IDB: 45 Co-financing (World Bank): 45 Local: 34.4 <b>Total: 124.4</b>	IDB: 80 Local: 20 <b>Total: 100</b>
<b>Objectives</b>	<i>Access for poor/low-income groups</i>	X	X	Not an explicit objective but cross subsidization strategy
	<i>Mobility</i>	X	X	X
	<i>Environment</i>	X	X	X
	<i>Safety</i>	X	X	X
	<i>Number &amp; length of BRT corridors</i>	3 (49km)	1 (28.6km)	2 (17.9 km)
	<i>Feeder bus system upgrade</i>	X	X	
	<i>% of Corridors Dedicated Lanes</i>	TBD	100%	TBD
<b>Components</b>	<i>Upgrading of feeder roads for transit</i>	X	X	X
	<i>New infrastructure related to public transit</i>	X	X	X
	<i>Land Use Plans</i>	Urban upgrading in corridors	Urban plazas	none
	<i>Pedestrian/bike infrastructure</i>	X	X	
	<i>Institutional strengthening</i>	X	X	X
	<i>Studies/supervision</i>	X	X	X

	<i>/trainings</i>			
	<i>Compensation/ Resettlement</i>	X	X	X
	<i>Transit fare policy</i>	X	X	X
	<i>Operating systems<sup>36</sup></i>	X	X	X
	<i>Green spaces</i>		X	
	<i>Communication / citizen participation</i>	X	X	X
	<i>New buses including for BRT</i>	(private sector)	IDB and private sector	(private sector)

## VI. TIMETABLE

6.1 The proposed timeline for the evaluation is as follows:

Activity	Due Date
<b>1. Approach paper approval</b>	June 2013
<b>2. Implementation</b>	June-October 2013
<b>3. Results</b>	November-December 2013
a. Draft to Management	November 2013
b. Final report to Board	December 2013

6.2 The team will include Alejandro Guerrero, Margareth Celse L. Hoste, Oscar Quintanilla, and Lynn Scholl, who will coordinate and lead the evaluation. Yuri Soares and Ana Maria Linares will provide guidance to the evaluation team.

<sup>36</sup> "Operations" include traffic lights, control centers, traffic monitoring or accident reporting systems, computer equipment.

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