



Comparative Case Studies of Three IDB-supported Urban Transport Projects

Montevideo Case Study Annex



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Office of Evaluation and Oversight
1350 New York Avenue, N.W.
Washington, D.C. 20577
www.iadb.org/evaluation

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EMISSIONS ANALYSIS

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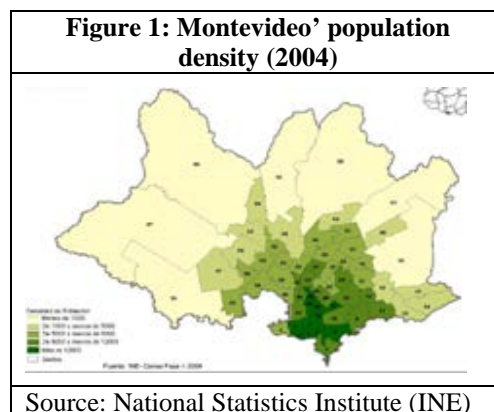
I. INTRODUCTION

- 1.1 Montevideo is characterized by a very concentrated and formalized supply of public transport, provided by five bus companies that serve about one million passengers per day. In spite of growing motorization rates (cars per inhabitant), Montevideo has relatively lower congestion and pollution rates compared to other large cities in Latin American and the Caribbean (LAC). However, the city's transportation system has lacked dedicated infrastructure to give public transport priority over other modes and has not adapted to demand, with over-supply in some areas and poor frequency and coverage in others. As a consequence, the overall productivity of the system has been very low, with few passengers transported per kilometer. The city's Mobility Plan for 2008-2020 envisioned the development of a network of segregated busways to streamline and rationalize public transport. The Inter-American Development Bank (IDB, or the Bank) supported the first phase of the plan (2008-2010), for the construction of two trunk lines, their related infrastructure and a transit management system.
- 1.2 This case study evaluates the design, implementation, and results of the IDB-supported exclusive and preferential bus corridors financed in Montevideo through the Montevideo Urban Transportation Program, approved in 2008. It is part of the comparative urban transport evaluation conducted by the Office of Evaluation and Oversight (OVE) to identify lessons learned from three urban transport projects –financed in Cali, Lima, and Montevideo between 2003 and 2013—and provide guidance for future Bank operations.
- 1.3 To analyze the project, the team used (i) documents and reports available in the Bank's repository systems and local institutions, and (ii) information collected during interviews and meetings with IDB staff involved in the project and with local stakeholders during a field mission to Montevideo in February 2014 (see Annex 1 for the list of interviewees). The data collected and analyzed were mainly of a legal, financial, and technical nature. The analysis of the project follows the OECD-DAC criteria of assessing (i) relevance, (ii) implementation and effectiveness, and (iii) results and sustainability. This document is organized as follows: Section II presents Montevideo and its transport situation before the project; Section III describes the project financed by the Bank; Section IV analyses the relevance, implementation, results, and sustainability of the project; Section V presents the lessons learned; and Section VI provides a conclusion and recommendations.

II. BACKGROUND AND SITUATION BEFORE THE PROJECT

A. The city of Montevideo

2.1 Montevideo is both the capital of Uruguay and one of the country's 19 administrative regions¹. In 2004, the city contained 41% (1.32 million) of the national population,² and the Montevideo metropolitan area, which includes the neighboring regions of Canelones and San Jose, contained about 57% of the national population (1.7 million, TC document). Montevideo is also Uruguay's cultural, economic, trade and financial center; in 2002, the metropolitan area accounted for about 60% of the country's GDP³ and more than 80% of the country's international trade passes through Montevideo's harbor (Glejberman, 2005).



2.2 High population growth, driven by mass European immigration in the late 19th century, lasted until the 1950s,⁴ when metropolitan corridors developed in the northeast and northwest of the city. Since the 1970s the metropolitan area has consolidated, with the establishment of residential suburban areas and irregular settlements.⁵ Mobility, formerly concentrated in the center of the city, now takes place between the center and the periphery.⁶ In recent years the center of Montevideo, where job opportunities and services are concentrated, has lost about 10% of its population, notably because of rising real estate prices.⁷ In the meantime, the population grew by more than 15% in the periphery of the city and in the greater metropolitan area.⁸

¹ Uruguay is a unitary country. Montevideo (530km²) represents 0.30% of Uruguay's 175.016 km².

² This share has decreased over time: Montevideo had 46.3% of the population in 1963 and 40.9% in 2004 (data from the 2004 Census, Instituto Nacional de Estadísticas (INE). Density in the city (2500hab/km²) is higher than the average of the large LAC cities (1,747 hab./km²) (CAF, Observatorio de Movilidad Urbana, 2007) in strong contrast with the rest of the country (19hab/km²). In addition, in the Montevideo metropolitan area, 96% of the population is concentrated in its *urban* portion, which covers only 37% of the area (Loan Proposal).

³ TC UR-T1015 document. In 2007, 19% of the population of Montevideo worked for the secondary sector and 79% for the tertiary sector. Data retrieved from CAF, Observatorio de Movilidad Urbana. 2007.

⁴ Between 1930 and 1963 the population of Montevideo doubled from 650,000 to 1.2 million (CAF, 2011).

⁵ About 10% of the population of Montevideo lives in irregular settlements. 2004 Census, (INE).

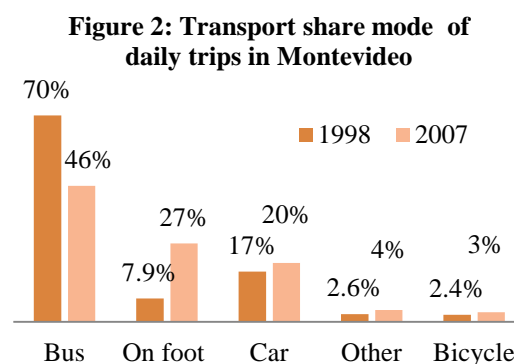
⁶ Homecoming movements occur mostly from the central areas of the city: 45% of returns to home are generated in the area covered by the seven central macro areas (TC product).

⁷ Loan Proposal. The IMM developed a *Programa de Actuación Urbanística* (PAU), aimed at re-populating the sectors of the city that were emptied over the last decades, by providing adequate basic infrastructure (Decreto N° 28.242, 1998, Plan de Ordenamiento Territorial de Montevideo).

⁸ In 1996-2004 the population decreased by 1.5/1000 each year in Montevideo, the largest decrease observed in the country, while it increased by 8/1000 and 11.5/1000 in San Jose and Canelones (2004 Census, INE).

B. Transport context

2.3 Urban transport in Montevideo is provided by collective public transport (buses), private vehicles (cars and taxis) and non-motorized modes. Unlike in other LAC cities, the operation of the transportation sector is *formalized and highly concentrated*, with five major bus companies and no illegal buses and vans; transport conditions are comparatively better than in other main LAC cities.⁹



2.4 Over the last 20 years, transport in Montevideo has been marked by a decline in the number of daily bus trips¹⁰ and by an increase in motorization rates and car ownership (see Figure 2). These changes may have been influenced by increasing public transport fares (IMM, 2010), as well as by a significant decrease in incomes associated with the 2001 economic crisis (CAF, 2011) which led to an increase in Montevideo's population of poor people from 18.4% to 31.7% between 2001 and 2004.¹¹ After 2004, as the economy started to recover – for instance in 2009 22% of the population was living in poor households (Unidad de Estadística, IMM, 2009)- motorization significantly increased; between 2010 and 2011 the number of cars and vans in Uruguay increased by 6% and the number of motorcycles by 13%.¹² Nevertheless, Montevideo's motorization rate (160 cars /1,000 habitants) is still below the rates of such large LAC cities as Mexico or Buenos Aires (over 290 vehicles/1,000 habitants (CAF, OMU). In 2007 about 3.4 million daily trips were made in the city.¹³ Modal distribution varies with the distance from the city historic center, which is Montevideo's public transport node,¹⁴ and with income.¹⁵ Walking is the main transportation mode in central areas (up to 70% of trips) while public transportation is

⁹ Doc 10.5 (*Lineamientos para la estrategia de implementacion*) TC's product. In the metropolitan area the trips last 29 minutes in average (data for 2009, UNDP-IMM, 2012) and, on average, a bus ride lasted 35.7 minutes in Montevideo in 2007 while the LAC average was 49.2 minutes (CAF, OMU).. In 2007, Montevideo possessed a road network of about 2,200km that was overall in good state with only 22% of the paved road network in a bad state (*Análisis de Oferta y Demanda*, TC's product).

¹⁰ Since 1963, public transport trips have decreased from about 500 million to 300 million/year in 2013 (OVE Mission Interviews). Between 1994 and 2002 the number of bus tickets sold decreased by 32% (TC document). See Annex 2 for the details of the number of sold tickets between 1994 and 2009.

¹¹ Unidad de Estadística, División Planificación Estratégica, Departamento de Planificación, IMM (2009). In the meantime, the proportion of poor people doubled from 20% to 40% between 2000 and 2004 in Uruguay (UNFPA, 2012).

¹² INE (2013). Between 2009 and 2010 and between 2010 and 2011, the sales of new cars increased by, respectively, 64.3% and 20.5%, UNASEV (2010, 2011).

¹³ Of all trips, 32% take place during the morning (7-9am) and evening (5-7pm) (Doc. 4.2, TC product)

¹⁴ In the central areas, where most trips are concentrated, public transport is used three times more than private vehicles (TC product).

¹⁵ Mobility in the Metropolitan Area is more important for the richest (*estrato 3*) with 69% of the people of this group travelling daily while only 44% of the poorest segment (*estrato 1*) makes a daily trip. Data for 2009 retrieved from UNDP-IMM. 2012.

used for the majority of trips (58%) in the western part of the city (loan proposal), which includes most of the lower-income population, and for up to 85% of trips in sections of the north and east (TC document).

C. The state of public transportation in Montevideo before the project

- 2.5 The city government (*Intendencia Municipal de Montevideo* - IMM)¹⁶ is responsible for planning, managing and regulating Montevideo's public transportation, which is provided by five private bus companies under short-term authorizations or concession agreements¹⁷, on routes defined and regulated by the IMM (see Box 1).

Box 1. The operation of public transport by private bus operators

In Montevideo, public transportation has been operated for more than 30 years by five private bus companies (CUTCSA and COMESA are corporations and RAINCOOP, UCOT and COETC are cooperatives) that employ about 6,300 people (TC). In the five companies the majority of the shareholders are also workers, such as bus drivers or fare collectors, and own a share of the vehicles. CUTCSA, created in 1937, is the main company, operating about 65% of the fleet and meet about 62% of the demand (2006) in Montevideo (see Annex 3 for the detail of market share). The companies are strongly organized in trade unions, such as the *Unión Nacional de Obreros y Trabajadores del Transporte* (UNOTT) to defend their labor conditions and oppose the entrance of new actors and the introduction of other public transportation modes (tramways and trolleybuses were removed and electric trains face resistance) (Rosa). Bus vehicles include a driver and a fare collector (*cobrador*) who also ensures security on board. This system is guaranteed by a 1998 agreement among the bus companies, the trade unions, and the IMM; job reductions can be made only when workers retire.

The fare is subsidized by the Government, which provides about 27% of the total fare revenues - in 2008, the subsidies amounted to US\$64 million of the US\$174 million collected (IMM, 2010) - to compensate the bus companies for increased fuel prices and for discounts awarded to students and older people (which represented about 20% of the tickets sold by CUTCSA in 2006 and 22% of those sold by COMESA in 2007).

Source: Plan of Operation of TC UR-T1015, Loan Proposal, Brasesco (2012), IMM (2010), TC product, Rosa (2003), OVE Mission Interviews

- 2.6 Transit service in Montevideo has not adapted to the changes in the city over the past 10 years. In 2007, about 1,500 bus units,¹⁸ travelling 320,000 km per day, provided public transport for 800,000 people per day in Montevideo. Demand for public transport increased by about 30% between 2003 and 2009¹⁹ but the urban road network lacked priority infrastructure for public transportation. The 140 bus routes were mixed in traffic along with 240,000 private vehicles, 100, 000 motorcycles and 3,000 taxis.²⁰ In addition,

¹⁶ About 540 persons worked in transport management in 2007 (CAF, OMU). No metropolitan institution exists for inter-urban public transportation among the three regions of Montevideo, San Jose and Canelones. The Agenda Metropolitana was created in 2005 by the three regions to foster decentralization and sustainable development with a metropolitan approach but it does not have legal status.

¹⁷ Articles D. 741- D. 756, Digesto Municipal de la IMM available at: <http://normativa.montevideo.gub.uy/articulos/84611>

¹⁸ Mostly conventional buses with a capacity of 70-85 passengers/unit (TC product).

¹⁹ From 225 to 290 million tickets sold per year, IMM (2010).

²⁰ Data for 2007, IMM (2010) and CAF (2011). As a result, average time for trips were the longest by bus (35.7 minutes versus 26.9 minutes by car or 28.4 minutes by bike) (CAF (2011)).

the city lacked efficient traffic management systems and adequate regulations for freight transport that was transiting in conflict with other modes (TC document). According to the TC document, public transport service was not well matched to the variation in demand in the different areas of the city. Some outlying areas, notably low-income areas, lacked access to the public transport network or inadequate frequency. Conversely, excess of service offered in the center of the city led to a low vehicle occupancy rate (57%) and a low passenger-per-kilometer index (IPK) - under 2 for all bus companies (loan proposal). These factors, coupled with increased motorization, led to significant growth in congestion in some areas of Montevideo.²¹

- 2.7 Although Uruguay produces a small fraction of the CO₂ emissions from Latin American countries,²² the level of emissions per capita is among the highest of the region, similar to levels in Mexico, Brazil and Argentina. Moreover, in the last 12 years, CO₂ emissions in the country have grown by 52% and 42% of total CO₂ emissions come from the transport sector, almost exclusively from the road mode (data for 2011, IEA, 2013). Emissions from the Montevideo region account for almost 20% of Uruguay's total emissions and emissions from the transport sector, accounting for 26% of the total emissions of the city in 2006, rose to 35% in 2010.²³ Increased motorization in Montevideo, coupled with the age of the transport fleet (12 years old in average).²⁴ (CAF-OMU) and the fact that collective transport vehicles generally use poor-quality diesel,²⁵ has affected not only mobility but also air quality. In 2006, air quality was satisfactory for the city of Montevideo: the concentration of major pollutants was below the limits established in international standards and local regulation on air quality.²⁶ However, exposure to pollutants is increasing with the age of the buses and the levels of emissions in Montevideo. By 2013, although general air quality was reported as good or very good, measured values for PM_{2.5} were over the standard on 22 days, those for SO₂ on 3 days, and those for PM₁₀ on 2 days. Some of the measures proposed in the Climate Plan for the

²¹ Buses were running at 16km/h (6-8km/h in the center) on average (TC).

²² Around 8 million tons/year, less than 1% according to (IEA, 2013 data).

²³ Emission Inventory, Departamento de Desarrollo Ambiental IMM (2013).

²⁴ Bus companies are required to establish a plan for fleet renewal to discard vehicles that are more than 16 year old. Article D. 768.24, Digesto Departamental available at: <http://normativa.montevideo.gub.uy/articulo/65664>. The only fleet renovation process in the city is due to regulations related to vehicle accessibility and technology; vehicles that are incorporated in the public bus system, because of fleet renewal or because of an increase in the system's fleet, have to include EURO III technology and be low-entry with accessibility ramps or platform-boarding (Artículo R.431.4, Digesto Municipal, Res.IM 4037/13, 09.09.2013). The objective is to have 40% of buses *low-entry* while the other 60% *level-boarding* (Artículo R.431.5, Digesto Municipal).

²⁵ Diesel was about 5000ppm for Euro II buses and about 50ppm for Euro III buses (OVE Mission Interviews). In comparison, 40% of individual transport uses diesel and 60% oil (CAF 2011). Euro IV technology cannot be implemented before 2016 because of shortcomings in the refinery technology. In Uruguay, the national energy policy is approved for 25 years; one of the goals for 2005-2030 is the achievement of an energy matrix that includes 90% of renewable energy for electricity production and about 50% of renewable energy at national level, for all sectors. The country is also developing, a project to improve the national oil refinery system and reduce the sulfur content of the fuel (OVE Mission Interviews).

²⁶ The monitoring network for air quality is led by the Unidad de Calidad del Aire which measures PM₁₀, MP_{2.5}, CO, NO₂, SO₂ and black smoke. A metropolitan standard has not yet and the country has no emission standards for vehicles (Departamento de Desarrollo Ambiental, IMM, 2006).

Metropolitan Area of Montevideo,²⁷ including the promotion of sustainable mobility, active modes and cleaner technologies, will produce co-benefits in terms of reducing local pollutants and thus improving air quality. In addition, the plan requires bus companies to establish a plan for fleet renewal to discard vehicles that are more than 16 year old;²⁸ and in 2013 the tax on the purchase of light vehicles was set at only 10% that for other types of vehicle (3% of the price instead of 35%, OVE Mission Interviews).

- 2.8 Finally, in spite of growing demand for bikeway facilities (OVE Mission Interviews), in 2007 the city possessed only 9.5km of priority infrastructure for pedestrians and bicycles (CAF-OMU). This has affected road safety with an accident rate (10.8 fatal accidents/100,000 habitants occurred per day in 2007), higher than the regional average (CAF, 2011) and which has constantly increased between 2007 and 2011.²⁹

III. THE PROJECT FINANCED BY THE BANK

D. Project preparation

- 3.1 **Previous local initiatives.** In 1988 the IMM, prepared a draft transit and city transportation plan (*Proyecto de Plan de Tráfico y Transporte para la ciudad de Montevideo*) that was financed in 1992 by the IMM and the Organization of the American States. The transport issues diagnosed in the plan³⁰ served as a basis for the IMM's proposal for a structured public transportation network organized around trunk corridors. The *Plan de Ordenamiento Territorial de Montevideo 1998-2005* (POD) was the first complete plan that integrated this vision.

²⁷ The Climate Plan of the Region of Montevideo,, developed in 2013, proposes three actions to mitigate the impact of transport: (i) developing a more efficient transport system; (ii) improving freight transportation, mainly associated with the operation of the Montevideo Port; and (iii) increasing participation in active modes such as walking and biking to obtain health and environment benefits (UNDP-IMM, 2013). In 2013 the tax on the purchase of light vehicles was also set at only 10% that for other types of vehicle (OVE Mission Interviews)

²⁹ The total number of transit accidents in Montevideo increased by 40% between 2001 and 2002 (TC document) and by up to 9.71% per year, according to the year, between 2007 and 2013 (IMM data).

²⁹ The total number of transit accidents in Montevideo increased by 40% between 2001 and 2002 (TC document) and by up to 9.71% per year, according to the year, between 2007 and 2013 (IMM data).

³⁰ For example: “*recorridos largos y sinuosos; falta de opciones de destino; frecuencias de paso inadecuadas; tiempos de viaje excesivos; velocidad operacional promedio baja; flota obsoleta y de tamaño inadecuado; operación de las paradas y terminales; niveles de saturación en algunas unidades; falta de priorización vial al transporte colectivo; irregularidad en los horarios; bajos volúmenes de pasajeros por ómnibus y por kilómetro*”.

Box 2. Plan de Ordenamiento Territorial de Montevideo 1998-2005

This plan emphasized the metropolitan dimension of mobility and identified urban-metropolitan transit axes and the need to develop coordinated planning actions among the three adjacent regions. It drew on the 1997 Origin-Destination survey to diagnose issues related to the transportation operational system and the road network and it developed transport planning, management and monitoring instruments. It recommended the development of a *Plan Sectorial de Movilidad Urbana* to improve mobility and network connectivity through such regulatory and strategic actions as rationalizing the public transport system, restructuring infrastructure for non-motorized transport, and investigating ways to reduce transport costs and numbers of private transport trips. It also recommended integrating and coordinating freight transport with passenger transport. The plan was revised for 2010-2020 to comply with the updates of the Land Use Planning Law, which included new provisions related to climate change, the metropolitan area, decentralization, social participation and gender.

Source: Plan de Ordenamiento Territorial 1998-2005, Plan de Movilidad Urbana (IMM, 2010)

- 3.2 In 2005, as the POD recommended, the IMM initiated a proposal for a *Plan de Movilidad Urbana*³¹, which proposed the creation of a Metropolitan Transportation System (STM) organized around exclusive public transport corridors. The STM would encompass passenger transport, freight and logistics³² to ensure priority to public and non-motorized transportation and provide a safe, accessible, sustainable and efficient transportation system with limited impact on the environment. The plan encompassed two phases: Phase 1 (2008-2010) involved the construction of two exclusive segregated corridors and their terminals and Phase 2 (2010-2020) entailed the construction of four additional segregated corridors and their terminals. In addition, the plan included integrated transit management measures; information systems for passengers, technology improvement (GPS in buses, pre-paid smart card for payment, centralized STM information); integrating the fare collection and operation systems; upgrading the legal framework for control and audit; creating an *Observatorio de Movilidad*; and prioritizing pedestrian areas and creating of biking lanes (see Boxes 3 and 4).

Box 3. Main provisions of the Plan de Movilidad

Main objectives	Specific objectives	Main components (for public transport)
<ul style="list-style-type: none"> • To develop and implement a rational, efficient and safe mobility system for people and goods in Montevideo and in the metropolitan area • To optimize and democratize transport modes, accessibility and connectivity of structures and territorial systems • To improve road infrastructure • To minimize externalities on the environment • To promote road safety 	<ul style="list-style-type: none"> • To maximize quality and efficiency for passenger of the STM • To lower vehicle operation costs and reach affordable fare for users • To consider alternatives for inter-modal integration and control freight • To implement an efficient passenger information system • To establish a road network hierarchy • To increase safety conditions for pedestrians and public transport users • To limit pollution from the fuels • To regulate vehicle parking 	<ul style="list-style-type: none"> • Six exclusive corridors • Network of feeder roads with preferential lines • High-capacity buses, with low-floor entry operating on the trunk lines • Reduction in the number of transversal road crossings • Accessibility of bus stations to the disabled • Passenger information system in bus stations • Transfer terminals • Bus stations each 400m

³¹ It was supervised by an executing agency, Municipal Resolution 3277/06 of August 30, 2006.

³² The plan includes measures for rail and waterways transportation that are not detailed in this analysis.

Box 4. Planned phases for the implementation of the Plan de Movilidad	
Phase 1: 2008-2010	Proposal of the Plan de Movilidad until 2020
<ul style="list-style-type: none"> • Construction of two exclusive segregated corridors: <ul style="list-style-type: none"> ▪ (i) Ave. Garzon, Llupez/Santa Lucia, Av. Agraciada, Rondeau/ Paraguay (11.6 km) to link the center of the city to the north-east of the city ▪ (ii) Ave. General Flores (8.2km) to link the center to the north of the city • Construction of Terminal Colon and Intercambiador Belloni • Other corridors operating as <i>preferential lane</i> corridors (Av. Italia, Av. 8 de Octubre, Av. Rivera, Bulevar Batlle y Ordonez, Bulevar Artigas) 	<p>Source: TC product</p>
<p>Phase 2: 2010-2020</p> <ul style="list-style-type: none"> • Transformation of the <i>preferential lanes</i> into segregated corridors • Construction of terminal Hipodromo and Interchanges Central and Buceo. 	

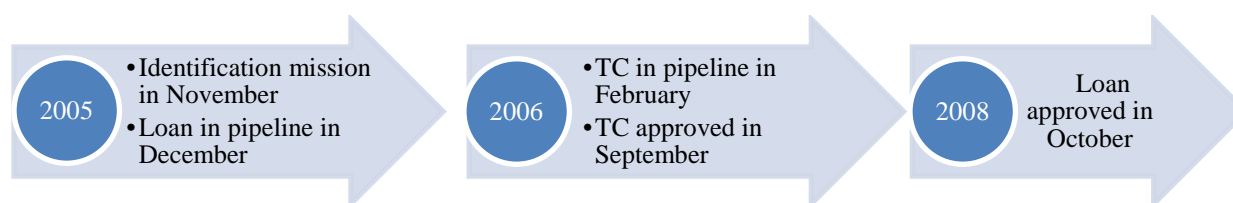
3.3 **The request to the Bank and the technical cooperation UR-T1015.** The IMM submitted a proposal to the Bank for an Urban Transportation Program to be considered for a Loan³³ that would finance the first part of the Plan de Movilidad. The objectives of the program were in line with the Bank's country strategy with Uruguay for 2005-2009,³⁴ and, in September 2006, the Bank approved a Technical Cooperation (TC)³⁵ to support the preparation of the Montevideo Urban Transport Program (see Figure 3).

³³ The Bank was the first financial institution contacted by the IMM for this project (OVE Mission Interviews). The IMM had cooperated for more than 30 years with the Bank, on a wide sanitation program (Urban Sanitation Project for Montevideo, phases I, II, III and IV in 1981, 1989, 1996 and 2006); on land use plans (TC-9906023, in 1999); and on work to improve the IMM's capacity in planning, organization and management evaluation (Loan UR0139 in 2002). In relation to urban transport, no other Multi-Lateral Development Banks financed projects in the city of Montevideo in the recent years; their support was mostly oriented to road rehabilitation and maintenance in the entire country.

³⁴ Country Strategy GN-2398-2. The project was in accord with the second pillar of the Strategy, related to lending for urban transportation upgrade and extension, and with the third pillar of the Strategy related to poverty reduction, social inclusion, and improved living conditions in cities.

³⁵ *Apoyo a la Preparacion del Programa de Transporte Urbano de Montevideo* (UR-T1015), with US\$720,000 financed by the Japanese Trust Fund and US\$180,000 of local contribution (mainly in-kind).

Figure 3. Chronology of the TC and Loan Approval Phases³⁶



Source: IDB repository systems.

3.4 The TC included two components:

- 1) Transportation planning and travel demand modeling, including
 - Update of the city's transportation plan, travel demand models for passenger and freight transport,³⁷ and the traffic micro-simulation model; and
 - Training of relevant authorities in the use of those tools.
- 2) Design of public transportation infrastructure, including feasibility studies, three technology alternatives for the vehicles and busway, estimation of costs and revenues and environmental impact assessments and work scheme.

3.5 Public opinion surveys conducted as part of the TC found that public transportation was overall rated 5.3 out of 10, and that infrequent service was the greatest concern with the system³⁸. The feasibility studies also indicated issues related to the IMM's technical skills³⁹ for transport management. As a result, courses in transport system planning, such as training in software for control and operation, were offered to the IMM.

3.6 The final studies, delivered in October 2008, recommended (i) the development of two exclusive corridors as segregated busways in the center lanes of Avenidas Garzon and Flores; (ii) the development of bus fleet and technology management systems; and (iii) fare integration and off-board payment (see Box 5). However, in spite of an ageing and polluting fleet and increasing accident rates, a cost-effectiveness analysis, plans for bus scrapping or fleet renewal and studies on traffic safety in the area of the corridor were not prepared as part of the feasibility studies. Likewise, the final reports –in spite of having identified those risks–did not suggest mitigation and reconversion plans for the public transport operators that could be left out the project, given the fleet reduction and bus route restructuration that different project scenarios implied. Neither did they mention the need to reframe the institutional organization of the bus companies,

³⁶ The Bank organized two missions during the preparation of the TC (in November 2005 and in April 2006) and two others in February and August 2008 to check process in the conceptualization of the Program.

³⁷ Construction, validation and calibration of Origin-Destination (OD) travel tables; development of a travel demand model; inventory of the road infrastructure network; collection of socio-economic and land use data. No study was carried out on the socio-economic characteristics of transport users (OVE Mission Interviews).

³⁸ The worst marks were given for night shift, waiting times, user information and frequency. However, at the time there was no strong demand from the population to modify public transport system in Montevideo and this topic that did not appear as one of the main concerns of the population (OVE Mission Interviews).

³⁹ TC's final report: *"the capacity of the bus transit companies and the municipal government to conduct adequate planning and supervision of the system is limited. The sector lacks any formal mechanism to manage and make use of the information generated by the system in terms of operational and performance indicators"*.

characterized by an over-supply of staff (Information retrieved from the TC final product).⁴⁰

Box 5. Main provisions and Recommendations of the TC Product for the Bank's project			
Relevance of the two corridors	Infrastructure projects	Bus fleet and technology management	Fare management
<ul style="list-style-type: none"> • Important demand for and supply of public transportation • Population increase around Avenidas Agraciada and General Flores, medium-low and low-income areas • Linkage of the center to inter-urban and national networks 	<ul style="list-style-type: none"> • Exclusive corridor in the center lanes • Partially elevated bus stations • Reduction in the number of intersections: traffic light only in very close intersections • Crossings as perpendicular as possible • Pavement upgrade 	<ul style="list-style-type: none"> • Use of internal combustion low-entry vehicles running on natural gas for the Corridors • Route restructuring: two services in Corredor Garzon and in Corredor Flores • Establishment of precise frequency for bus lines 	<ul style="list-style-type: none"> • Fare validation outside the vehicles, in closed bus stations • Fare integration system • Integration of the fare collection and transit control systems that are under the responsibility of the IMM into a unique control center

E. The approved project

3.7 IDB Loan UR-L1025 (US\$80 million)⁴¹ to support the Montevideo Urban Transport Program was approved in October 2008. The objective of the program was to improve mobility and increase the efficiency of the urban transportation system, providing “an accessible, safe, efficient and sustainable transportation system” by upgrading mass transit infrastructure and restructuring and streamlining services.

3.8 The program was intended to finance infrastructure for exclusive and preferential bus lanes, terminal stations, feeder lanes and traffic-lights. In counterpart, the IMM was supposed to develop demand management measures (introduction of a prepaid fare and electronic ticketing systems; technological fleet management; operating control systems) and to adapt and expand the bicycle network and overhaul the road network. The first component of the Bank's project supported engineering and administration, and the second component supported the construction of physical infrastructure for the exclusive mass transit corridors and their terminals (see Box 6). The program and loan disbursement were planned for four years, until the end of 2012 and works in Corridors Agraciada-Garzon and Flores and Terminal Colon were to be done by mid-2010.

⁴⁰ In parallel, in August 2008, a commission (*Comisión Consultiva de Seguimiento para la Reestructura del Transporte Colectivo Urbano de Montevideo*) integrating the IMM, the bus companies and the UNOTT was created to discuss the restructuring of public urban transport in Montevideo (Resolution 3608/2008: <http://www.montevideo.gub.uy/asl/sistemas/gestar/resoluci.nsf/678a9bb12579e33d03256f000044a0e3/5457058f4f1952cb032574c6004d9354?OpenDocument>).

⁴¹ The borrower was the Republic of Uruguay. The executing agency, the IMM, provided counterpart funding of US\$20 million.

Box 6. Components of Loan UR-L1025 and share of the total budget (including local contribution in italic)	
Component I: Engineering and administration (US\$4 million)	Component II: Investments for improving public transportation (US\$86 million)
<ul style="list-style-type: none"> • <i>Procurement of technology and computer equipment for the (STM) (0.2%)</i> • <i>Public awareness and information campaigns for STM implementation (0.5%)</i> • Ongoing consultation and surveys during the STM implementation/evaluation phases (0.6%) • Monitoring of the program's environmental and social management plan (0.4%) • <i>Feasibility studies and designs for future STM corridors and terminals (0.6%)</i> • <i>Program's management and administrative operating costs (executing unit support and incremental costs) (1.5%)</i> • Technical assistance, supervision, audits (0.2%) 	<ul style="list-style-type: none"> • Work measures: <ul style="list-style-type: none"> ○ Introduction of exclusive mass transit lanes in corridors Av. Agraciada/Av. Garzon, 9.99km, (30%) and Av. Flores, 7.94km (11.1%) ○ Three terminals stations (Central, Colon and Hipodromo) and interchanges (16.5%) ○ <i>Supplementary infrastructure works in priority mass transit corridors: upgrading of complementary roads on 16.3 km (20.6%)</i> • Land purchase and expropriations in the areas of influence of the terminals and corridors (5%) • Modernization and synchronization of traffic lights in the main STM corridors on 63 intersections (1%) • <i>Marked alternative corridors on 18,000m2 (1.8%)</i>

Source: Loan proposal. US\$ 10 million was also included for contingencies and cost escalation, given variations observed in work contracts in Uruguay at that time. See Annex 4 for the details of the budget for each component and the planned time frame.

IV. ANALYSIS OF THE PROJECT

A. Relevance

- 4.1 **Objective and design.** The project was intended to support the first stage (2008-2010) of the IMM's *Plan de Movilidad* and to provide the IMM with the tools to finalize the second stage (2010-2020) of the plan. The project addressed the need to restructure local urban transport (rationalization of the bus routes), to improve travel conditions (end of mixed-traffic lanes and upgrade of road network), and to control transit management by developing trunk corridors and traffic-light systems. However, no specific measures related to the identified road safety and the environmental issues⁴², such as fleet renewal or technology improvement, were included in the project.⁴³

⁴² Indicators related to reduction in the number of traffic accidents and reduction in pollutant emissions in the city were each seen as a "*positive externality not directly attributable to the program*" (loan proposal).

⁴³ To protect the jobs of the fare collectors and drivers, the bus companies opposed the introduction of articulated buses; they stated that except during the 7-9am peak hour there was no need for such vehicles, which cost 50% more than regular ones. Smaller buses (8m long) for feeder services were also considered but not implemented. New buses, with advanced technology such as Euro IV, platform level boarding and reduced bus-platform gaps that would have reduced boarding times were not introduced under the pretext that buses had to be able to run not only on the busway but also in mixed-lane traffic in other sections of the city (OVE Mission Interviews)..

4.2 Choice of corridors (see Figure 4).

Avenida Garzón was the first corridor selected as a pilot busway for several reasons: (i) it was one of the corridors recommended in the Mobility Plan; (ii) it seemed relatively simple to implement as no land acquisition was needed and the negative effects of construction would be minor on this wide avenue; (iii) the bus route restructuring seemed less controversial than it might have been for other corridors since the northwest of the city had the fewest public transportation routes; and (iv) it was deemed essential to connect the center of Montevideo to the northern areas in which the city's most important population growth is taking place (document 8.1, TC product), especially given the complaints of the local populations around the corridor concerning the time they needed to go downtown (OVE Mission Interviews)⁴⁴. Both the Mobility Plan and the TC product identified these corridors as priority axes for the city.⁴⁵ The low density of the area limited the scope of expropriations, and the low congestion levels (OVE Mission Interviews) permitted developing the project as a pilot, without challenging the city's dynamics. The corridors were also relevant to the Mobility Plan's social integration aim,⁴⁶ given the importance of lower-and medium-income populations living in these areas (TC product),⁴⁷ and the construction of Terminal Colon was seen as an opportunity to foster development and land use densification in areas of lesser commercial activity.

Figure 4. Location of the Agraciada-Garzon and Flores corridors



Source: TC product

4.3 However, overall travel volumes and demand for public transportation were greater in the center and in other parts of the city. In 2007, about 29% of all daily trips took place in only 8 of the metropolitan area's 61 zones⁴⁸ - those in the center of Montevideo- while the 8 zones around Terminal Colon and Avenida Garzon,⁴⁹ in the north-west of the city, accounted for only 8.08% of the total daily trips. The 8 central areas gathered about

⁴⁴ However, in the entire city, there was no subsequent demand for changes in the public transport system; public transport was not ranked, in opinion surveys, among the most important concerns (OVE Mission notes).

⁴⁵ Document 2 of the TC product mentions: "*Cabe destacar la importancia de los sectores centrales de la ciudad como grandes atractores/generadores de demanda (...), si bien también destacan los sectores correspondientes a Paso Molino, Colón y, en general, los ejes que se estructuran alrededor de la Av. Agraciada-Garzón, así como la Av. 8 de Octubre, y la Av. Italia*".

⁴⁶ The Plan de Movilidad recognized the link between urban mobility and social equity. The TC's product mentioned the strategic importance of Corridor Garzon for the inclusion of the low-income population.

⁴⁷ See Annex 5 for a map of income levels in Montevideo. In addition, from a political point of view, it was convenient for a leftist government to show that it was improving public transportation for the poor population (OVE Mission Interviews).

⁴⁸ Defined as such during the design studies (Document.4.2, *Análisis de la demanda*, TC product).

⁴⁹ Villa Colon; Conciliación, Colon, Peñarol, Sayago, Belvedere, Colon Norte and Paso Molino.

30.8% (484,605) of the total (1,572,936) daily trips made in the city by public transportation while the 8 areas around Corredor Garzon gathered only about 8.4% of total daily drips (132,300) made by this mode (*Analisis de la Demanda*, TC's product). Likewise, vehicle counting and demand analysis indicated that Avenida Flores was a potential corridor for public transport but that demand for this mode did not reach the levels observed in other areas (Document 2.2, TC product). In the feasibility studies, the grouping of the 122 urban routes into 43 public transport axes indicates that most demand for public transport occurred in the center and in the east of the city.⁵⁰

Table 1. Findings of the TC Feasibility Studies about Demand for Public Transport in Montevideo				
<i>Location</i>	West	East	Northwest	Coast (South)
Number of structural public transport axes and bus routes	13 axes 26 bus routes	15 axes 38 bus routes	9 axes 17 bus routes	6 axes 22 bus routes
Share of the total demand for public transportation	27.2%	33.08%	21.75%	17.98%
Structural public transport axis with highest demand (in passengers/day)	West 7: 22, 374	East 9: 30,885	Northwest 8: 26,225	Costa 4: 27,988)

Source: Information retrieved from Document 2.2 of the TC product, based on the number of bus tickets sold by the five bus companies operating in Montevideo, for the month of November 2006.

- 4.4 In addition, most interviewees said that Avenida Garzón was a bad choice for a public transport improvement project because of its relative absence of congestion and because it was too far up North. The feasibility studies (TC) identified the need to reduce the travel time of the bus routes leading to the center of the city, affected by congestion in the *southern part* of the Avenida Garzon, and important waiting time in bus stations because of a lack of service in the *northern section* of the Avenue.

B. Project implementation: Challenges and efficiency

- 4.5 The IMM implemented the program through the Executing Unit of the Urban Mobility Plan⁵¹, created in 2006, which reported to the Department of Mobility. Other institutions involved in the project were the Transit and Transport Division, the Highway Division and the Division of Environmental Development for environmental advice and for the implementation of a monitoring plan for air quality. Negotiations with the bus companies entailed the participation of the National Ministry of Transport and Public Works, which is responsible for regulating inter-urban routes. The implementation of the project has been complex because such factors as the political context, the opposition of the bus companies to the project, and shortcomings in the executing's agency institutional capacity led to design issues and construction delays. Consequently, the Avenida Garzon

⁵⁰ For instance, the areas of Barrio Borro and Piedras Blancas (East) accounted for about 5.43% of all daily trips of the city but, in proportion, used more public transportation and accounted for more non-motorized tips and more trips by motorcycles than any other part of the city (except the center) (Doc 2.2, TC product).

⁵¹ It was responsible for planning investments; preparing and monitoring bidding processes; performing control and oversight of works; supervising environmental and social management plans; preparing monitoring reports.

busway opened in December 2012, two years after the planned date⁵² and works in Avenida Flores were not concluded under the Bank's loan.

1. Complex political and social context

- 4.6 **Lack of political support to the project.** The project seems to have been approved quickly in comparison to the municipality's political readiness to undertake important changes, such as the restructuring of the established business model involving the bus companies, the need to integrate public transport among the distinct metropolitan authorities or to update or define new regulatory frameworks for urban transport. The Bank may have overestimated the local support for the project. In the context of the 2010 mayoral elections,⁵³ negotiations with the bus operators were postponed and the IMM decided not to tender the operation of the lines in Avenida Garzon and to avoid the planned route restructuring. After the elections, executing agency staff changed⁵⁴ and reduced the budget for the Plan de Movilidad (OVE Mission Interviews).⁵⁵ Negotiations with the bus companies started again (Loan Result Report, 2011) in mid-2010, but real political commitment to the project seems not to have occurred until six months before the opening of the Corridor Garzon, in mid-2012 (OVE Mission Interviews). Finally, in August 2013, in a tense political environment, the head of the IMM's Division of Urban Mobility was changed (El Pais, 2013 and OVE Mission Interviews).
- 4.7 **Bus companies' opposition to the project.** The highly centralized and formalized organization of the bus companies, which had had long experience in negotiating with the Government (notably through their trade unions),⁵⁶ complicated the project's implementation. According to the conclusions of the TC's product, the companies were at first in favor of improving the public transport system; they acknowledged the importance of restructuring bus routes to better serve passenger demand, prioritizing public transport over other modes and improving bus stations and terminals and transit management systems to increase the safety of both passengers and their employees. However, the companies were only willing to accept changes that would not affect their acquired rights: they opposed total service integration that might threaten their control over service provision,⁵⁷ the use of articulated buses, the reduction in the number of

⁵² The disbursement expiration date was changed from December 30, 2012 to June 30, 2013 and the closing date was August 1, 2013. See Annex 7 for a summary of the Bank's monitoring documents.

⁵³ The executive and administrative functions in Montevideo are carried out by a mayor, elected every five years. In recent years the mayors have been Ricardo Ehrlich (2005-2010) and Ana Olivera (since 2010), both from the Frente Amplio, a leftist party that has governed Montevideo since 1990.

⁵⁴ The 2010 mayoral elections led to the victory of another faction of the Frente Amplio that was not in office during the previous mayoral mandate and had not initiated the project with the Bank.

⁵⁵ The monitoring report from the Executing Agency (second semester of 2010) mentioned that the election would not modify any of the project's objectives and that was one of the priorities of the new administration in spite of its reluctance to proceed to bus route restructuring.

⁵⁶ Bus companies are influential in the local political scene, with important political connections. The bus company CUTCSA tried to assign one of its staff members to the executing agency but the IMM refused.

⁵⁷ CUTCSA, in particular, was skeptical about a project that would involve more equal participation and coordination among all operating bus companies and overall, the companies were skeptical about the number of additional passengers the corridor could lead to (OVE Mission Interviews).

buses and the outsourcing of the fare collection system and off-board payment⁵⁸ that would jeopardize the jobs of fare collectors.⁵⁹ Consequently, no operational program had been agreed upon with bus operators when works in the first corridors started and many of the components planned as part of the Plan de Movilidad could not be implemented (OVE Mission Interviews).

- 4.8 **Unclear public consultation and communication process.** Both civil society and the bus companies (OVE Mission Interviews) denounced the IMM's lack of consultation during the construction in Avenida Garzon.⁶⁰ The bus companies claimed that they were included only once the economic model had been decided by the IMM.⁶¹ The Loan Results Report of April 2011 mentioned the asymmetry of information between the IMM and the bus companies (in favor of the companies) that would compromise the negotiation process and ultimately hampered the implementation because of the bus companies' lack of buy-in. Relations with the IMM eventually improved in mid-2013, with the companies participating more in works in Corridor Flores.⁶² Likewise, the IMM's communication with civil society on the benefits of the system has been limited because of little political leadership. According to the IMM progress report, in spite of initial public communications to explain the scope of the project (June 2009), most communication happened *after* the beginning of works, when the population had already realized the changes that the corridor would imply for bus routes or parking restrictions (OVE Mission Interviews). People's discontent led to protests in the work area.⁶³

2. Lack of technical capacity of the executing agency

- 4.9 The executing agency integrated staff from two divisions –with expertise in road physical works (*Division de Vialidad*) and in transit regulation (*Division de Transito y Transporte*)– but not from an urban transport division and their management capacity was limited.⁶⁴ The 2010 local elections led to staff turn-over in the executing agency, notably of some staff that had benefited from capacity-building activities provided as part of the TC (IDB interview notes). To some extent the Bank compensated for the shortage

⁵⁸ March 2011 PMR: the risk that negotiation with the companies would be unsatisfactory was raised from *low* to *moderate*.

⁵⁹ About 40% of the buses have a driver and a *cobrador* and 60% only one driver (OVE Mission Interviews). The organization of some of the bus companies in cooperatives (such as CUTCSA) complicates any possible fleet reduction since some of the staff integrating the bus companies are also the owners of the vehicles.

⁶⁰ Likewise, no coordination or negotiation process with the National Ministry of Transport, in relation to inter-urban public transport, took place.

⁶¹ Only the first progress report of the Executing Agency (June 2009) mentions that in May 2009 meetings with the five bus companies and the transport trade unions took place. Their other progress reports (that cover the period between July 2009 and December 2010) did not mention the organization of other similar meetings.

⁶² Since then, to avoid distortions, the IMM registers the bus companies during the negotiation process and requires them to sign minutes that record the content of the discussions (OVE Mission Interviews).

⁶³ Montevideo Portal. 2013. However, the protests have never involved more than 100 people. Discontent was also observed during the popular *murgas* of carnival (OVE Mission Interviews)

⁶⁴ Especially the planning capacity of the IMM was considered to be very weak. (OVE Mission Interviews). In addition their knowledge of urban transport system, such as BRT, was limited (Porrás Maieli, 2014).

of technical staff specialized in urban transport,⁶⁵ but overall the executing agency has been reluctant to receive support from external consultants.⁶⁶ Initial delays in the procurement of technology and computer equipment and in the development of studies for the future STM corridors⁶⁷ led to the IMM to accept additional support for training in transportation modeling to formulate a proposal for bus route organization. In 2009, after contracting a new consulting company, the IMM updated the information gathered in the 2007 Origin-Destination (OD) survey with the information generated by the studies of the TC (LRR, 2011) to evaluate the alternatives. During the implementation of the TC, the consulting companies received little feedback from the IMM (OVE Mission Interviews) and sometimes their studies were redone by the IMM in a way that did not fit the design of other components or international BRT standards. This was particularly the case for the design of the bus stations,⁶⁸ which was reviewed many times between 2008 and 2010 and of the traffic-lights, which turned out smaller than planned.⁶⁹

3. Supervision process of the Bank

- 4.10 Many interviewees mentioned shortcomings in the supervision process of the Bank during the project preparation and implementation. Sometimes the Bank would note issues in designs for which the works were already being implemented. Three Bank's supervision visits were documented during the project implementation (in June 2010, in April 2011 and in November 2013) in lieu of the planned bi-annual missions per year.⁷⁰ From a formal point of view, the Bank produced 7 PMR between June 2009 and September 2012 (approximately each 6 months, except for the first ones, produced in June 2009 and later in July 2010). The most robust PMR information was mostly related to progress of the physical infrastructure. Little was reported on the first component of the Project (Engineering and Administration) or on the project's Institutional challenges, such as the negotiation process with the bus operators, and their related mitigation measures.⁷¹

⁶⁵ The situation is critical in the public sector, where low salaries did not increase much between 2003 and 2013 in comparison to the salaries of the private sector (OVE Mission Interviews).

⁶⁶ It was planned that an international consultant would support the organization of the negotiation process with the bus companies (June 2009 PMR) but the IMM was not interested. In the end the IDB helped the IMM get support from a non-motorized transportation expert (OVE Mission Interviews).

⁶⁷ Both had to be financed through resources of the IM (as a local counterpart).

⁶⁸ The IMM had remodeled them after the beginning of the works in the corridors and in the terminals, discarding the initial design of the consulting firm (OVE Mission Interviews).

⁶⁹ Their design was first carried out by the IMM, then modified with support from a consulting firm and tendered out (OVE Mission Interviews). They were shorter than planned, with the green light at 2.5 meter instead of 3 meter high.

⁷⁰ In total, the Bank devoted 87 staff-week to prepare, implement and close the project (2006-2013), with nearly half of the support concentrated in the preparation of the project, in the TC implementation and first year of supervision (IDB's Time and Labor and Budget Execution by Product repository systems)

⁷¹ Only 2 PMR (in June 2009 and March 2011) reported on the state of the negotiations between the bus operators and the IMM and recommended the provision of a consultant specialized in Systems Planning to the IMM.

4. Construction challenges

- 4.11 The implementation of the project started in the first half of 2009 with the opening of the works of Corridor Garzon to the bidding process (June 2009 PMR) while the Executing Agency started the engineering design of the other terminals and corridors. In June 2010, the works of Corridor Garzon were being implemented in a satisfactory and timely manner (technical visit of June 2010); the works schedule remained unchanged, except for Corridor Flores.⁷² In 2011, the IMM decided to redo the studies for route rationalization (April 2011 PMR)⁷³ in Corridor Garzon. However, no such re-organization took place after the final design of the infrastructure. In April 2011 (PMR), works were delayed, except for the marking of the alternative corridors, the traffic light synchronizing, and the construction of complementary roads and terminals and the scope of Corridor Garzon for the end of 2011 was reduced from 5.58 to 2.38km (out of the total 7.94km planned) and the scope of works for the terminals was reduced by 20% (March 2011 PMR).⁷⁴ The last Bank monitoring report (September 2012) indicates that the construction of Corridor Flores had not started and that only 50% of the planned works had been built on Corridor Garzon. In addition, construction of all the terminals experienced delays. In August 2013 (Republica, 2013), the mayor was summoned by the Junta Departamental de Montevideo to explain the reasons for delays. Eventually, in view of the negative reactions to the Avenida Garzon busway the works in Avenida Agraciada were interrupted and the mixed-transit lanes were restored. The same occurred for Corridor Flores which avenue was redesigned to permit mixed-transit lanes (OVE Mission Interviews).

C. Results

- 4.12 To date, only Corridor Garzon is complete; it has been inaugurated (December 2012) and opened to transit. Works on Corridor Flores are still being executed (with financing from the IMM) and only Terminal Colon has been achieved. The infrastructure built in Corridor Garzon includes a 6.3km segregated busway, with limited transit management system and infrastructure upgrade. The busway connects the new Terminal Colon with Avenida Agraciada, a radial thoroughfare leading toward the city center. Besides the busway and 30 stations (15 on each side) Avenida Garzón was completely rebuilt with four mixed-traffic lanes and ample sidewalks and many new traffic signals were installed. It is utilized by six bus routes, of which two run the entire length of the busway – the others enter or leave the corridor at various locations and run in various city streets for the remainder of their alignment.

⁷² July 2010 PMR: only 5.58km of the planned 7.94km were expected to be built by the end of 2011.

⁷³ The IMM contracted a consultant for 6-8 months to assist in planning bus route rationalization (OVE Mission Interviews). The Bank planned (May 2011) to support the IMM's management of the public transportation system during the operation phase through the dissemination of the best international practices in the field and improvement in the analysis and measurement of the Program's results (technical visit of April 2011 that emphasized the importance of achieving bus restructuring *before* the completion of the infrastructure works). The TC's product had also recommended that the IMM develop a detailed program for bus routes, the establishment of the schedule of service and the preparation of adequate regulations for the bus companies.

⁷⁴ Delays in works implied cost overrun which difference was covered by the counterpart (PMR April 2011).

Table 2: Obtained outputs for the physical infrastructure financed by the Bank (at Bank's program completion)	
Planned	Achieved
<ul style="list-style-type: none"> About 18km of exclusive mass transit lanes on Avenidas Garzon, Agraciada and Flores 	<ul style="list-style-type: none"> 6.3km of exclusive mass transit lane built on Avenida Garzon with 15 stations on each side and mere road improvement scheme for Avenidas Flores and Agraciada
<ul style="list-style-type: none"> Three terminals stations (Central, Colon and Hipodromo) and interchanges 	<ul style="list-style-type: none"> Construction of Terminal Colon
<ul style="list-style-type: none"> Land purchase and expropriations 	<ul style="list-style-type: none"> Land purchase and expropriation of 10 families
<ul style="list-style-type: none"> Modernization and synchronization of traffic lights on 63 intersections 	<ul style="list-style-type: none"> Treatment of 15 intersections with traffic signals

Source: OVE mission interviews. No PCR was produced for this project, more than 2 years after its completion. Likewise no ex-post evaluation had been planned for the project.

1. Design as implemented

- 4.13 At the time of the evaluation, the infrastructure consists of a segregated right of way, with a limited transit management system and infrastructure upgrade; it does not meet the basic International BRT Standards criteria for a BRT.⁷⁵
- 4.14 **The segregated busway.** The two-lane busway was built in the center of the corridor, flanked by two mixed traffic lanes on each side. It lacks a third passing lane in which buses can pass others.⁷⁶ The possible extension of the lanes was limited by the presence, along the corridor, of a railway and of the general mixed-transit lanes in which inter-urban routes operate.⁷⁷ The pavement quality appeared to be good quality during the team's field visit.⁷⁸
- 4.15 **Traffic engineering issues.** In the initial traffic concept for Avenida Garzón, most left turns were prohibited, even though the surrounding street network normally did not provide alternative paths. There was strong opposition to the left-turn prohibition which, in most cases, was lifted after the system started operations. To permit safe left turns across the busway, extra signal phases were established at many intersections, adding to the traffic signal delays for both buses and general traffic. Moreover, the number of intersections with traffic lights increased from 5 to 16. All mixed-traffic approaches to intersections have only two lanes, even when there would have been space for extra left-turn lanes.⁷⁹

⁷⁵ According to the BRT standards 2013 a BRT should include five basic elements: (i) a dedicated right-of-way, (ii) a center-aligned busway, (iii) off-board fare collection, (iv) intersection treatments that prohibit turns across the busway, and (v) level platform boarding (ITDP, 2013). The busway reached the score of 15/33 (for BRT basic) while the minimum needed to qualify as BRT is 18 (BRT Standard (ITPD, 2013).

⁷⁶ Vehicle overtaking was first prohibited and now authorized (OVE Mission Interviews).

⁷⁷ There is no interchange between the busway and suburban buses (field observations).

⁷⁸ Before the project, the corridor was "green", with a wide grassy strip in the center dividing the roadways.

⁷⁹ Some sidewalks are very wide which would have permitted to put extra left-turn lanes with a green signal in parallel with the straight mixed-traffic lanes for the busway (field observations).

- 4.16 **Traffic-light and control systems.** Because of the left-turn issue, most intersections require at least four signal phases, which means that intersection approaches have a red light most of the time.⁸⁰ Field observations by the team revealed that several intersections have a long cycle, with up to five phases lasting from 80-120 seconds in total; efficient BRT operations would call for minimizing the number of traffic-signal phases (BRT Standard 2013). Additionally, little green light time is given to buses since there is no automatic recognition of the buses at intersection⁸¹ and no differentiated signal system between peak and regular hour. Consequently, the signal control calls each signal phase, whether there are vehicles or not, generating unnecessary delays. The use of sensors could reduce signal delays, enabling prioritization of the buses at intersections.⁸²
- 4.17 **Bus stations.** The number of bus stations in Avenida Garzon decreased from 20 to 15. They are installed at about each 400m, an optimal distance to reduce the amount of delay associated with stops, according to BRT standards 2013. However, the stations were placed too close to the intersections, before them, which created issues for the vehicles turning at intersections.⁸³ In addition their “shape coefficient”⁸⁴ has resulted in pedestrians having to get off the bus by disembarking from vehicles first onto the street and then into the bus station and passengers lining up at the front to enter the front door of the bus and their design combined with mostly high-level buses is not convenient for passengers with disabilities. Finally, the stations do not provide for a comfortable and safe environment since they do not have sliding doors, have only partial weather protection, and display little information about buses. However, well designed crosswalks and pedestrian signals have been built around all busway stations.
- 4.18 **Bus route restructuring.** In spite of the recommendation of the TC report, bus lines in Corridor Garzon were not restructured except for the creation of Line G, which operates the entire length of the corridor⁸⁵. No express services to increase commercial speed and reduce passenger travel times were developed and no consortium was created to integrate the three bus companies (CUTCSA, RAINCOOP and COETC) operating the six bus

⁸⁰ An extreme case was observed at the intersection with Avenida Millán, with five signal phases and a signal cycle of 200 seconds –of which the busway had a green signal of only 10 seconds. During an in-bus field inspection, the mission observed that the bus had to stop for 120 seconds before getting a green light. It is understood that, before implementation of the project, the crossing with Avenida Millán used to work as a traffic circle. Supposedly, the waiting time for vehicles is only 18 seconds at each intersection.. Some signals also have two brief green phases for the busway within the same cycle.

⁸¹ No traffic control system has been modified to give priority to the corridor; transit monitoring is done by the monitoring center as buses give real-time information on their positioning which is then used to analyze route demand and frequency (OVE Mission Interviews).

⁸² Vehicles detectors were installed at intersection approaches but reportedly they do not work properly (OVE Mission Interviews).

⁸³ Field observation. They should be located at least 40m from intersections –versus 20 m currently - to avoid delays with passengers taking a long time to board/alight (ITDP, 2013).

⁸⁴ The relation between the width and length of the station; the gap between the platform and the descent door is too big.

⁸⁵ Given the very low demand for Line D5 (382 passengers/day in November 2006 and an IPK of 0.58 in 2007), the TC’s product advised the elimination of this route. Line G *Ciudad Vieja* replaced Line 130 and Line G *Portones* replaced what was before covered by Line 468.

lines of the Corridor. In addition, the system has not been integrated with the inter-urban bus routes that run on mixed-traffic lanes next to the busway.⁸⁶ Changes in the bus routes have been related to the location of Terminal Colon, a large transfer terminal at about 100m from Avenida Garzon. When the busway opened all bus lines ended at the terminal where passengers were supposed to transfer to feeder buses. However, the detour to go to the terminal added 6-10 minutes to the bus travel time, compared to a straight alignment along Avenida Garzon (OVE Mission Interviews), and the transfer to the feeder buses added approximately 3 minutes to each passenger trip.⁸⁷ After some weeks of experimentation and taking into consideration the discontent of the population and the bus companies, many original through services were restored and additional buses were introduced as an attempt to operational deficit (OVE Mission Interviews).

4.19 In addition, two components supposedly financed by the IMM were not developed:

- **Payment system.** Off-board fare collection, essential for reducing travel time, was not implemented because of the opposition of the bus companies which wanted to continue controlling revenues with direct fare collection. In addition, it was felt that the busway was too short to merit the costs and complications of off-board fare collection.⁸⁸
- **Non-motorized facilities.** No bicycle lanes, bicycle parking or bike share systems were installed near the corridor in spite of the presence of wide sidewalks.

2. System operation

4.20 The program was expected to improve mobility conditions in the city. It was intended to increase the efficiency of Montevideo's Urban Transport system through increases travel speeds in segregated corridors and streamlined bus routing, with higher service productivity. Other expected co-benefits of the project⁸⁹ were improved accident rates and reduced pollutant emissions in the city (Table 3 shows the program's results framework and indicators).

⁸⁶ During the night they are allowed to run on the Garzon which thus provides a 24 hour service. Due to a lack of coordination among national and local jurisdiction, no metropolitan transport integration was achieved (OVE Mission Interviews).

⁸⁷ The bus companies insisted that the vehicle boarding and alighting times represent a maximum of 7 minutes on the bus route for the lines going by the Corridor. A bus company mentioned that because of the delays they had to buy an extra bus (OVE Mission Interviews).

⁸⁸ It also seems that the IMM wanted to limit the scope of expropriations (OVE Mission Interviews).

⁸⁹ The loan proposal mentions that these are not directly attributable to the program's components but are positive externalities.

Table 3. Results framework and key indicators⁹⁰		
Result indicators	Baseline	Target
Increase in average commercial speed for mass transit services in the main STM corridors	Agraciada: 12km/h Garzon: 16 km/h General Flores: 15 km/h	Agraciada: 18km/h (+50%) Garzon: 22 km/h (+38%) General Flores: 22 km/h (+47%)
Increase in average passengers per km for all mass transit routes and services	IPK = 2	IPK = 4
Reduction in the number of traffic accidents in the main STM corridors	13 accidents on average per month	10 accidents on average per month (-20%)
Reduction in pollutant emissions in the city	PM10: 48 microgram/m ³	PM10: 41microgram/m ³ (-10%)

Source: Loan Proposal. Baseline information was gathered before Board approval. Indicators were already selected for the development of the studies financed by the TC.

3. Ridership demand

- 4.21 Although measurement of ridership was not part of the project result matrix, the number of passengers using the lines that cross the busway increased between 2006 and 2014 (Table 4).

Table 4. Demand for the Bus Lines Crossing the Garzon busway, November 2006 and August 2014					
<i>Line</i>	<i>Passengers/day in 2006</i>	<i>Length in 2006 (km)</i>	<i>Km/day/bus in 2006</i>	<i>Fleet for the line in 2006</i>	<i>Passengers/day in 2014⁹¹</i>
2	6,240	27.5	No data	18	14,434
130	8,203	20.8	273.71	21	11,384
174	10,950	28.4	288.38	24	17,066
148	8,810	24.4	267.89	23	13,350
468	15,441	32.	296	27	23,587
D5	382	19	240.41	4	1,501

Source: Tickets sold by the companies in November 2006 (*Levantamiento y procesamiento de la informacion* and *Analisis y caracterizacion de la oferta*), TC product.

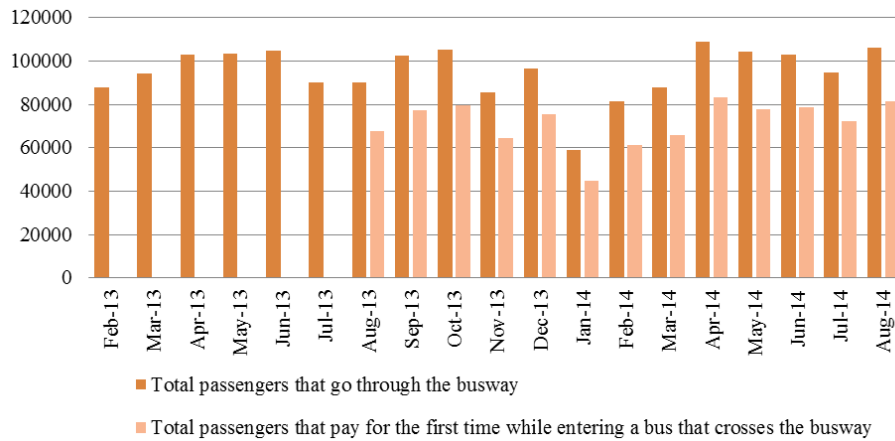
- 4.22 In October 2013, about 932,000 passengers travelled along Avenida Garzon (IMM data).⁹² Between the opening of the system (December 2012) and August 2014, the number of passengers transported per day on the busway has remained stable (about 95,200/day) (see Figure 5). However, according to the IMM, the peak hour volume probably declined compared to before the project. In 2006 about 2,645 passengers were transported in average during the morning peak hour (for the route Ciudad Vieja- to the south, using the Corridor Garzon, GEA, 2008); about 2,200 passengers now travel in each direction at maximum load.

⁹⁰ Although it was expected that the multiple changes from the initial designs would impact the achievement of the planned targets, the project's indicators have not been redefined during the project implementation.

⁹¹ Tickets sold while boarding, not considering the passengers that bought their ticket in another vehicle and transfer into a second one (IMM data).

⁹² Data for the entire month for passengers boarding at in one of the bus stations of Avenida Garzon or in Terminal Colon. Passengers boarding the buses are the most important between 7 and 8am (60,000 passengers), between 12 and 2pm (140,000 passengers) and between 4 and 6pm (about 140,000 passengers).

Figure 5. Total passengers Transported on the First Business Day of Each Month for all Lines Using the Corridor Garzon (2013-2014)



Source: IMM data

4. Productivity

- 4.23 The evaluation team could not assess whether the IPK⁹³ for the lines using Corridor Garzon has met the target for the end of the project (IPK=4). Inconsistency in the different data received and between the baseline (the IPK was established for the *entire bus routes* crossing the corridors) and the actual current data (the IPK was established *only for the busway section* of the bus routes crossing the corridor) prevent a precise estimation of the change. Given the characteristics of the bus system, an increase in the system's productivity around the busway is highly unlikely

5. Frequency, headway and speeds of buses

- 4.24 Frequency was not part of the result indicators established for the project. However, the planned frequency of buses in the Garzon busway was 3.5 minutes (GEA, 2008) for buses running between Terminal Colon and the center of the city; the team obtained no data about the actual frequency or travel times for the different bus lines using the busway.⁹⁴
- 4.25 In relation to speed increase, defined as a result indicator, it is difficult to calculate whether there has been speed increase in Corridor Garzon since the data used as a baseline for the bus routes that cross the busway corresponded to the entire bus route, not just for the Garzon section – making it lower than it should, given that the BRT section was less congested than other sections of the Avenue. According to the IMM, speed in the corridor is close to the baseline despite the fact that traffic lights were installed at 11 additional intersections and

⁹³ The index of passenger kilometers (IPK) is a measure used in the mass transit field to determine whether bus lines have sufficient demand per unit operating cost to be financially sustainable.

⁹⁴ However, it seems that frequency is high overall (Field observations).

long traffic-light cycles added 5 new vehicle stops.⁹⁵ In addition, the commercial bus speed observed is similar to the target for the project (22km/h) (see Table 5).

Table 5. Commercial Speeds in December 2, 2013 along the Garzon Section and Evolution of the Average Speed for Line G after the Inauguration of Terminal Colon			
Line	Speed 2013 in the busway Garzon	Date	Speed of line G
2	23.418km/h	December 2012	17.95 km/h
G	19.614 km/h	April 2013	19.48 km/h
174	21.359 km/h	October 2013	19.8 m km/h
148	21.725 km/h	November 2013	20.17 km/h
D5	25.964 km/h	June 2014	19.72 km/h

Source: IMM data

- 4.26 In addition, according to IMM data, the level of service for the Avenida Garzon was D⁹⁶ given that the avenue was classified as an intermediate class II way while the executing unit of the Plan de Movilidad estimated that before the work the level of service was B or C.

6. Access and mobility for the poor

- 4.27 The project did not explicitly target the low-income population and did not possess a result indicator in this respect. However, it was developed in a lower-income area of the city and was consistent with the IMM's strategies to foster social inclusion and access to economic development opportunities for the low-income population (loan proposal). There has been no evidence that Corridor Garzon increased the mobility of the low-income population and favored their access to opportunities and jobs. The bus companies mentioned they had not observed a particular increase in the mobility of the low-income population (OVE Mission Interviews) since the people who use buses in this area were already low-income.⁹⁷ So far, given the small impact of the busway in terms of mobility, there have been no direct benefits deriving from increase in mobility in the corridor.

7. Impacts on emissions of local and global pollutants

⁹⁵ Information generated by the IMM thanks to the GPS technology on buses and the use of software Control de Minutas, by comparing the number of important stops in the old bus routes 130 and 468 (4.09 stops on average in September 2012) against the new line G (11.96 stops on average in September 2013).

⁹⁶ IMM data indicate that the average speed on Avenida Garzon was 27.1 km/h and that the travel time to cross the Corridor Garzon was about 13.71 minutes on average (data for October 2014).

⁹⁷ In the entire city, between 2007 and 2009, only about 7.73% of poor households owned a car versus about 35% for non-poor households (Unidad de Estadística, División Planificación Estratégica, Departamento de Planificación, 2009). About 50% of the trips of the poorest segment of the population was made by bus or non-motorized modes (28%) while the richest segment travels mostly by car (64% of all trips and 28% by bus). The poor also travels longer (32 minutes in average per trip) than the richest (25 minutes) in Montevideo (UNDP-IMM, 2012). In parallel to the Bank's project, the development of an integrated fare system combined with the introduction of smart cards (2010) could have favored the mobility of the poor; in 2009, about 35% of the trips of the poorest segment of the population (poorest 30%) were made thanks to the use of the 1 hour or of the 2 hour ticket while only 9% of the trips of the richest segment was made using those tickets. Overall, the poorest segment accounted for 55% of all users that has acquired a 1 hour or 2 hour ticket (UNDP-IMM, 2012).

- 4.28 Reduction in pollutant emissions in the city was an expected co-benefit of the project. However, it was not clear how the environmental results indicator baseline and target had been estimated; The IMM recently began measuring air quality in the city.⁹⁸ However, the only monitoring station near the corridor is located in Terminal Colon, about 500m from the bus corridor and therefore minimally relevant to measuring potential busway air quality impacts.⁹⁹ The project's target for reduced pollutant emissions was based on the premise that bus companies would renew their fleet to evolve towards more Euro III – a process that was slowly implemented before the Bank's project.¹⁰⁰ However, key aspects that would be expected to contribute to emission reductions were not implemented in the Corridor.¹⁰¹ For example optimization of bus routes was initially implemented but then mostly reversed because of opposition from passengers: intersection treatments do not give priority to buses or improve vehicle flows; and no fleet renewal or scrapping programs were implemented. However, a resolution was passed in September 2013 that requires all new buses to be Euro III (because of the low fuel quality in Uruguay, the law was not able to require higher Euro standards, such as Euro IV or Euro IV)¹⁰² and accessible using low-floor platforms or elevated platforms. Interviews suggest that the bus fleet has been renewed at a rate of approximately 10% a year since then. Since Diesel fuel refineries have begun plans to reduce sulfur content of the fuel.¹⁰³ Mostly free-flowing bus and car traffic along Avenida Garzón was slowed down by the tripling of signalized intersections and the diesel vehicles in circulation have not been changed. In addition buses are running until they reach 16 years of operation and many Euro II vehicles are still running.
- 4.29 Quantitative analysis reveals¹⁰⁴ that the busway is unlikely to have produced any significant reduction of emissions. Data on baseline vehicle speeds are unclear;¹⁰⁵ given

⁹⁸ Since 2004, the Intendencia has put in place an Air Quality Monitoring network that tracks the concentration of multiple pollutants (PM₁₀, MP_{2.5}, CO, NO₂, SO₂ and black smoke).

⁹⁹ The IMM explained they could not change the monitoring system to monitor the Corridor Garzon (the price of installing a measurement station is US\$50,000). In Colon station, atmospheric particulate matters were measured in 2006 and in 2012 and overall air quality was good; with respect to the measured PM10, 91% of the stay were "very good" and 4% "good" (local index of air quality, ICAire, below 100) (OVE Mission Interviews and Departamento de Desarrollo Ambiental, IMM, 2012).

¹⁰⁰ CUTCSA has developed an internal saving fund that finances the renovation of vehicles according to a percentage of the fare collected each month (TC product); they have already put one additive in the fuel to emit fewer pollutants, which leads to a 3-5% increase in vehicle performance and a possible 30% decrease in fuel consumption. According to IMM data, currently about 459 vehicles are Euro II and 288 are Euro III of the total 1514 vehicles of the five bus companies operating in the entire city.

¹⁰¹ For example optimization of bus routes was initially implemented but then mostly reversed, intersection treatments do not give priority to buses and no fleet renewal or scrapping programs were implemented. In addition mostly free-flowing bus and car traffic along Avenida Garzón was slowed down by the tripling of signalized intersections and the diesel vehicles in circulation have not been changed. Analysis made by Juan Pablo Bocarejo. See Annex 8 for the detail of the qualitative analysis.

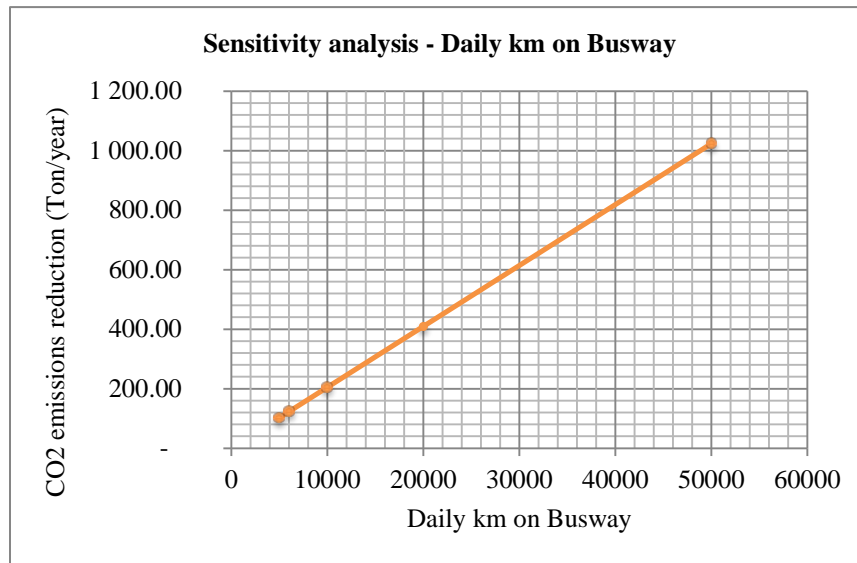
¹⁰² Calculations made with the CORINAIR Software by Juan Pablo Bocarejo, Universidad de los Andes. See Annex 9 for the detail of the quantitative analysis.

¹⁰³ Calculations made with the CORINAIR Software by Juan Pablo Bocarejo, Universidad de los Andes. See Annex 9 for the detail of the quantitative analysis.

¹⁰⁴ Calculations made with the CORINAIR Software by Juan Pablo Bocarejo, Universidad de Los Andes. See Annex 9 for the detail of the quantitative analysis,

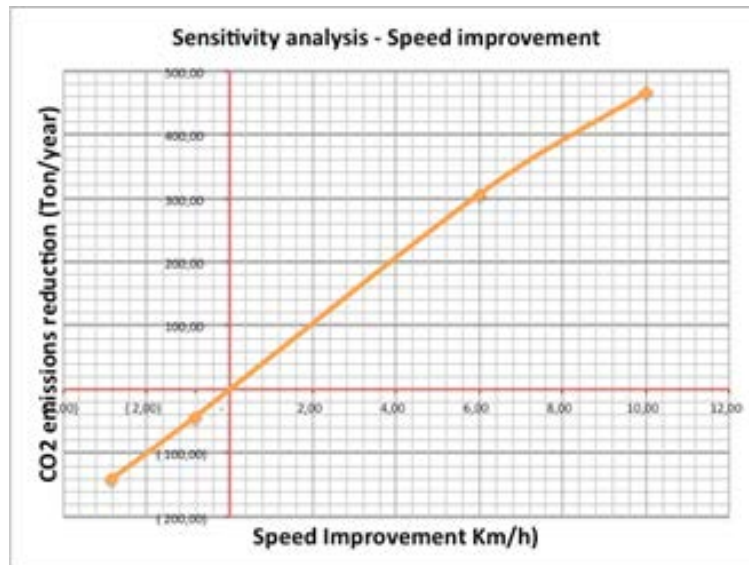
this uncertainty, emissions impacts were estimated using a range of possible average vehicle speed business scenarios (from a low of 16 to a high of 23km/h). Since the busway was inaugurated, the average speed of public transport on the busway has reportedly ranged between 19.5 and 21.2 km/h. A sensitivity analysis on variables such as speed and use of the busway proposes a range of emissions reductions.¹⁰⁶ In an optimistic scenario, considering a low average speed (16 km/h) before the project, a 10% reduction in CO₂ and CO emissions, a negligible decline in PM, and a 15% reduction on NOx emissions were estimated (see Figure 6).

Figure 6. Sensitivity Analysis: CO₂ Emissions Reduction under an Optimistic scenario



¹⁰⁵ The loan document reported them as low as 16km/hour but data from interviews suggesting much higher speeds given low congestions levels and few signalized intersections in the corridor as well as passenger complaints of decreases in bus speeds after the system was inaugurated indicate that speeds may have declined.

¹⁰⁶ Considering a range of bus vehicle-km in the segregated corridor between 6000 km and 8000 km, the range for CO₂ reductions would be between 120 to 160 ton/year. A range of speed improvement between 2 and 4 km/h would bring a reduction in CO₂ emissions between 120 and 200 tons of CO₂ (information retrieved from Juan Pablo Bocarejo analysis).



Source: Bocarejo, J.P. 2014.

- 4.30 Because the actual baseline speed was likely higher, two other scenarios can be considered:
- in a *pessimistic scenario*, the average speed is hypothesized to have been 23 km/h, higher than the average speed with the project; an increase of 8% (140 ton/year) for CO₂ emissions and 12% for NO_x is estimated; and
 - an *intermediate scenario*, assuming baseline speeds between 18 and 20.7km/h,¹⁰⁷ emissions reductions would be between 40 and 80 tons per year of CO₂ (1.65-3.30% reduction).
- 4.31 The actual use of the busway corridor, around 6,000 km per day, is low for a BRT system. A restructuring of bus routes that would result in higher use of the exclusive corridor in combination with repairing pavement detectors to allow buses to have priority at intersections could bring increased emissions benefits. An improvement in the bus technology and a more radical improvement on the operational design could drastically improve the reduction in emissions of the different pollutants. Finally, a redesign of traffic lights is needed to give priority to public transport flows. Improving the speed of bus operation can have a positive impact on the environmental performance of the busway in the short term.

8. Road safety

- 4.32 Since the avenue used to have a grassy median strip that enables pedestrians to cross in two stages, the population and the bus companies see the busway as more dangerous than before.¹⁰⁸ Moreover, vehicle left-turns across the busway present a hazard of vehicle conflicts and accidents. IMM' statistics indicate that the project led to a decrease in the

¹⁰⁷ For the bus lines that currently cross the busway. *Analisis y caracterizacion de la oferta* (TC).

¹⁰⁸ However, road safety in the corridor is a much politicized topic, especially around elections. Bus companies also feel the danger that bicycles and motorcycles can enter into or cross the busway slots but fences have finally been placed on separators to limit such risks. (OVE Mission Interviews).

number of accidents and that the actual monthly average is close to the target (10 accidents/month). However, the baseline (13 accidents/month) is not accurate, since data for this period indicate a lower average, already very close to the target.¹⁰⁹ Data also indicate a spike in non-fatal accidents during construction which seems to imply inadequate safety arrangements by the contractor (see Table 6).

	Table 6. Accidents in the Corridor Garzon								
	2006	2007	2008	2009	2010	2011 *	2012 *	2013	2014 (Jan-Aug.)
Fatal accidents	5	4	1	1	5	2	1	2	3
Severe accidents	13	20	17	10	10	28	18	21	14
Minor accidents	112	88	80	101	94	121	145	99	61
Total	130	112	98	112	109	151	164	122	78
Average/month	10.83	9.3	8.16	9.33	9.08	12.58	13.66	10.16	9.75

Source: Data from the IMM

* Years of construction

9. Institutional strengthening

- 4.33 Institutional strengthening activities financed by the TC had a limited scope given the low number of staff who attended the trainings and the 2010 staff turn-over due to mayoral elections. In addition, the bus operators did not receive special training related to driving in the new corridor as the TC product recommended; thus they reported having had initial difficulties maneuvering in the busway (OVE Mission Interviews).

D. Sustainability of the results

- 4.34 Given the limited impact of the project on mobility and transport system efficiency, the sustainability of the project's outcomes cannot be easily assessed. No business model, regulatory institution or land use planning has been specifically created or adapted in relation to the project. The main project result (in relation to the planned outcomes) is the construction of the infrastructure. Since no important increased ridership has been observed, it can be assumed that for the short and medium-terms the infrastructure can support the ridership demand, maintaining the costs of operations but the extent to which it will be able to absorb possible additional demand or provide non-declining accessibility is unknown..
- 4.35 Public investment, such as in a BRT system, has the potential under certain conditions generate increased land value, that can be in turn, taxed to pay for the initial investment and its maintenance, on the grounds that the incremental value was generated by a government investment that produces a public good. Since the BRT has not been successful land development benefit is inexistent or very low - the revitalization process of this area did not occur until mid-2013 and, for instance, the commercial slots of Terminal Colon were still free more than a year after the opening of the system (OVE Mission Interviews and field mission) - in spite of the existing local policies for land value capture. Indeed, in 2008 the national *Ley de Ordenamiento Territorial y Desarrollo*

¹⁰⁹

The baseline and the target indicators were supposed to be part of the IMM accident rate statistics. However, measurement of such data is complicated since three distinct institutions (the local police, the transit police and the transit inspectors) compile accident statistics (OVE Mission Interviews).

Sostenibles (Law 18.308)¹¹⁰ was passed, providing for the equitable distribution, among public and private actors, of the benefits of municipal urbanization process, through a 15% charge on additional property value resulting from public interventions (*return on valorization*). In parallel, Montevideo has implemented such process since 2001; it charges 10% for developments in strategic areas.¹¹¹ If the corridor was to be improved in the future and generated land value increases, this tax mechanism could be an additional source of financing.

E. Ongoing changes and initiatives carried out in parallel with the project

1. Improvements related to the overall operation and to works

- 4.36 In March 2013 improvements were made in Corridor Garzon to increase the number of bus units and their frequency, in the context of an integral adjustment plan for the Corridor that included inputs from the bus companies, users, civil society organizations and the IMM (IMM, 2013). Transfer in Terminal Colon was no longer compulsory for the buses, and the bus lines that existed before the implementation of the corridor were running again (El Pais, 2013 b). The difficulties experienced in the construction of the Corridor informed adjustments to the works in Avenida Flores that had begun while the works in Corridor Garzon were still being carried out. For instance the size of the bus stations was adapted (enlarged), and they were installed well away from intersections (on the other side of the intersection, after the intersection, to avoid bus delays); the busway will have three lanes, permitting passing, and a left hand turn pocket to reduce the number of signal phases, inter-city buses will be permitted to use the busway, and there will be no additional traffic lights (OVE Mission Interviews). In addition, all bus companies were involved in the project and agreed on the project design before the construction (OVE Mission Interviews). However, the bus companies have not restructured the routes to maximize the use of the segregated right of way.

2. Parallel local initiatives

- 4.37 **Fare integration system and smart card system.** In 2010, the fare integration was combined with the introduction of smart cards.¹¹² Smart card readers were procured and financed directly by the bus companies with their own suppliers. Although, about 80% of the users still pay inside the bus (OVE Mission Interviews), notably because it is hard to find a place to buy the cards (IMM, 2014), it is felt that the introduction of the smart card led to an increase in the number of trips (OVE Mission Interviews). Each day, the information about the sold tickets is integrated at a clearing house.¹¹³ The card permits transfers between various lines of the bus system of the STM within a determined central area of the city; for up to two buses during one hour for 23 pesos (IMM, 2014b) or two

¹¹⁰ Available at: <http://www.parlamento.gub.uy/leyes/ AccesoTextoLey.asp?Ley=18308&Anchor=>

¹¹¹ In 2011, this permitted the collection of US\$3.8 million, about 2.5% of the city's total investment budget (Smolka, 2013).

¹¹² In comparison to many Latin American experiences, this process went smoothly (OVE Mission Interviews).

¹¹³ However, there is no information related to the distance made by the users since they do not use the pass when exiting vehicles.

hours for 36 pesos in any vehicle of the five companies. A *boleto zonal* was also developed, at half of the price of a regular ticket for trips in the peripheries. A system of *pospago* was introduced in March 2014 to permit users to ride the system and pay later through their credit card (IMM, 2014c).

- 4.38 **Technological improvement.** After the system started operation, the IMM developed systems to inform users about urban transport service. In Terminal Colon, screens with information about the bus schedules were installed. In addition, the online application *Como Ir*¹¹⁴ permits users to know possible bus route itineraries. Likewise, an Internet application, used by about 10,000 users per day (OVE Mission Interviews), tells when the next two buses of a particular line will arrive (service IBUS).¹¹⁵ Regarding transit management, all buses are now equipped with GPS systems but the IMM still faces issues to access real-time information.¹¹⁶
- 4.39 **Future development for the rest of the city.** Many transport projects are under discussion in Montevideo,¹¹⁷ particularly the development of a metropolitan corridor between the regions of Canelones and Montevideo. A BRT was envisioned for this part of the city, in Avenida Italia, which is characterized by high automobile traffic and important congestion levels during peak hours.¹¹⁸ In December 2012 the Bank approved funding for Phase II of the Montevideo Urban Transportation Program¹¹⁹ to finance feasibility studies for the construction of the infrastructure for this BRT. In a heated electoral context,¹²⁰ the project was finally not signed (May 2014) because of a lack of political majority (UY Press, 2014).

V. LESSONS LEARNED

F. General

- 5.1 This project illustrates the complexity of developing mass transit projects that affect various aspects of the political, institutional and cultural functioning in a city and the importance of tailoring projects to local particularities and needs instead of replicating works that have been successful in other cities. It demonstrates the importance of having

¹¹⁴ <http://www.montevideo.gub.uy/aplicacion/como-ir> and <http://www.montevideo.gub.uy/horariosSTM/>

¹¹⁵ Agreement between Movistar and CUTCSA (Montevideo Portal. 2013b).

¹¹⁶ OVE mission interviews. A Center for Mobility Management was supposed to open in late 2014, with control systems, electronic screens and GPS systems for the 1,500 buses of the city (IMM, 2013b).

¹¹⁷ Such as the introduction of electric transport - for example, for taxis- and the extension of the bike lane network to respond to increasing demand for biking (OVE Mission Interviews).

¹¹⁸ Institutional agreements between Montevideo and Canelones, such as the development of a Metropolitan Consortium including the bus companies and the National Ministry of Transportation, were a prerequisite for the beginning of the works. About 50% of the buses running in this area are under the responsibility of the region of Canelones and 50% under that of Montevideo (OVE Mission Interviews).

¹¹⁹ Prequalification was done for the design of the busway along the Avenida Italia, and a short-list of six firms was developed (OVE Mission Interviews) (IDB, News Releases, 2012).

¹²⁰ The Parliamentary approval process has been blocked by the local elections planned for October 2014, the November 2014 presidential elections, and the May 2015 regional and municipal elections.

strong political commitment for reorganizing a system and changing its business model, along with adequate consultation of and communication with local stakeholders. It confirms the importance of local agencies having adequate institutional technical capacity to determine the most cost-effective and realistic options and to carry out project implementation and supervision. When this capacity is limited, the Bank should take engage in early capacity building and should closely supervise the development of the feasibility studies and project design.

G. Role of the IDB going forward

- 5.2 The Bank has supported the IMM in developing an initial part of its ambitious Plan de Movilidad. The Bank's support has been important in technical matters and for dialogue and conciliation. In addition, its financial support was crucial given the financial state of the IMM at the time of the project preparation (OVE Mission Interviews). Box 7 summarizes conclusions on the Banks added value.

Box 7. The Bank's Added Value			
Technical support	Institutional dialogue	Institutional strengthening	Relation IDB/Uruguay
<ul style="list-style-type: none"> • Review of the feasibility studies • Provision of consultants 	<ul style="list-style-type: none"> • Fostering dialogue among local stakeholders • Putting public transportation at the center of the IMM agenda 	<ul style="list-style-type: none"> • The Bank's regulations for the bidding processes can be incorporated by the IMM for future projects • The Bank permitted the consolidation of the IMM's Department of Urban Mobility 	<ul style="list-style-type: none"> • The Bank has now the tools to better approach transportation and urban issues of Montevideo • The relationship between the Bank and local stakeholders was good • The Bank has an overall good understanding of the country's direction, notably because of lasting experience with the IMM (water and sanitation project).
Source: Views of local stakeholders recorded in the OVE Mission Interviews, OVE analysis			

VI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

- 6.1 Before the Bank-supported project, the Municipal Government of Montevideo was interested in developing a city-wide public transport program, consisting of a system of trunk and feeder bus lines. The first two segregated busways of the city, Avenida Garzon and Flores, were planned as pilot projects in corridors with lower construction externalities than possible corridors in denser and more heavily traveled areas of the city. For example, the first corridor, Avenida Garzon, was in a lower-density area that was several miles from the city's center and had relatively low levels of congestion; therefore its construction would entail fewer negative externalities and possibly lower resistance from general traffic that would lose road space when traffic lanes were dedicated to buses. While this made Avenida Garzon an easier corridor to build, the benefits in terms of increased bus speeds were also lower than would be expected in a corridor where bus services experienced significant delays due to congestion. The same was true of Avenida Flores, for which works were not carried out under the Bank's loan; this avenue was not in the most congested areas

of the city, and demand for public transport in its surroundings did not reach the important levels of the busier eastern and central parts of Montevideo.

- 6.2 Several institutional and operational reforms that would be expected to improve bus service –such as technology improvement, fleet renewal, bus route restructuring, off-board payment systems, and appropriate intersection treatments - were not implemented. The project also suffered from a complex political context, especially after the turn-over of the 2010 mayoral elections and of the opposition of the bus companies. In addition, various design issues, related to the lack of technical capacity of the Executing Agency, – such as traffic light cycles lasting 200 seconds in some intersections– negatively affected the potential speed increase, and the location of Terminal Colon led to additional transfer times for some users; thus the program did not achieve its main objectives of improved travel times for passengers and, more broadly, transit improvements.
- 6.3 In sum, because the project’s technical design diverged from the initial conception and because of the less than optimal choice of corridors and of the lack of institutional reform in relation to the regulatory framework or organization of public transportation, notably in its metropolitan dimension, the gains in terms of mobility and bus system performance did not materialize. At the same time, the project’s costs were still incurred and inconveniences were imposed on private vehicles, resulting in political backlash against the project from transit users and car owners alike. Although some transit management measures were implemented outside the scope of the Bank loan to improve service, the project has so far not been well received by the public and it is still much criticized for not having achieved its intended results. As a result, similar busway projects planned for the city have not been funded for now. In particular, as recently as June 2014, the city rejected the proposal for a BRT on Avenida Italia that was planned with support of a second IDB loan.

B. Lessons learned for future projects

- 6.4 Building on the analysis of the project financed by the Bank in Montevideo, four main lessons can be garnered from this case for future operations:
- Both the political will of local stakeholders and the local institutional and regulatory framework and capacity of entities involved in project preparation and execution should be better assessed and fostered before the project’s implementation. When there are institutional capacity issues, the Bank should provide more training and possibly extend the timeframe between the execution of a TC (if it includes, as for this project, institutional strengthening activities that are not integrated in a loan) and its related loan to ensure appropriate acquisition of the competencies covered in the trainings. For projects involving significant technological changes, capacity-building activities should be offered to all the relevant stakeholders, such as bus companies and drivers who have to adapt their operation. Given the risks of political turnover, staff that is trained could also belong to academia or to civil society to minimize the risk that technical expertise in an executing agency may be overridden by the political agenda. In this respect, the Bank should also assess the political timing before approving a project; for instance, the

- implementation phase should not be too close to elections that can lead to staff turnover or change the political will to commit to a project.
- The Bank should ensure that early and strong negotiation process with established bus companies and negotiations tailored to the political economy of the particular context take place to gain the political buy-in of bus operators and companies to the reforms. In a place like Montevideo, where the system was run by a few powerful and well-established companies, political theory posits that such actors are more likely to oppose reforms that would mean losses or perceived losses to them. In places where the potential benefits of reforms are widely spread among less concentrated or organized actors - such as public transit users- they are less likely to rally in favor of those reforms.¹²¹ Given the political context, negotiations to gain the support of the bus operators in Montevideo were highly relevant to the project's results.
 - The Bank's headquarters and country office staff should strengthen efforts to supervise the project design and implementation phases, to ensure that the executing agencies base decisions on solid technical analysis and design specifications. In addition, specialists should work to achieve the highest level of consensus on the technical aspects of the project *before* its implementation, and the infrastructure and operational design should meet international standards in the urban transport field. Before works are begun, a clear public transport model involving all transport stakeholders should be defined and agreed upon, especially in relation to streamlining service, restructuring routes, and changing the fare collection system or the revenue scheme.
 - Bus companies and other local stakeholders should be adequately integrated,¹²² through a bottom-up approach, in as many project phases as possible to increase their buy-in to and ownership of the project. In addition, the complexity of the interests at stake in massive urban project implies the need to better track the official positions of the involved parties; records of public consultations could be kept in repository systems so that the Bank can keep track of local negotiations.¹²³ In this respect the Bank can also support the executing agency and other local stakeholders in better communicating the benefits and the changes a project would involve, especially when those imply restructuring the institutional and regulatory frameworks. An effective way for the Bank to keep track of the project's perception would be to more systematically proceed to use satisfaction surveys during and after the project's implementation.

¹²¹ Analyses from Hayes, M. (1981). *Lobbyists and Legislators: A Theory of Political Markets*, Rutgers University Press, about the concentrated interest groups and about distributed versus concentrated costs and benefits, mentioned in Scholl, L.(2011) *Essays on Transportation Safety, Economics, and Policy*, Berkeley. <http://escholarship.org/uc/item/9qb6v0mw>

¹²² Supported by various interviews with stakeholders during the IDB mission, who acknowledged that a part of the population was not taken into consideration; mostly national neighborhood organizations were consulted, not the local ones around Corridor Garzon.

¹²³ In this project it has been particularly difficult for the evaluation team to understand how and when tensions arose between the IMM and bus companies, and how the communication and consultation processes have failed.

Annexes

Annex 1: list of interviewees

IDB Staff:

- Juan Taccone (COF Representative)
- Andres Pereyra (COF Transport Specialist)
- Elias Rubinstein (COF Transport Specialist)
- Esteban Diez-Roux (Team Leader)

Intendencia Municipal de Montevideo (IMM):

- Executing Agency of the Plan de Movilidad
- Environment Development Division
- Transport and Transit Division
- Territorial Planning Division
- Urban Mobility Division
- Current and previous Mayors

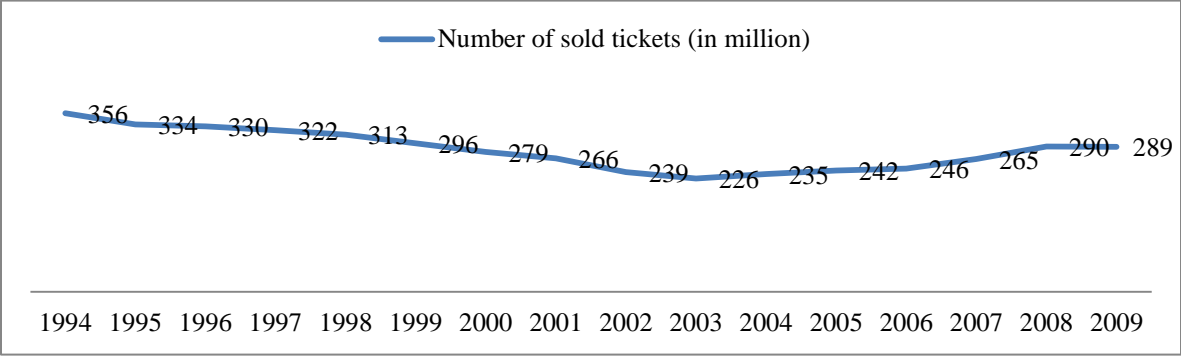
National Ministries:

- Ministry of Energy, Industry and Mining
- Ministry of Transport and Public Works
- Ministry of Finance

Others:

- Montevideo Como Vamos (NGO)
- Diego Hernandez (Professor, Catholic University of Uruguay)
- COMESA (Bus company)
- CUTCSA (Bus company)
- Union de Trabajadores de la CUTCSA (Trade Union of CUTCSA)

Annex 2: Evolution of the number of sold tickets in Montevideo between 1994 and 2009

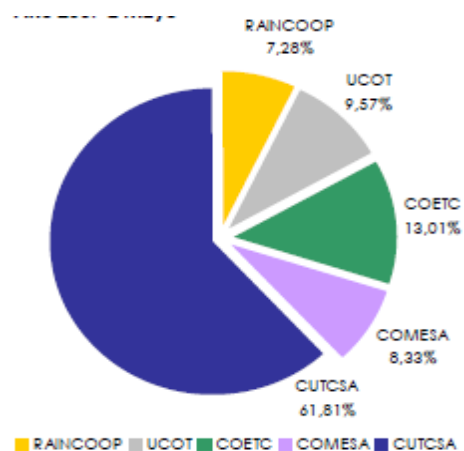


Source: IMM. 2010. *Plan de Movilidad*.

Annex 3: Evolution of the share of the markets among the five bus companies operating in Montevideo between 2001 and 2006 and in 2007

	RAINCOOP	UCOT	COETC	COMESA	CUTCSA
2001	7,53%	9,61%	13,13%	8,30%	61,42%
2002	7,63%	9,37%	13,11%	8,41%	61,49%
2003	7,83%	9,41%	13,02%	8,49%	61,26%
2004	7,74%	9,45%	12,65%	8,35%	61,82%
2005	7,71%	9,65%	12,82%	8,35%	61,47%
2006	7,46%	9,73%	13,00%	8,40%	61,41%

Sources: TC's product and
IMM. 2010. *Plan de Movilidad*



Annex 4: Details of the budget; planning of the works and disbursement scheme (source: IDB repository systems and IMM)

In thousands of US\$

Componente	BID	Aporte Local	Total US\$	Porcentajes
1 - Ingeniería y Administración	1,015	2,810	3,825	4%
1.1 - Tecnología y equipamiento informático		200	200	0%
1.2 - Campaña de sensibilización y difusión		500	500	1%
1.3 - Consultas y encuestas permanentes	615		615	1%
1.4 - Monitoreo Plan de Gestión Ambiental y Social	400		400	0%
1.5 - Diseños futuros corredores y terminales, auditoría	-	610	610	1%
1.6 - Recursos Humanos Unidad Ejecutiva	-	1,500	1,500	2%
2 - Inversiones	78,985	7,190	86,175	86%
2.1 - Corredor exclusivo Agraciada - Garzón (tramos Agraciada)	7,670		7,670	8%
2.2 - Corredor exclusivo Agraciada - Garzón (tramo Garzón)	22,348		22,348	22%
2.3 - Corredor exclusivo General Flores	11,078		11,078	11%
2.4 - Corredores alternativos pintados	1,493	307	1,800	2%
2.5 - Sincronización semafórica	1,000		1,000	1%
2.6 - Vías Complementarias	13,876	6,883	20,759	21%
2.7 - Terrenos	5,000		5,000	5%
2.8- Terminales e Intercambiadores	16,520		16,520	17%
3 - Imprevistos y Escalamiento de Costos	-	10,000	10,000	10%
Total	80,000	20,000	100,000	100%
Porcentajes	80%	20%	100%	

Plan de Movilidad Urbana - Cronograma

	2008												2009												2010													
	En	Feb	Mar	Abr	May	Jun	Jul	Ago	Set	Oct	Nov	Dic	En	Feb	Mar	Abr	May	Jun	Jul	Ago	Set	Oct	Nov	Dic	En	Feb	Mar	Abr	May	Jun	Jul	Ago	Set	Oct	Nov	Dic		
COMPONENTE 1																																						
1.1 - Tecnología y Equipamiento Informático																																						
1.2 - Campaña de sensibilización y difusión																																						
1.3 - Consultas y encuestas permanentes																																						
1.4 - Monitoreo Plan Gestión Ambiental y Social																																						
Racionalización del líneas																																						
Renovación de Flota - Fideicomiso Financiero																																						
Refugios Peatonales																																						
COMPONENTE 2																																						
2.1 - Corredor Exclusivo Agraciada Garzón (tramos Agraciada)																																						
Agraciada tramo I y S.Quintín, Lluques, etc.																																						
Viaducto																																						
Agraciada tramo II y Paraguay y Rondeau																																						
2.2 - Corredor Exclusivo Agraciada Garzón (tramo Garzón)																																						
Garzón																																						
2.3 - Corredor Exclusivo General Flores																																						
2.4 - Corredores Alternativos Pintados																																						
Avenida Italia																																						
Boulevard Artigas																																						
8 de Octubre																																						
Rivera																																						
Propios																																						
General Flores																																						
2.5 - Sincronización semafórica																																						
2.6 - Vías Complementarias																																						
San Quintín																																						
Paraguay																																						
Rondeau																																						
Santa Lucía																																						
Lluques																																						
Mármol													</																									

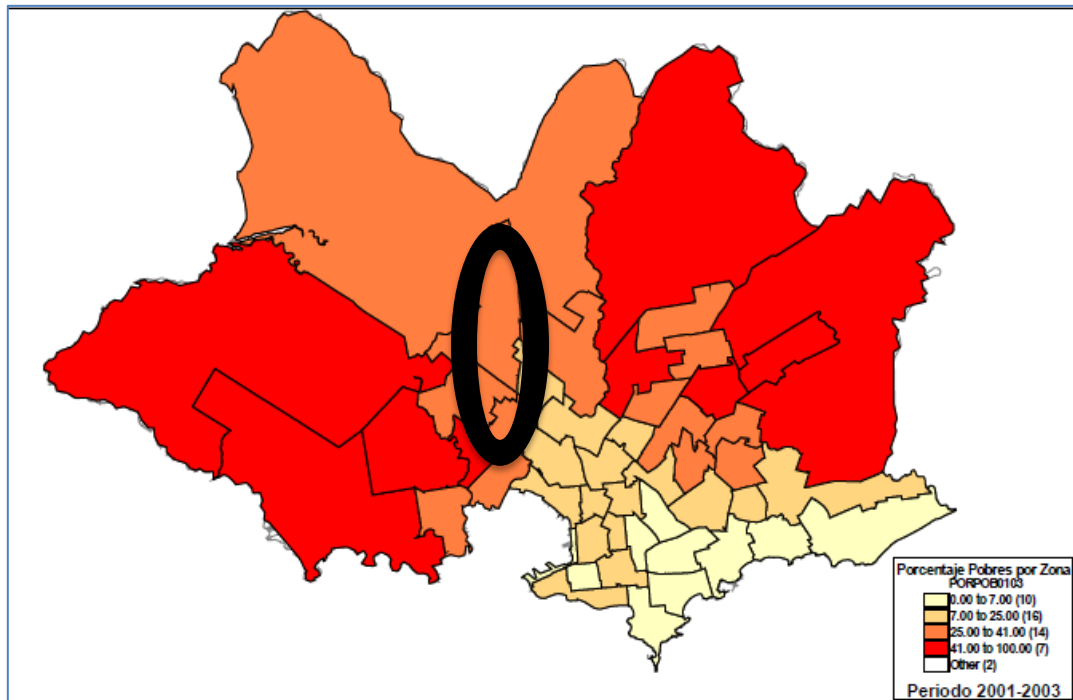
Plan de Movilidad Urbana
Costo y Financiamiento del Plan
Préstamo BID en preparación UR - L1025
Cronograma desembolsos fondos BID

En miles de USD

Componente	2008	2009	2010	2011	2012	Total USD
1 - Ingeniería y Administración	135	220	220	220	220	1,015
1.1 - Tecnología y equipamiento informático						-
1.2 - Campaña de sensibilización y difusión						-
1.3 - Consultas y encuestas permanentes	135	120	120	120	120	615
1.4 - Monitoreo Plan de Gestión Ambiental y Social		100	100	100	100	400
1.5 - Diseños futuros corredores y terminales, auditoría						-
1.6 - Recursos Humanos Unidad Ejecutiva						-
2 - Inversiones	5,950	36,313	28,846	4,000	3,876	78,985
2.1 - Corredor exclusivo Agraciada - Garzón (tramo Agraciada)		7,000	670			7,670
2.2 - Corredor exclusivo Agraciada - Garzón (tramo Garzón)		17,000	5,348			22,348
2.3 - Corredor exclusivo General Flores		7,000	4,078			11,078
2.4 - Corredores alternativos pintados	750	743				1,493
2.5 - Sincronización semafórica	200	800				1,000
2.6 - Vías Complementarias			6,000	4,000	3,876	13,876
2.7 - Terrenos	5,000					5,000
2.8- Terminales e Intercambiadores		3,770	12,750			16,520
3 - Sin Asignación Específica	-	-	-	-	-	-
Total	6,085	36,533	29,066	4,220	4,096	80,000
Porcentajes	8%	46%	36%	5%	5%	100%

Annex 5: Map of the population according to income in Montevideo

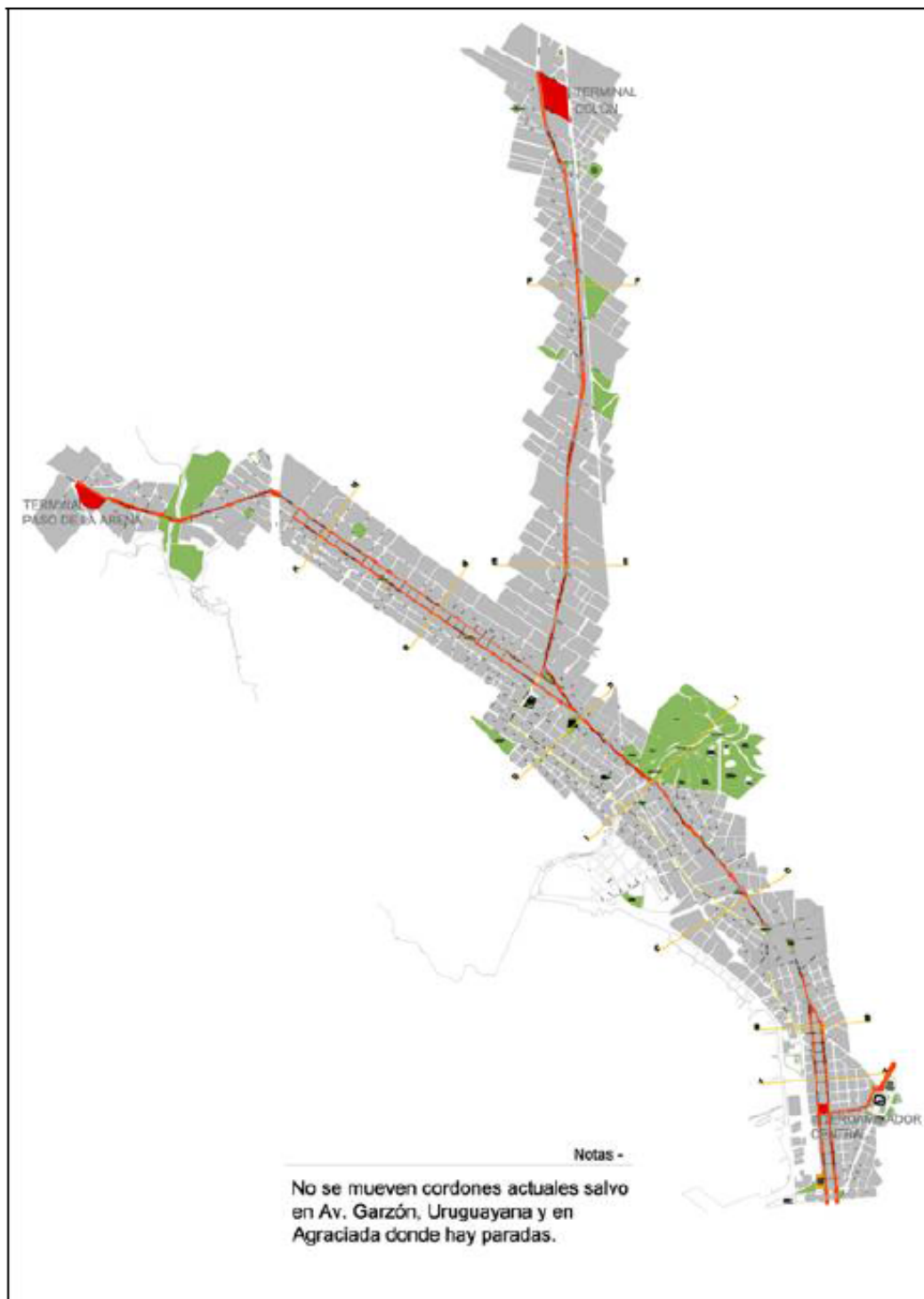
Share of the poor population by district, between 2001 and 2003, in Montevideo and location of the proposed Busways in Avenida Garzon



Source: TC's final product

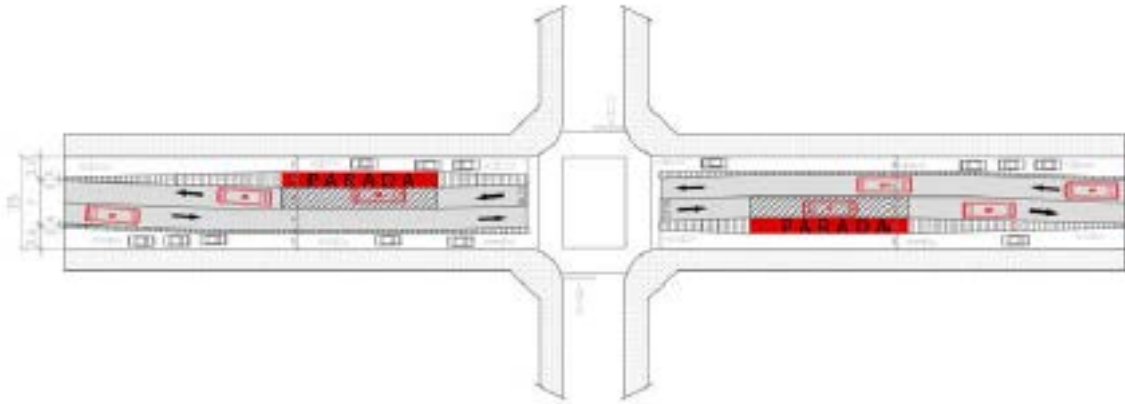
Annex 6: Maps of the envisioned busways in Avenida Garzon and in Avenida Flores

Busway in Avenida Garzon and Terminal Colon and Paso de Arena

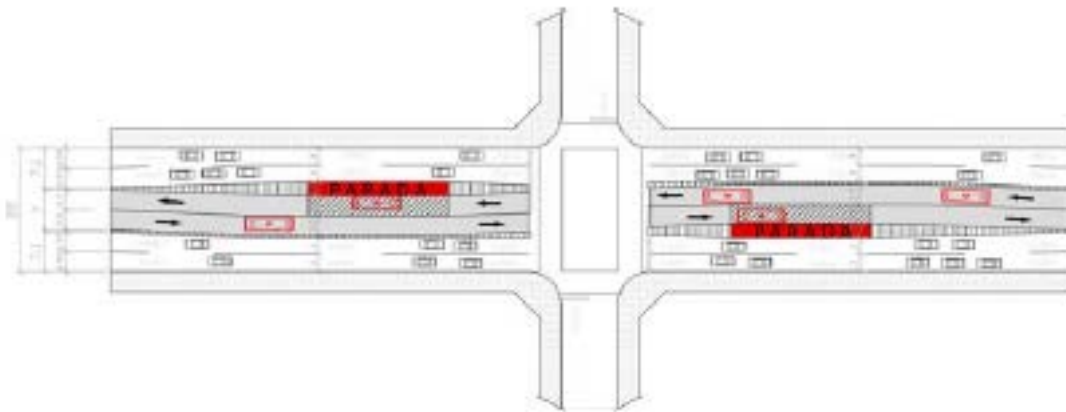


Source: IMM, retrieved from the TC's final product

Map of the Corridor Agraciada-Garzon



AVDA. AGRACIADA/ Perfil propuesto con parada



Source: IMM, retrieved from the TC's final product

Busway in Avenida Flores and Terminal Hipodromo



Source: IMM, retrieved from the TC's final product

Annex 7: Information about the project's implementation process retrieved from the available Bank's monitoring documents (program monitoring reports, PMR) for the Loan UR-L1025

Date of PMR	June 2009	July 2010	PMR – March 2011	April 2011 and Loan Result Report of 2011	September 2011	April 2012	September 2012
Disbursement	13.77%	16.54%	32.47%	37.77%	44.21%	59.81%	75.72%
Overall implementation in comparison to the planned progress for the given period	<ul style="list-style-type: none"> - The implementation of the project just started, with the opening of the first bidding process for Corredor Garzon. The prices of the bidding process are aligned with the estimates and the planned budget. - The Executing Agency is new but demonstrated technical proficiency and dynamism 		<ul style="list-style-type: none"> - The risk that negotiation with the bus companies is unsatisfactory was increased from Low to Moderated - The planned results deriving from the operation's design (including information generation and line rationalization models and proposals) did not fit the IMM's expectations; thus the IMM decided to repeat some studies - Mention of a timing issue: when the TC was under execution, the IMM did not possess yet the human resources to receive and monitor the TC. When the IMM staff acquired the 	<ul style="list-style-type: none"> - Planned marked alternative corridor and traffic-light changed for the period were achieved - Construction of complementary roads for the period is nearly complete - Land use purchase was achieve and initial works for the Terminals - Delays in the restructuration of the public transport system and routes - Cost Increase: the actual budget exceeds the initial one because of larger infrastructure works costs. The difference will be covered by the counterpart's funds 	<ul style="list-style-type: none"> - Delays in the planned marked alternative corridors and traffic-light synchronization - Delays for works in the two corridors - Delays in land use purchase and terminal and interexchange constructions 	<ul style="list-style-type: none"> - Delays for works in the two corridors - Delays in the planned marked alternative corridors and traffic-light synchronization - Delays in land use purchase and terminal and interexchange constructions 	<ul style="list-style-type: none"> - Delays for works in the two corridors - Delays in land use purchase and terminal and interexchange constructions - Planned marked alternative corridors and traffic-light synchronization achieved

			needed capacities, the TC was over.				
Implementation of Component 1	<ul style="list-style-type: none"> - Delays in the implementation progress for procurement of technology and computer equipment acquisition - Good progress for the public awareness and information campaigns - No progress on permanent consultation and enquiries; on the monitoring of the socio-environmental management plan; on the studies and design for the future STM corridors 			<ul style="list-style-type: none"> - Low progress in the implementation; only 6% of the planned funds were allocated (mostly for staffs' salaries and dissemination activities related to the program) 			
Implementation of Component 2	<ul style="list-style-type: none"> - No disbursement for land use acquisition and works in the Agraciada-Garzon and Flores corridors and for marking alternative 	<ul style="list-style-type: none"> - The Corridor Garzon is still planned to be finished by 2010 - Only 5.58 out of the 7.94 planned km are expected to be built for Corridor 	<ul style="list-style-type: none"> - Only 2.38 out of the 7.94 planned km are expected to be built for Corridor Flores at the end of 2011 - Terminals' construction works are reduced from 3531 to 2831m² 	<ul style="list-style-type: none"> - Construction of Corridor Garzon: 1.85km/9.99km - No construction of Corridor Flores which length remained unchanged 	<ul style="list-style-type: none"> - Construction of Corridor Garzon: 3km/9.99km (vs 6.07km planned) - No construction of Corridor Flores vs 0.58km planned 	<ul style="list-style-type: none"> - Construction of Corridor Garzon: 4.70km/9.99km (vs 6.07km planned) - No construction of Corridor Flores vs 0.58km planned 	<ul style="list-style-type: none"> - No construction of Corridor Flores vs 8km planned - Construction of Corridor Garzon: 2 km vs 3km planned

	corridors - 10% disbursement for works on complementary roads	Flores at the end of 2011 - Other planned works remain unchanged	by the end of 2011 - Other planned works remain unchanged				
Planned actions to mitigate risks	- Support of an international consultant to organize the negotiations with the bus operators before December 2010		- Contracting of a consultant specialized in Transportation Systems Planning to train local staff (planned for 1 year)				

Annex 8: Quantitative analysis of Juan Pablo Bocarejo about the busway financed by the Bank in relation to emissions

Information retrieved from Bocarejo, J.P. 2014. *Evaluation of the Evaluation of the effects of Bus Rapid Transit (BRT) Systems on Emissions, Montevideo Busway emission analysis*, 2014

Methodology to evaluate public transport improvement projects on emissions

In general, public transport improvement projects developed in the last two decades in Latin America have not placed GHG emissions reduction as a main objective (Hidalgo and Huizenga, 2013). However, as those projects have been planned under a sustainability framework, emissions reductions target has appeared implicitly or as a secondary explicit objective. It is worth mentioning some interesting cases such as Bogota and Cali that have explored the possibility to apply for Low Emissions Certificates.

The following general equation is used to evaluate emissions of CO₂ and “criteria pollutants”:

$$E_{k,i} = \sum_j FA_j \cdot FE_{k,j,i}$$

Where:

$E_{k,i}$ represents the total emissions of species k (type of pollutant such as PM or CO₂) in year i (tons/year),

FA_j represents the activity factor of sources in category j (type of vehicle including buses, cars and BUSWAY buses in km/year), and

$FE_{k,j,i}$ represents the emission factor associated to vehicle category j of species k in the year i (tons/km).

This equation allows us to determine different aspects of the BRT projects that can have an impact on emissions reductions:

Table 1 - BUSWAY systems and emission reductions

Factor	BRT elements	Impact (*)
Activity Factor	➤ Better public transport system may slow down modal shift towards private modes	LOW-MEDIUM
	➤ Better operational design can reduce km driven daily	HIGH
	➤ High capacity buses may reduce km driven	MEDIUM-HIGH
	➤ Operation management systems may improve efficiency	MEDIUM
	➤ Traffic lights, better infrastructure and priority lanes can reduce the needs of a bigger fleet size	HIGH
Emissions factor	➤ New buses with good environmental performance (Euro IV, gas or electric technologies)	MEDIUM-HIGH
	➤ Scrapping programs will reduce the average emission factor	HIGH
	➤ Ecodriving, Driving	MEDIUM
	➤ Traffic lights and priority lanes can improve operational speeds and driving standards, reducing emission factors	MEDIUM
	➤ Improved bus companies may improve maintenance practices	MEDIUM-HIGH
	➤ Fuel quality is essential to guarantee environmental performance of new vehicles	HIGH

(*) Taken from recent experiences of BRT's in operation

Several studies have proposed different ways to evaluate BRT systems. It is the case of the “Gold Standard” developed recently by ITDP. The standard tends to provide a better evaluation of systems that include an integrated approach together with investment in new bus technologies, good infrastructure and ITS among others. In a similar way, it is possible to

focus in a qualitative and quantitative analysis of the impacts of different BRT projects on emission reductions. A proposed set of questions and a methodology to answer them is proposed to evaluate those systems. Depending on the available information, it is possible to make an accurate calculation of reductions in emissions for the different pollutants.

Qualitative evaluation of Montevideo Busway impact on emissions

As shown in Table 1, the characteristics of the Busway project have an influence on its impact on emissions. Based on the review of planning documents, existing data and interviews undertaken in Montevideo an initial qualitative evaluation is presented below. This evaluation is shown on Table 2.

Table 2 – Qualitative evaluation of emission reduction of Montevideo BUSWAY

Aspect	Situation in Montevideo	Qualitative evaluation Change with the project
1. Changes in modal share	No information available	Not available. Information on former users of private modes using the Busway should be gathered
2. New Operational design	A trunk-feeder system was proposed using Terminal Colon. This may have led to an addition in bus-km run, as the terminal is inconveniently located for several bus routes.	Negative change. Expected reduction in Km did not occur as the initial design was abandoned.
3. Higher capacity buses	Buses operating in the Busway have the same capacity and design that the ones that traditionally operate in the rest of the system	No change
4. Operational management systems	Fare Collection smart cards have been included. This produces a positive impact on access time to vehicles and shorter stops on stations. However off board Fare Collection has not been introduced and cash payment remains partially	Limited Positive change
5. Traffic Lights	The number of signalized intersections increased three-fold, from 8 to 25. Moreover, signal cycles are longer to allow for left turns of mixed traffic across the Busway, and the new controls do not give priority to public transport.	Important Negative impact on bus (and mixed-traffic) speeds.
6. Priorities	A segregated Busway was built in the center of the avenue. Interstation speeds probably declined, as the avenue was not congested before the project was built.	Limited Positive impact
7. Bus technology	BUSWAY operates with the existing buses. According to a new regulation from 2013 ¹²⁴ , new buses will have better standards. This improvement is not due to the Busway project.	No change
8. Scrapping projects	No specific scrapping project has been introduced	No change
9. Ecodriving	No evidence of Ecodriving. In interviews with bus drivers, the team learned that the drivers received no driver training before the	No change

¹²⁴

September 9, 2013, Article R.431.4 was passed. The new law requires that all new buses are Euro III and low floor or low entry with a ramp for wheel chair accessibility or a vehicle lifting platform. <http://normativa.montevideo.gub.uy/articulo/88095>.

	system opened.	
10. Improvement speeds	Operation speed before the project was close to 22-24 km/h. The actual operational speeds range between 20 to 24 km/h, according to daily measurements	Uncertain impact (probably negative)
11. Strengthening of bus companies	Bus operators companies remain the same. Buses seem to be poorly maintained. However, a resolution was passed in companies to purchase Euro III, wheel chair accessible buses when purchasing a new bus.	No change
12. Fuel quality	There was no change in energy and fuel policies	No change

Source: OVE analysis, in collaboration with Juan Pablo Bocarejo, using data provided by IMM.

The qualitative analysis of Montevideo BUSWAY shows that some of the key aspects that can contribute to emissions reductions were not considered. Bus technologies, changes in operation, and ITS, such as GIS systems, scrapping programs were not implemented as part of the IDB project. However, a resolution was passed in September of 2013 that requires all new buses to be Euro III and accessible using low-floor platforms or elevated platforms.

Interviews with the environmental agencies, suggest that the bus fleet has been renewed at approximately 10% a year since then. Diesel fuel refineries have also recently begun plans to reduce sulfur content of the fuel. However, since this plan was adopted after the above resolution, the law was not able to require higher Euro standards, such as Euro 4 or Euro 5 due to the low fuel quality.

Available data does not permit a clear determination if changes in operation (speeds) are positive or negative. There is a negative impact at intersections. Interviews suggest that commercial bus speeds declined, at least in the first year after the system was opened. It is also likely that mixed-traffic runs more slowly now, due to the addition of traffic signals. The improved infrastructure provides a good potential for operational improvement that has not been fully used to date. Bus routes have changed only slightly. “The restructuring of bus routes primarily focused on terminating all existing services at the Colón Terminal where passengers were to transfer to an improved feeder service to the outer catchment areas¹²⁵. As already mentioned, this arrangement was opposed by passengers and bus companies alike, and many of the original direct routes have been reinstated. There was no attempt to run express services on Avenida Garzón or to change the routing of buses in northern Montevideo generally. Thus, most buses leave the Busway and continue along their original alignments in mixed traffic streets. Only few buses operate in the last, innermost, section of the Busway.

¹²⁵ Small feeder buses (about 8 m long), similar to some busway operations elsewhere in Latin America, were considered but not introduced.

Annex 9: Qualitative analysis and conclusions of Juan Pablo Bocarejo about the busway financed by the Bank in relation to emissions

Information retrieved from Bocarejo, J.P. 2014.

According to the qualitative analysis the possible changes in GHG emissions and local pollutants are due to changes in operational conditions for the buses that operate in the BUSWAY corridor. In a methodology aimed at comparing a business as usual (BAU) scenario with a Project scenario, the impacts would come from changes in the Driving Pattern. Eco-driving, less stops, a better interstation speed would be some of the variables that could produce an impact on emissions of the different pollutants.

The European program CORINAIR provides a comprehensive methodology to calculate emission inventories of the main pollutants. The equations developed consider urban/interurban/rural environment, different types of fuels and a wide range of vehicle categories. In general those equations include speed as one of the main variables for emissions.

The equations showed in Table 3 will be used to calculate emissions for CO, NO_x, PM and CO₂. In the BAU scenario, the average speed will be 17.9 Km/h. In the BUSWAY corridor the average speed is 20.3 km/h.

Table 3 - Emission equations for Euro 3 Buses

Pollutant	Equation
NO _x	$ENO_x = (a + (b / (1 + \exp(((((-1) * c) + (d * \ln(V)) + (e * V)))))))$
CO	$ECO = (((a * (V^3)) + (b * (V^2)))) + (V * x) + d$
PM	$EPM = ((a + (b * V)) + (((c - b) * (1 - \exp(((((-1) * d) * V)))))) / d)$
Fuel Consumption	$FC = (((a * (V^3)) + (b * (V^2)))) + (c * V) + d$

E and FC in gr/km; V in km/h; a, b, c, d given by Corinair for different types of buses

Source: CORINAIR, 2007

Recent research proposes the use of the Vehicle Specific Power (VSP) indicator especially while measuring CO₂ emissions (Rodriguez, 2014). This research shows that differences in average speed would be imprecise while VSP would be more accurate in predicting CO₂ Emissions. The way a driver accelerates or the traffic condition are variables that impact emissions and are not considered while using average speeds. In fact, changes in the driving cycle, from the one that is used in Bogota nowadays to driving cycles from developed countries could produce a 12% reduction on CO₂ emissions.

However, measuring VSP requires a sophisticated on board real time experiment not available in the case of Montevideo. First, a “Montevideo driving cycle” is needed. It would represent the actual situation without the Busway corridor. A new driving pattern, which would be taken from good driving standards, would be the goal to achieve.

The Busway system opened December 4, 2012. According to speed records provided by Montevideo Authority (see Table 4), the average speed in the corridor before the Busway in 2012 was in a range of 20-21.4 km/h. Although the IDB loan proposal states they were 16 km/hour, interviews suggest that the actual velocities would have been higher given that very fewer intersections were signalized (8 in total) and that after the system was implemented there were 25 signalized intersections and the fact that there was no congestion

in the corridor. After the Busway started operations, the average speed of public transport on the Busway is in the range of 19.5 to 21.2 km/h. The Authority is confident towards the data gathered during 2013, as it includes almost 1400 measurements. The standard deviation of the collected data is low, close to 2 km/h, so average speed can be used to evaluate changes in emissions and fuel consumption.

Table 4 - Average speeds before and after the Busway (source: IMM)

	Julio del 2012	Diciembre del 2012	Abril del 2013	Octubre del 2013	Noviembre del 2013	Junio del 2014
Cantidad de datos	347	383	391	428	435	218
Media (km/h)	21,4	17,95	19,48	19,8	20,17	19,72
Mediana (km/h)	21,31	17,92	19,31	19,71	19,86	19,7
Media recortada al 5%	21,4	17,9	19,44	19,77	20,1	19,68
intervalo de confianza para la media al 95%	21,19	17,79	19,28	19,63	20	19,52
	21,6	18,1	19,68	19,98	20,34	19,92
Mínimo	14,84	15,06	15,16	15,77	16,2	17,26
Máximo	26,61	22,74	25,71	27,5	28,02	25,73
Desviación estándar	1,98	1,53	1,98	1,82	1,77	1,47

Montevideo Mobility Authority has also a record of the km driven in the Busway corridor. This is shown on Table 5. Every day the vehicles in transit lines that use Garzon Corridor make a total of 48.000 km, but only 13% of this mileage is done inside the Busway. Compared to other Busway corridors with similar length, its use is low. There may have been a small increase in bus-km because of the inconvenient location of the Colón Terminal and the imposition of trunk-feeder operation

Table 5 - km driven in the Busway corridor (source: IMM)

Líneas	Coches	Kilómetros recorridos			Km/ Coches	Kilómetros recorridos sobre Garzón		
		Sentido A	Sentido B	Total		Sentido A	Sentido B	Total
2	19	2 451	2 446	4 898	258	335	335	670
145	22	2 929	3 338	6 267	285	96	113	209
147	9	1 162	1 171	2 333	259	49	56	105
148	18	2 293	2 345	4 638	258	451	399	850
174	21	2 806	2 933	5 739	273	186	205	391
329	12	1 229	1 418	2 647	221	41	53	94
526	20	2 838	2 768	5 606	280	103	114	217
D5	6	806	937	1 743	291	160	159	319
L29	6	719	814	1 533	255	51	60	110
G Cutcsa	18	2 175	2 646	4 821	268	778	770	1 548
G Coetc	26	3 775	3 557	7 332	282	784	736	1 520
Total	177	23 185	24 372	47 557	269	3 034	2 999	6 033

Table 6 shows the emissions reduction per vehicle and per year in the Busway corridor in an optimistic scenario that considers a 16 km/h average speed in the BAU. The limited operational improvement produces CO₂ reductions close to 242 Ton/year. The emissions reduction for PM is very low.

Table 6 - Emissions reduction for Montevideo Busway – Optimistic scenario

Pollutant	BAU (g)/km	Bway (g)/km	Change per vehicle.km (g)	Estimated change per year (Ton/y)	Reduction for 2012-2022
NOX	8,74	6,85	1,89	3,31	$ENO_x = (a + (b / (1 + \exp(((c - 1) * c) + (d * \ln(V)) + (e * V))))))$
CO	2,84	2,34	0,50	0,87	$ECO = (((a * (V^3)) + (b * (V^2))) + (V * x)) + d)$
PM	0,20	0,17	0,03	0,05	$EPM = ((a + (b * V)) + (((c - b) * (1 - \exp(((c - 1) * d * V))) / d)))$
Fuel Consumption	262,72	218,61	44,11	77,17	$FC = (((a * (V^3)) + (b * (V^2))) + (c * V)) + d)$
CO2				242,12	$E_{CO_2, 1m}^{CALC} = 44.011 \times \frac{FC_{1m}^{CALC}}{12.011 + 1.008r_{HC,m} + 16.000r_{OC,m}}$

Source: Authors calculations with data from Intendencia Municipal de Montevideo

Table 7 - Emissions reduction for Montevideo Busway – Pessimistic scenario

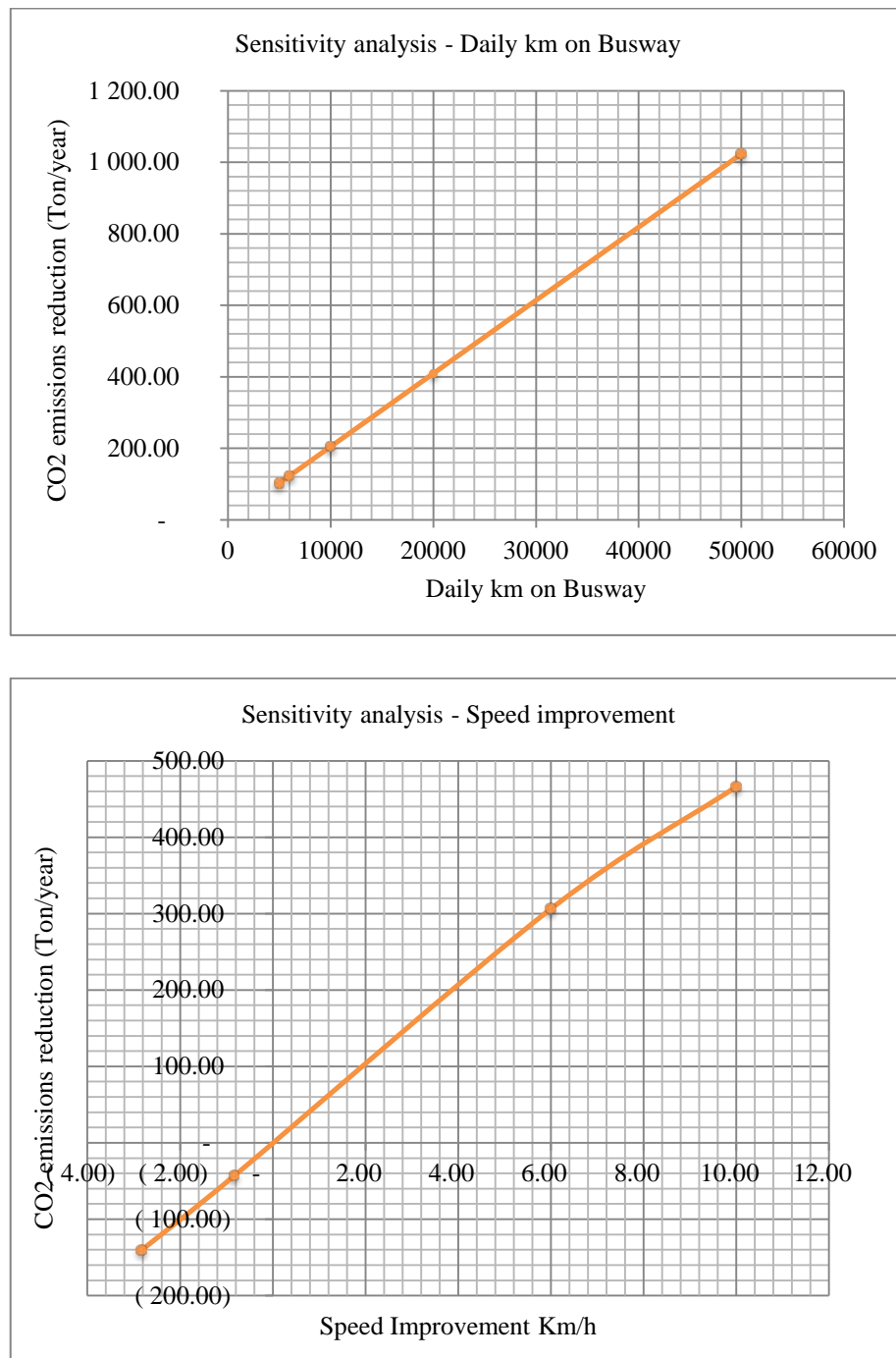
Pollutant	BAU (g)/km	Bway (g)/km	Change per vehicle.km (g)	Estimated change per year (Ton/y)	Reduction for 2012-2022
NOX	5,88	6,85	(0,97)	(1,69)	$ENO_x = (a + (b / (1 + \exp(((c - 1) * c) + (d * \ln(V)) + (e * V))))))$
CO	2,06	2,34	(0,29)	(0,50)	$ECO = (((a * (V^3)) + (b * (V^2))) + (V * x)) + d)$
PM	0,15	0,17	(0,02)	(0,03)	$EPM = ((a + (b * V)) + (((c - b) * (1 - \exp(((c - 1) * d * V))) / d)))$
Fuel Consumption	193,04	218,61	(25,57)	(44,74)	$FC = (((a * (V^3)) + (b * (V^2))) + (c * V)) + d)$
CO2				(140,39)	$E_{CO_2, 1m}^{CALC} = 44.011 \times \frac{FC_{1m}^{CALC}}{12.011 + 1.008r_{HC,m} + 16.000r_{OC,m}}$

Source: Authors calculations with data from Intendencia Municipal de Montevideo

A pessimistic scenario is presented in Table 7. In this case the BAU average speed is supposed to be 23 km/h, higher than the average speed with the project. In this scenario an estimated increase of 140 Ton/year in CO₂ emissions is estimated. Increases in the other pollutants are also calculated.

A sensitivity analysis on variables such as speed and use of the Busway corridor allows us to propose a range of the emissions reductions. Figures 1 and 2 show the impact of the changes in the estimation of the emissions reductions. Considering a range of mileage done on the Busway corridor between 6000 km and 8000 km, the range for CO₂ reductions would be between 120 to 160 ton/year. A range of speed improvement between 2 and 4 km/h would bring a reduction in CO₂ emissions between 120 to 200 tons of CO₂.

Figure 1 - Sensitivity Analysis Km driven from optimistic scenario



Conclusions and recommendations in relation to emissions

Montevideo Busway is unlikely to have produced any reduction of emissions. Some of the possible measures that could have had an important impact were not introduced. Moreover, the mostly free-flowing bus and car traffic along Avenida Garzón was slowed down by the tripling of signalized intersections.

The qualitative analysis shows that the only major variable that could have an impact is the change in the operation pattern. Measures to produce a better driving cycle, such as driver

training for eco-driving, intersection prioritization, funding or incentives to companies to renew the fleet to standards above Euro III and at a faster rate than currently required, would all contribute to having a more positive impact on emissions reductions than is currently observed.

It was not possible to determine impacts produced by changes in speed for private transport. This can have an impact on CO₂ emissions.

It was not possible to determine speed increases before and after the start of the Garzon Busway corridor for public transport. In an optimistic scenario, considering a low average speed before the project, (taken from the IDB loan proposal) a 10% reduction on CO₂ and CO emissions and a 15% reduction on NO_x emissions were estimated.

In a pessimistic scenario, considering higher speeds before the project, emissions would have increased in 8% for CO₂ and 12% for NO_x.

The actual use of the Busway corridor, around 6000 km per day seems low. A restructuring of bus routes that would result in higher use of the exclusive corridor in combination with repairing pavement detectors to allow buses to have priorities at intersections it could bring more important benefits.

An improvement on the bus technology and a more radical improvement on the operational design could improve drastically the emissions reduction of the different pollutants.

A redesign of traffic lights is needed in order to give priorities to public transport flows. Improving speed operation can have a positive impact on environmental performance of the Busway in the short term.

BIBLIOGRAPHY FOR THE EMISSION ANALYSIS

- Bocarejo J.P., Sanchez S., Behrentz E., 2011. *Estrategias ambientales integradas-Bogotá*, Technical report developed as product of the Technical Cooperation CO-T1202 funded by the Inter-American Development Bank
http://www.cleanairinstitute.org/caifiles/file/Informe_1A_y_1B.pdf
- CORINAIR, Emissions Inventory Guidebook, 2007. European Union
<http://www.eea.europa.eu/publications/EMEPCORINAIR5>
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2006. *Informe anual de la Red de Monitoreo de calidad del aire de la ciudad de Montevideo*
<http://portal.mercociudades.net/sites/portal.mercociudades.net/files/archivos/documentos/Modulos/Ambiente/Aire/InformeAireMontevideo2006.pdf>
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2012. *Informe de Calidad de Aire, Año 2012, Informe anual*
<http://www.elpais.com.uy/uploads/files/2014/02/14/Informe%20de%20calidad%20de%20aire%20de%20la%20Intendencia.pdf>
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2013. *Informe de Calidad de Aire, Año 2013, Informe anual*
http://www.montevideo.gub.uy/sites/default/files/articulo/informe_anual_2013_aire.pdf
- Hidalgo, D., & Huizenga, C. 2013. *Implementation of sustainable urban transport in Latin America*. Research In Transportation Economics, Research in Transportation Economics
Volume 40, Issue 1, April 2013, Pages 66–77
<http://www.sciencedirect.com/science/article/pii/S0739885912001060>
- UNDP-Intendencia Municipal de Montevideo (IMM). 2013. *Plan Climático de la Región Metropolitana de Uruguay*. Montevideo: UNDP
http://www.montevideo.gub.uy/sites/default/files/articulo/plan_climatico.pdf

Annex 10: Avenida Garzon Busway Scoring Sheet according to the BRT Standard 2013

Analysis performed by Gerhard Menckhoff, Consultant, in March 2014, on the basis of the BRT Standard 2013 published in February 2013 by the Institute of Transportation & Development Policy (ITDP).

Table 8 – Scoring Sheet for Avenida Garzon Busway

Item	Max Score	MVD Score	COMMENTS
Off-Vehicle Fare Collection and Verification	7	0	Fare collection and farecard validation is on-board. All passengers enter the bus through the front door, next to the driver. Most buses also have a second person who prints tickets as needed. He/she is seated near the driver.
Multiple Routes Use same BRT Infrastructure	4	4	There has been virtually no route restructuring, except at the outer end of the busway. Here some bus routes were cut short and replaced by feeder buses. Otherwise, bus routes enter and leave at several locations.
Peak Period Frequency	3	3	36 buses / hour in each direction, in the most heavily used section of the busway
Off-Peak Frequency	2	2	Frequency is high overall, but much less so per route of which there are (too) many.
Limited and Local-stop Services.	3	3	No express bus services on busway. Suburban buses, running in the uncongested mixed-traffic lanes adjacent to the busway, provide a somewhat faster service. There is no interchange between the busway and suburban buses.
System Control Center	3	1	The municipality operates a GPS system for all city buses. However, there is no direct application on the busway.
Routes in top 10 demand corridors	2	0	Although there are relatively many buses traveling on Avenida Garzón (see above), the busway is in the city's outskirts. There are many higher-demand corridors
Operates late nights and weekends	2	2	Municipal buses operate very late and on weekends. During the night hours, suburban buses run on the busway, thereby providing a 24-hour service
Demand Profile	3	0	The busway is located in the outskirts of the city. Its extension towards the city center operates a mixed-traffic street, even though passengers demand is much higher near the central business district
Part of (planned) multi-route network	2	0	Avenida Garzón was intended to be part of larger BRT network, but BRT expansion has been put on ice
Bus lanes in central verge of road	7	7	The entire busway is in the center of Avenida Garzón
Segregated Right-of-Way	7	7	The entire busways physically segregated from the mixed-traffic lanes.
Intersection Treatments	6	1	Some attempts were made initially to prohibit left turns of mixed traffic across the busway. Because of citizen's complaints, many of these left-turn prohibitions were later canceled. Traffic signal cycles on some intersections are quite long, up to 200 seconds. This slows down traffic and buses.
Physically Separated Passing Lanes at Stations	4	0	There are no passing lanes at stations
Distance between Stations	2	2	There is one terminal and 14 stations in each direction. The average distance between stations is 450 meters
Emission Standards	3	0	All buses run on Diesel. About 50% are Euro II, and 50 % are Euro III.
Stations set back from intersections	3	0	Most (probably all) stations are about 20 meters from traffic light
Stations are in Center and Shared by both directions of service	2	0	All stations are at the outside of the busway

Item	Max Score	MVD Score	COMMENTS
Pavement quality	2	2	Most (probably all) of the busway and mixed-traffic lanes are new cement concrete
Platform-level Boarding	6	0	Standard buses (most with steps to a 90cm floor level) stop at platforms that have a level of 25-30 cm above the busway. The horizontal distance between the “docked” bus and the platform ranges from 10 to 50 cm. No effort appears to have been made to achieve platform-level boarding
Safe, wide, attractive weather protected stations	3	1	Stations are relatively narrow (<2m). They have a roof against rain, but otherwise are open. The design is simple and reasonably attractive.
3+ doors on articulated buses or 2+ very wide doors on standard buses	3	1	Buses are standard city buses (about 12 m long), with two relatively narrow doors, wide enough for two persons.
Multiple docking bays and sub-stops	1	1	Stations are long enough to accommodate two 12-m buses. Just
Sliding doors at BRT stations	1	0	No sliding doors
Branding of vehicles and system	3	0	No efforts were made to give the system a special image. Standard buses are used, identical to those in the rest of the city.
Passenger information	2	0	Except for electronic message signs at Terminal Colón, the signing is minimal, and includes on simple route map in stations (often covered with graffiti or mini-posters)
Universal Access	3	0	The basic design (low platforms with mostly high-level buses) is not convenient for passengers with disabilities.
Integration with other public transport	3	3	Busway routes – like all city bus routes – benefit from full ticket integration across the bus system.
Improved safe and attractive pedestrian access to system and along corridor	3	2	Well-designed crosswalks and pedestrian signals have been built to all busway stations. No footpath improvements were seen on side streets
Secure bicycle parking at stations.	2	0	No bicycle facilities were seen
Bicycle lanes in corridor or on parallel streets	2	0	No bicycle facilities were seen
Bicycle sharing systems at BRT stations	1	0	No bike sharing was seen at stations
TOTAL (1)	100	42	
Total BRT Basic	33	15	(Minimum needed qualify as BRT: 18)
POINT DEDUCTIONS			
Minimum average commercial speed below 13 km/h	-10	0	Average commercial speed is 20 km/
Peak passengers per hour per direction (pphpd) below 1000	-5	0	Peak passenger volume is probably above 1500 pphpd
Lack of enforcement of Right-of-Way	-5	0	No enforcement problems were observed. Nor would they be expected, considering that the mixed-traffic lanes are uncongested and permit faster movement than. the busway.
Significant gap between bus floor and station platform	-5	0	The design criteria of the Avenida Garzón busway did not envisage platform-level boarding
Overcrowding	-3	0	No major overcrowding was observed
Poorly maintained buses and stations	-8	-2	Some stations suffer from graffiti and mediocre maintenance
TOTAL (2)	- 36	-2	

Role of the IDB

	IDB	National Govt	Local Govt	Private Sector	Other MDB	Other
Planning and Diagnosis Phase						
<i>Feasibility Studies</i>	D/F					
<i>Risk analysis</i>	D/F					
<i>Institutional Strengthening activities</i>	D/F					
<i>Negotiation with the bus operators</i>			D			
<i>Alternatives Analysis (if done) or where did the project originate from..</i>	D/F					
Construction						
<i>BRT Physical Infrastructure</i>	C					
<i>Other infra (pedestrian-bikes)</i>			C-M			
<i>Resettlement – Compensation activities</i>			O			
<i>Communication – Branding</i>			D/O			
<i>Public consultation</i>			D/O			
Reform of the Bus Sector						
<i>Creation of a consortium or supervising entity</i>						
<i>Creation of an integrated fare</i>			D/O			
<i>Fare card system</i>			D/O			
<i>Scrapping process</i>						
PPPs						
<i>Contract design/competitive bidding for bus companies – new business model</i>						
Fare policy			D/O ¹²⁶			
Sustainability						
<i>2nd phase proposed for the project</i>	X ¹²⁷					
<i>Other initiatives</i>						

¹²⁶ Not changed for or after the project's implementation

¹²⁷ Loan UR-L1079 approved by the Bank in December 2012.

Bibliography

- Aguilar, S. 2011. *Dinámicas de la segregación urbana Movilidad cotidiana en Montevideo*. Revista de Ciencias Sociales, Departamento de Sociología, Facultad de Ciencias Sociales, Universidad de la República de Uruguay, V. 24 N° 28, 2011
<http://cienciassociales.edu.uy/departamentodesociologia/wpcontent/uploads/sites/3/2013/archivos/RevCienSoc%2028-4.pdf>
- Bocarejo, J.P. 2014. *Evaluation of the Evaluation of the effects of Bus Rapid Transit (BRT) Systems on Emissions, Montevideo Busway emission analysis*, prepared in August 2014
- Brasesco, J. 2012. *30 años de lucha, la Historia de la Unión de Trabajadores de CUTCSA*
- Corporación Andina de Fomento (CAF), Observatorio de Movilidad Urbana. 2007. Online data retrieved from <http://omu.caf.com/>
- CAF. 2011. *Desarrollo Urbano y Movilidad en América Latina*, Caracas: CAF
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2006. *Informe anual de la Red de Monitoreo de calidad del aire de la ciudad de Montevideo*
<http://portal.mercociudades.net/sites/portal.mercociudades.net/files/archivos/documentos/Modulos/Ambiente/Aire/InformeAireMontevideo2006.pdf>
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2012. *Informe de Calidad de Aire, Año 2012, Informe anual*
<http://www.elpais.com.uy/uploads/files/2014/02/14/Informe%20de%20calidad%20de%20aire%20de%20la%20Intendencia.pdf>
- Departamento de Desarrollo Ambiental, Intendencia Municipal de Montevideo (IMM). 2013. *Informe de Calidad de Aire, Año 2013, Informe anual*
http://www.montevideo.gub.uy/sites/default/files/articulo/informe_anual_2013_aire.pdf
- El Pais. 2013. *Nestor Campal será nuevo director de Movilidad Urbana*. Article published on the online edition of El Pais on August, 1st 2013
<http://www.elpais.com.uy/informacion/nestor-campal-sera-nuevo-director.html>
- El Pais. 2013, b. *Tras fallas del Corredor Garzón reformularán plan de movilidad*. Article published on the online edition of El Pais on October, 22th 2013,
<http://www.elpais.com.uy/informacion/fallas-corredor-garzon-reformularan-plan.html>
- GEA Consultores Ambientales. 2008. *Análisis Socio-Ambiental del Programa. Plan de Movilidad Urbana de Montevideo*. Montevideo
- Glejberman, D. 2005. *El sistema municipal y la superación de la pobreza y precariedad urbana en Uruguay*, Santiago de Chile: CAF
http://repositorio.cepal.org/bitstream/handle/11362/5666/S0601089_es.pdf?sequence=1 and shorter presentation by the author:
<http://www.eclac.org/dmaah/noticias/paginas/1/21471/URUGUAYGlejberman.pdf>

- Hayes, M. 1981. *Lobbyists and Legislators: A Theory of Political Markets*, Rutgers University Press, mentioned in Scholl, L. 2011. *Essays on Transportation Safety, Economics, and Policy*, Berkeley, <http://escholarship.org/uc/item/9qb6v0mw>
- Institute for Transportation and Development Policy (ITDP). 2007. *Bus Rapid Transit Planning Guide*. <https://www.itdp.org/brt-planning-guide-english/>
- ITDP. 2013. *The BRT Standard 2013*. Retrieved from <https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/>
- Instituto Nacional de Estadísticas (INE). 2004. Resultados del Censo Fase I – 2004 http://www.ine.gub.uy/faseInew/divulgacion_definitivos.asp
- INE. 2013. *Uruguay en Cifras 2013, Transporte y Comunicaciones*, <http://www.ine.gub.uy/biblioteca/uruguayencifras2013/capitulos/Transporte%20y%20Comunicaciones.pdf>
- Intendencia Municipal de Montevideo (IMM), *Digesto Municipal Volumen V. Del Tránsito y Transporte*, <http://normativa.montevideo.gub.uy/indice/65068>
- IMM. *Como Ir*. Online application available at: <http://www.montevideo.gub.uy/aplicacion/como-ir> and STM schedule available at: <http://www.montevideo.gub.uy/horariosSTM/>
- IMM. 2008. *Plan Montevideo. Plan de Ordenamiento Territorial 1998-2005*. <http://www.montevideo.gub.uy/institucional/politicas/ordenamiento-territorial/plan-montevideo>
- IMM. 2010. *Plan de Movilidad*. http://www.montevideo.gub.uy/sites/default/files/articulo/Plan_de_movilidad.pdf
- IMM. 2013. *Mejoras en corredor Garzón - marzo 2013*. Article published on March, 4th 2013, www.montevideo.gub.uy/ciudadania/stm-transporte-metropolitano/novedades/mejoras-en-corredor-garzon-marzo-2013
- IMM. 2013, b. *Centro de Gestión de Movilidad comenzará a operar en 2014*. Article published on December, 12th 2013, <http://www.montevideo.gub.uy/noticias/centro-de-gestion-de-movilidad-comenzara-a-operar-en-2014>
- IMM. 2014. *Locales de emisión y recarga de tarjeta*. Information retrieved from <http://www.montevideo.gub.uy/ciudadania/stm-transporte-metropolitano/locales-de-emision-y-recarga-de-tarjeta>
- IMM. 2014, b. *Tipos de viaje*. Information retrieved from: <http://www.montevideo.gub.uy/ciudadania/stm-transporte-metropolitano/el-sistema/el-sistema>

- IMM. 2014, c. *Tarjeta STM pospago*. Information retrieved from:
<http://www.montevideo.gub.uy/ciudadania/stm-transporte-metropolitano/pospago/tarjeta-stm-pospago>
- Inter-American Development Bank (IDB). 2006. *IDB Country Strategy with Uruguay (2005-2009). Revised version*. Document GN-2398-2
- IDB. 2006, b. Technical Cooperation UR-T1015 *Support to the Preparation of the Montevideo Urban Transport Program (UR-L1025)*
- IDB. 2008. *Proposal for a loan for the “Montevideo Urban Transportation Program”*
- IDB Program Monitoring Reports (PMR) and Loan Result Report for Loan Operation UR-L102. 2009-2011
- IDB, News Releases, 2012: *Uruguay will improve public transport in Montevideo with IDB support* published on December, 19th 2012
<http://www.iadb.org/es/noticias/comunicados-de-prensa/2012-12-19/desarrollo-del-transporte-publico-en-montevideo,10273.html>
- International Energy Agency, (IEA), online data for 2011 and 201, retrieved from
<http://www.iea.org/statistics/topics/CO2emissions/>
- Montevideo Portal, 2013. *Caminador Garzon*, Article published on February, 21st 2013,
<http://www.montevideo.com.uy/auc.aspx?193216,1,1149>
- Montevideo Portal. 2013, b *En el Celular*. Article published on September, 1, 2013,
<http://www.montevideo.com.uy/auc.aspx?212231,1,1149>
- Porras Maieli, J.M., 2014. *La implementacion del Sistema de Transporte Metropolitano de Montevideo, un estudio desde las capacidades estatales*. Monography under the direction of Alejandro Milanesi, Facultad de Ciencias Sociales, Universidad de la Republica, Uruguay
- Republica, 2013. *Junta Departamental convoca a sala a la intendenta Olivera*. Article published on the online edition of Republica on August, 2nd, 2013 available at:
<http://www.republica.com.uy/junta-departamental-convoca-a-sala-a-la-intendenta-olivera/361585/>
- Rosa, de la. P. 2003. *La difícil relación entre dos actores del transporte: CUTCSA - Intendencia Municipal de Montevideo*. Presentation during the 2nd anual meeting of the Investigadores del Departamento de Sociologia, 2003, Departamento de Sociologia, Facultad de Ciencias Sociales, Universidad de la Republica, Uruguay
<http://www.fcs.edu.uy/archivos/de%20la%20rosa.pdf>
- Smolka, M.O. 2013. *Implementing Value Capture in Latin America: Policies and Tools for Urban Development*. Policy Focus Report, Cambridge, MA: Lincoln Institute of Land Policy, available at:

https://www.lincolninst.edu/pubs/dl/2244_1581_Implementing_Value_Capture_in_Latin_America.pdf

Tonichi Engineering Consultants – ALG. 2007. *Informe final. Consultoría de Apoyo a la Preparación del Programa de Transporte Urbano de Montevideo (PTUM)*.

Unidad de Estadística, División Planificación Estratégica, Departamento de Planificación. Intendencia de Montevideo. 2009. *Evolución de la Pobreza, Montevideo-2009*
http://www.montevideo.gub.uy/sites/default/files/articulo/evolucion_pobreza_1999-2009.pdf

Unidad Nacional de Seguridad Vial (UNASEV), Presidencia de la Republica, Uruguay. 2010. *Siniestralidad Vial en Uruguay, Informe 2010*
http://unasev.gub.uy/wps/wcm/connect/4081f7804dfa549bb556ff01b72d8394/InformeSiniestralidad2010.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=4081f7804dfa549bb556ff01b72d8394

UNASEV, Presidencia de la Republica, Uruguay. 2011. *Siniestralidad Vial en Uruguay 2011*
http://unasev.gub.uy/wps/wcm/connect/c5f56b804e09331dbc6cfe01b72d8394/InformeSiniestralidad2011.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=c5f56b804e09331dbc6cfe01b72d8394

United Nations Development Program (UNDP)-Intendencia Municipal de Montevideo (IMM). 2012. *Políticas de tiempo, movilidad y transporte público: rasgos básicos, equidad social y de género*. Montevideo: UNDP
http://mvd2030.montevideo.gub.uy/sites/mvd2030.montevideo.gub.uy/files/biblioteca/politicas_de_tiempo_y_movilidad_y_transporte_publico.pdf

UNDP-Intendencia Municipal de Montevideo (IMM). 2013. *Plan Climático de la Región Metropolitana de Uruguay*. Montevideo: UNDP
http://www.montevideo.gub.uy/sites/default/files/articulo/plan_climatico.pdf

United Nations-Habitat, CAF, Fondation AVINA. 2012. *Encuesta de Percepción, la desigualdad en diez Ciudades latinoamericanas, 2012*,
<http://www.desigualdadsocial.org/ladesigualdad.pdf>.

United Nations Population Fund (UNFPA). 2012. *Análisis de situación en población. Uruguay*. <http://unfpa.org/psa/wp-content/uploads/2012/11/Uruguay-Analisis-de-situacion-en-poblacion.pdf>

UY Press. 2014. *Oposición impidió desarrollo del Plan de Movilidad Urbana en Montevideo*. Article published on May, 14th 2014, http://www.uypress.net/uc_51224_1.html.