

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

**BRAZIL**

**SÃO PAULO METRO LINE 5 (PURPLE LINE) EXTENSION  
PROJECT**

**(BR-L1227)**

**LOAN PROPOSAL**

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ELECTRONIC LINKS
<b>REQUIRED</b>
1. Development Effectiveness Matrix (DEM) <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198542">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198542</a>
2. Annual work plan (AWP) <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198539">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198539</a>
3. Monitoring and evaluation arrangements <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198541">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198541</a>
4. Procurement plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198538">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198538</a>
5. Environmental and Social Management Report (ESMR) <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198540">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198540</a>
<b>OPTIONAL</b>
1. Operational plan for São Paulo Metro Line 5 <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2191136">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2191136</a>
2. Economic feasibility study of São Paulo Metro Line 5: Largo Treze–Chácara Klabin segment <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198434">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198434</a>
3. Impact of Metro Line 5 on the poor <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198474">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198474</a>
4. Mass transit reorganization and integration plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198477">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198477</a>
5. General presentation on Line 5 <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198484">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198484</a>
6. Hierarchical model for studying alternative routes for Line 5 <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198486">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198486</a>
7. State of São Paulo rail transport system expansion plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198491">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198491</a>
8. Map <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198501">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=2198501</a>
9. Basic environmental plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35061217">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35061217</a>

## **ABBREVIATIONS**

AWP	annual work plan
CBTC	communication-based train control
CPTM	Companhia Paulista de Trens Metropolitanos
EIA	Environmental impact assessment
ESMR	Environmental and Social Management Report
km	kilometer
LIBOR	London Interbank Offered Rate
METRÔ	Companhia do Metropolitano de São Paulo
PBA	Basic Environmental Plan
PMU	Project Management Unit
STM	Metropolitan Transportation Department

## PROJECT SUMMARY

### BRAZIL SÃO PAULO METRO LINE 5 (PURPLE LINE) EXPANSION PROJECT (BR-L1227)

Financial Terms and Conditions			
<b>Borrower:</b> State of São Paulo		Amortization period:	25 years
<b>Guarantor:</b> Federative Republic of Brazil		Grace period:	4.5 years
<b>Executing agency:</b> São Paulo Metropolitan Transportation Department		Disbursement period:	4.5 years
		Interest rate:	LIBOR
IDB (Ordinary Capital)	US\$480,958,000.00	Inspection and supervision fee:	*
Local (State of São Paulo)	US\$143,140,000.00	Credit fee:	*
Total	US\$624,098,000.00	Currency:	U.S. dollars from the Single Currency Facility of the Ordinary Capital
Project at a Glance			
<b>Project objective/description:</b> The purpose of the Metro Line 5 (Purple Line) expansion project is to meet the growing demand on metropolitan São Paulo's transportation system by expanding the metro services and improving mobility, connectivity, safety, and comfort for mass transit users. The project will support the expansion through financing for the upgrading trains and for procurement of systems and equipment for the operation of this metro line (paragraph 1.13).			
<b>Conditions precedent to the first disbursement:</b> (i) entry into force of the subsidiary execution agreement between the State of São Paulo's Metropolitan Transportation Department (STM) and Companhia do Metropolitano São Paulo (METRÔ) on terms previously agreed with the Bank (paragraph 3.2); (ii) evidence that the installation permit for the project has been submitted; and (iii) evidence that the resettlement plan has been presented in accordance with Operational Policy OP-710 (paragraph 2.6).			
<b>Special execution condition:</b> (i) A letter of commitment approved by the Department of the Environment for implementation of the environmental compensation program must be presented within 18 months after the first disbursement (paragraph 2.7); (ii) semiannual progress reports enabling the Bank to monitor the project and the financial situation of the borrower and METRÔ must be presented within 30 days after the end of each semiannual period (paragraph 2.10); and (iii) a safety assessment of the communication-based train control system must be performed by an independent entity of recognized standing and acceptable to the Bank prior to the release of Line 5 for commercial operation (paragraph 2.15).			
<b>Exceptions to Bank policies:</b> None.			
<b>Project consistent with country strategy:</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
<b>Project qualifies as:</b> SEQ <input type="checkbox"/> PTI <input type="checkbox"/> Sector <input type="checkbox"/> Geographic <input type="checkbox"/> Headcount <input type="checkbox"/>			

\* The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank's lending charges, in accordance with the applicable provisions of the Bank's policy on lending rate methodology for Ordinary Capital loans. In no case will the credit fee exceed 0.75% or the inspection and supervision fee exceed, in a given six-month period, the amount that would result from applying 1% to the loan amount divided by the number of six-month periods included in the original disbursement period.

## I. DESCRIPTION AND RESULTS MONITORING

### A. Background, problem to be addressed, and rationale

- 1.1 **Metropolitan São Paulo**, with approximately 18.5 million inhabitants (11% of Brazil's population) living in 39 municípios, is the country's largest urban conglomerate (2,245 persons/km<sup>2</sup>) and economic hub, generating over 20% of national gross domestic product. In contrast to other big Latin American cities, 61% of its population and most of its jobs are concentrated centrally, in the city of São Paulo, resulting in an urban dynamic marked by long commutes and major traffic congestion.
- 1.2 **Metropolitan São Paulo's public transit system** consists of: (a) metropolitan trains, run by Companhia Paulista de Trens Metropolitanos (CPTM); (b) the metro or subway system, operated by Companhia do Metropolitano de São Paulo (METRÔ); (c) the state's intermunicipal buses, run by Empresa Metropolitana de Transportes Urbanos; and (d) the municipal bus systems, the largest of which is the city of São Paulo's system, run by the public enterprise SPTrans, which operates more than 15,000 buses.
- 1.3 Of the 39 million daily trips in the metropolitan region, 67% are motorized; of these, 55% are by automobile and 45% (12 million trips a day) are within the public transit system (78% buses, 14% metro, and 8% metropolitan trains). An estimated one third of passengers use more than one mode of transportation for each trip: specifically, 78% of metro trips, 61% of train trips, and 16% of bus trips require at least one transfer. The train and metro systems together carry some 5.5 million passengers per day.
- 1.4 **Public transit system management.** The decentralization of the metropolitan transit system instituted by the 1988 constitutional reform explicitly delegated urban and metropolitan transit to the state and municipal authorities. Taking over the metropolitan rail system posed major institutional and operational challenges for the State of São Paulo, given the need to coordinate and integrate the various components of the system. The creation of the Metropolitan Transportation Department (STM) in 1991 through Law 7450 largely met that challenge, as it was assigned the central functions of coordination, regulation and inspection of the public transit system, as well as the formulation of policy guidelines and a strategy for urban transportation. The STM operates the rail system through the CPTM and METRÔ.
- 1.5 METRÔ operates a 61.3 km network of four lines within the city of São Paulo, handling about 14% of all mass transit trips and carrying some 3.4 million passengers per day. The São Paulo metro system is among the largest in the world in terms of ridership, measured as passengers per kilometer of track per year.

	Line 1 - Blue	Line 2 - Green	Line 3 - Red	Line 5 - Purple	Total
Passengers/day	1,400,000	410,000	1,435,000	117,356	3,362,356
%	41.6%	12.2%	42.7%	3.5%	100.0%

- 1.6 The metropolitan São Paulo public transportation system has always been poorly integrated, both in terms of physical infrastructure and pricing, largely excluding low-income groups from using the rail system. In 2002, those groups mainly took the bus. From 2000 to 2005, a number of steps were taken to make the railway system more accessible and comfortable, including: (i) physical integration of the CPTM and METRÔ rail systems and the introduction of free transfers; and (ii) improvements on Line C and the construction of the first section of Line 5 (from Capão Redondo to Largo Treze). In 2006, the STM signed an agreement with the City of São Paulo's Municipal Transportation Department, creating a Joint Transportation Steering Committee (CDTI) to integrate the policies, plans, and designs of the respective mass transit and road systems. One of the main actions, taken in 2006, was to create a mass transit pass, enabling users to travel throughout the train network and transfer freely to the metro system, at four hub stations, and to the municipal bus system, for a period of up to two hours, which translated into a significant fare reduction (of roughly 25% compared to the cost of individual tickets on the rail and bus systems).
- 1.7 These operational and pricing improvements had a positive impact, reducing the amount that families had to spend on transportation, boosting demand for CPTM system and metro travel, and significantly increasing the percentage of low-income rail users. However, this growth in demand for the train and bus systems has not been matched by the necessary investments, and the quality of service has clearly deteriorated, as reflected in high passenger density (10 passengers per square meter on some lines during peak hours), long travel times (2.5 hours per day from outlying areas to the center of the city), infrequent service, and safety problems.
- 1.8 **State of São Paulo strategy and investment plan.** The state's urban transportation strategy sets out the following priorities: (i) integration of the state-run systems with those of the other municípios in the metropolitan region; (ii) improvement in the quality of rail services; (iii) better coordination with operators and users; (iv) development of an integrated strategy for land use, urban transportation, and air quality; and (v) introduction of financial mechanisms to guarantee the long-term sustainability of the public transit system so as to reduce subsidies.
- 1.9 As part of this strategy, the state government plans to invest over US\$4 billion in the rail system by 2012 in order to improve access for low-income people to centers of employment, health services, education, and social recreation facilities. In 2008 the state government approved external financing operations with (i) the World Bank and the Japan Bank for International Cooperation (US\$1.08 billion), and

(ii) the IDB (operation BR-L1162, US\$168 million), primarily for the procurement of trains and signaling, power, and communications systems.

- 1.10 **Country strategy.** The project is consistent with the Bank's strategy with Brazil (document GN-2327), which outlines four areas of action: (i) productivity and infrastructure, with emphasis on the use of public-private partnerships for new investments; (ii) poverty, equity, and human capital formation, with a focus on programs for income distribution; (iii) living conditions and efficiency in cities, integrating measures to fight urban poverty with improvements in habitability, efficiency, and environmental quality; and (iv) institutional strengthening and modernization of the State, with emphasis on subnational governments. The project is consistent with that strategy in that it will: (a) assist in the development of an efficient transportation system based on safe, environmentally sustainable operation, thereby improving quality of life in the city; (b) enhance productivity through greater mobility for passengers and shorter travel times; and (c) lend continuity to the state's transportation policies.
- 1.11 **Rationale for the Bank's involvement.** Bank support for São Paulo's public transit system began 15 years ago with financing of Line 5 from Capão Redondo to Largo Treze and the modernization of Line C between Osasco and Jurubatuba. The proposed program represents a continuation of the Bank's participation in the sector, by improving transportation conditions and increasing access to social services and jobs for a large proportion of the low-income population served by this line, consistent with the Bank's strategy.
- 1.12 At the same time, the Transport Division, together with the Sustainable Energy and Climate Change Unit and in partnership with other development banks and institutions, is working on the Regional Environmentally Sustainable Transport Strategy, which seeks to develop transport infrastructure under environmentally sustainable conditions. Among other things, the strategy encourages a shift towards mass urban transit modes that generates fewer gas emissions. Expansion of Line 5 (the Purple Line) is consistent with this strategy, as it will help reduce the use of buses and automobiles, thereby decreasing fuel consumption and carbon dioxide emissions.

## **B. Objective, description, components, and costs**

### **1. Objective**

- 1.13 The purpose of the Purple Line expansion project is to meet the growing demand on metropolitan São Paulo's transportation system by expanding the metro services and improving mobility, connectivity, safety, and comfort for mass transit users. The project will support the expansion through financing for the upgrading of existing trains and procurement of systems and equipment for operation of this new metro line.

### **2. Description**

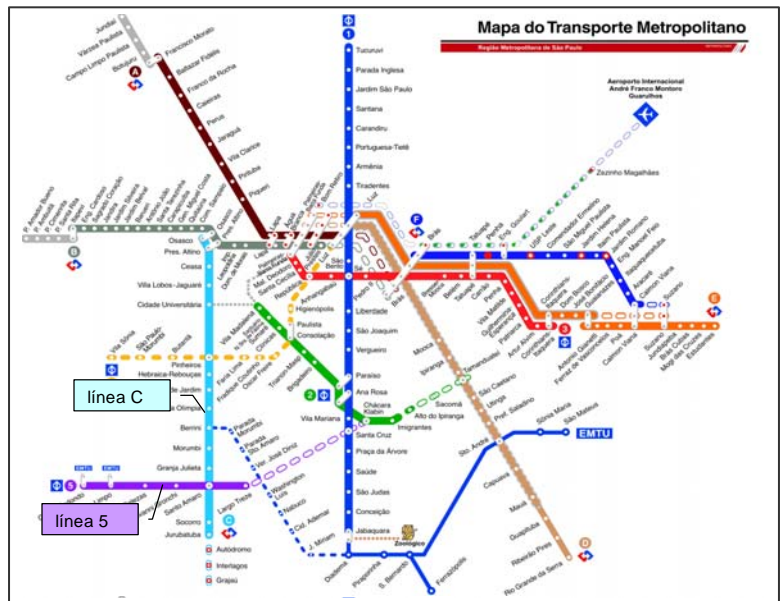
- 1.14 **Current situation in the project's area of influence.** The addition of Line 5 to the São Paulo metropolitan transit network, together with the new Line 4, will round



out the new configuration of the metro system. Line 5 is part of the southern project, intended to improve physical integration of the southern and southwestern areas of greater São Paulo, where much of the low-income population lives, with the western and central parts of the metropolis. It also plays a key role in the STM's 2020 Integrated Urban Transportation Plan, as it will better link the different areas of the metropolitan region, connecting the high-capacity transport system (metro and metropolitan trains) with the complementary bus transit systems. The line is also in the study *Rede Essencial do metrô 2020*, which reviewed options for the 2020 essential metro network.

- 1.15 Today Line 5 is operating with six stations along the 8.4 km Capão Redondo–Largo Treze segment, connecting the far south of the city (Capão Redondo), where much of the city's low-income population lives, to the Santo Amaro business and industrial center, a major job hub. Although it was opened only in 2002 and is relatively short, Line 5 has seen a substantial increase in demand, reaching 130,000 passengers/day in May 2009. Its integration with CPTM Line 9 (Emerald Line) makes it easier for users to reach the city's new financial and service centers along the Nações Unidas, Luiz Carlos Berrini, and Faria Lima avenues, and will provide interconnection with Line 4.

- 1.16 Line 5 (Purple Line) from Largo Treze to Chácara Klabin with approximately 12 km of tunnels and 11 new stations will have a total cost of US\$2,485.2 million. This extension was designed to connect the existing stations of Largo Treze and Chácara Klabin on the Line 2 (Green Line), cutting nearly 54 minutes off travel times for low-income users in southern neighborhoods to downtown, where much of the city's economic

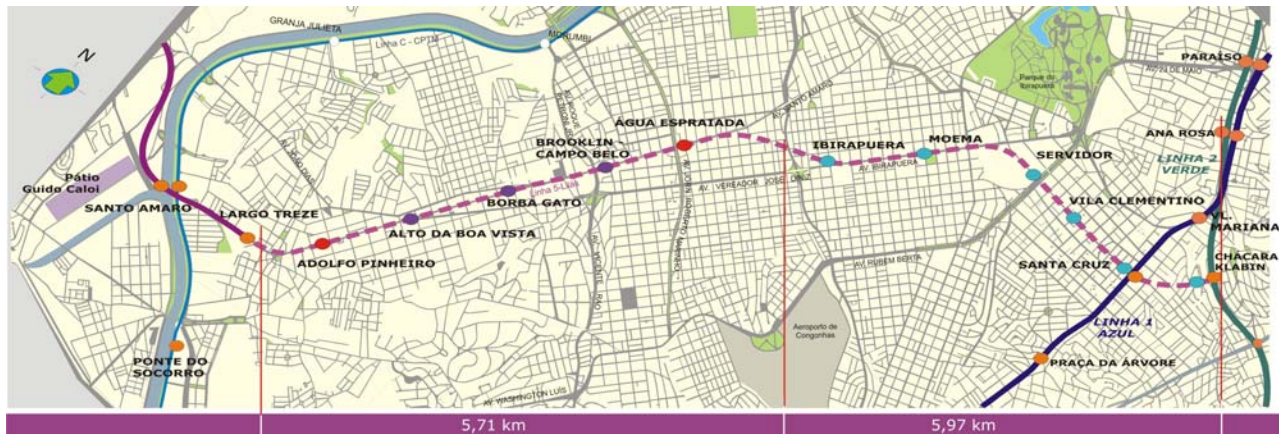


activity takes place. It will also provide access to eight major hospitals, making basic public services more accessible to a broader spectrum of society. It will enhance the structure of the metropolitan public transit network, with connections to CPTM Line 9 (Emerald Line) at Santo Amaro station; metro Line 1 (Blue Line) at Santa Cruz station; and metro Line 2 (Green Line) at Chácara Klabin station.

- 1.17 One of the main outcomes expected from the Line 5 extension will be a major modal shift from buses and private cars to the metro system, which will help reduce traffic congestion and raise average speeds along the main corridors, with savings

in travel time of 203 million hours a year, including 129 million hours for commuting workers. The extension of Line 5 will entail significant environmental benefits through a reduction in fuel consumption (50 million liters of diesel and 70 million liters of gasoline per year) and in emissions of air pollutants (17,000 tons per year) and carbon dioxide (257,000 tons per year).

- 1.18 Line 5 is being extended in two stages: (i) Largo Treze to Adolfo Pinheiro, including construction of the Adolfo Pinheiro station and 636 meters of tunnel, scheduled to begin operation in March 2011; and (ii) Adolfo Pinheiro to Chácara Klabin, scheduled to begin operation in the first half of 2013, with 11.1 km of track, 10 stations (Alto da Boa Vista, Borba Gato, Brooklin-Campo Belo, Água Espraiada, Ibirapuera, Moema, Servidor, Vila Clementino, Santa Cruz, and Chácara Klabin), and the Guido Caloi rail yard.



- 1.19 Commercial operation of Line 5 will require the purchase of 26 new trains and upgrading of the eight existing trains, with six cars each. Demand is projected to reach an estimated 644,000 passengers per day in 2013. The following table summarizes the targets:

	Current	2011	2013
<b>Segment</b>	Capão Redondo Largo Treze	Capão Redondo Adolfo Pinheiro	Capão Redondo Chácara Klabin
<b>Length (km)</b>	8.4	9.0	20.1
<b>Stations</b>	6	7	17
<b>Passengers/day</b>	120,000	260,000	644,000
<b>Headway (seconds)</b>	307	307	125
<b>Train fleet</b>	8	8	34

- 1.20 The Line 5 extension will incorporate advanced technologies, including signaling and track control systems based on digital radio communication, thereby reducing waiting times between trains (headway) and accommodating more users in greater comfort. The trains will have technological innovations that will allow them to be operated in driverless mode, and onboard systems are being designed to enable real-time diagnosis, remote video monitoring, and continuous voice communication

between passengers and the operations control center. The trains will have a fire emergency system, air conditioning, and free movement between train cars.

- 1.21 The station platforms will have glass doors (platform gates) that will prevent access by passengers to the track area; those doors will open only for loading and unloading, thereby enhancing user safety. Entry systems into the fare-paid zone of each station will also have glass doors, replacing the current turnstiles, thus reducing the possibility of fare evasion. Stations and trains will be equipped with devices to meet the needs of persons with disabilities.
- 1.22 For the extension of Line 5, METRÔ plans to contract eight lots of civil works and permanent track. Lot 1 corresponds to the first stage of the project, the Largo Treze–Adolfo Pinheiro segment, which is being constructed using the New Austrian Tunneling Method (NATM). Lot 8 is the Guido Caloi maintenance yard, while lots 2 through 7 involve the construction of tunnels and stations on the Adolfo Pinheiro–Chácara Klabin segment will be 11.1 km long, including 5.1 km of two single-track tunnels (from Adolfo Pinheiro to Poço Bandeirantes) and 6.0 km of twin-track tunnels (as far as Chácara Klabin) and 10 new stations. The tunnels will be built with shield tunneling machines, and the stations with the open-cut excavation method NATM.
- 1.23 The Line 5 extension will be both self-financed and financed from other sources (the World Bank and BNDES). The financing will cover the cost of construction and supervision of tunnel works and track, procurement of 26 new 6-car trains, signal systems (communication-based train control) associated with the new trains and trains to be reconditioned. Bank financing for the project will cover the upgrading and supervision of existing trains, design, procurement, and installation of operating systems and equipment, institution-strengthening studies, and audits.

### **3. Components**

- 1.24 **Component 1. Rolling stock (US\$22.4 million).** This component includes the upgrading of eight existing six-car trains to bring them up to the same operating standards as the new fleet. It also includes supervision of the detailed design of the upgrading of the existing trains, component manufacture and installation, and final acceptance of the trains (see optional electronic link 1, section 7.11, for details).
- 1.25 **Component 2. Systems and equipment (US\$600.1 million).** This component includes the design, implementation, and supervision of the systems described below (see optional electronic link 1, sections 7.1 through 7.10, for details).
- 1.26 **Telecommunications and control.** The telecommunications system includes: (i) a multimedia system for providing accurate, up-to-date information to passengers; (ii) fixed-line communications to meet operational, administrative, accessibility, and emergency needs using voice-over-Internet protocol technology; (iii) radio communication for commercial operation needs; (iv) mobile voice and data communication over the Wi-Fi network in all stations and tunnels; (v) electronic video monitoring; (vi) control over access to restricted areas in the stations and yards; and (vii) maintenance support. The component also includes funding for the

passenger and **fare control system** and for the local control system, which is the principal interface between operators and systems.

- 1.27 **Power supply.** This includes installation of a primary substation, medium- and high-voltage power systems, and transformer and auxiliary substations.
- 1.28 **Auxiliary systems.** These systems will include: water pumping and reuse, fire detectors, and air conditioning; internal and external lighting systems; escalators and moving walkways; elevators; visual identification of escape routes; the main mechanized ventilation system; and auxiliary maintenance equipment.
- 1.29 **Component 3. Institutional development** (US\$1.25 million). This component will include financing for an ex post evaluation of impacts on low-income residents in the Line 5 service area and other studies to be determined during the project.

#### 4. Costs

- 1.30 The total cost of the project will be US\$624,098,000.00, of which US\$480,958,000.00 will be financed by the Bank; the local counterpart contribution is estimated at US\$143,140,000.00. The project will have an execution period of 4.5 years. A breakdown of funding by component and source is shown below (in thousands of U.S. dollars).

COMPONENTS	TOTAL	BANK	SÃO PAULO
<b>Component 1. Rolling stock</b>	<b>22,398</b>	<b>19,498</b>	<b>2,900</b>
1.1 Upgrading of new trains (26)	19,498	19,498	0
1.2 Supervision	2,900	0	2,900
<b>Component 2. Systems and equipment</b>	<b>600,050</b>	<b>460,010</b>	<b>140,040</b>
2.1 Telecommunications and control	79,493	61,195	18,298
2.2 Power supply	222,781	171,585	51,196
2.3 Auxiliary systems	274,376	227,230	47,146
2.4 Supervision	23,400	0	23,400
<b>Component 3. Institutional development</b>	<b>1,250</b>	<b>1,250</b>	<b>0</b>
3.1 Poverty impact monitoring	850	850	0
3.2 Other studies	400	400	0
<b>Audit</b>	<b>400</b>	<b>200</b>	<b>200</b>
<b>TOTAL</b>	<b>624,098</b>	<b>480,958</b>	<b>143,140</b>

#### C. Results matrix and key indicators

- 1.31 The principal outcomes expected from the project are summarized below and detailed in the results matrix.

EXPECTED OUTCOMES	INDICATOR
Modal integration	Number of stations with integrated bus-metro service
Reduced travel times between selected stations	Comparison of public transit travel times: (i) current situation, by bus and (ii) situation with the project, bus-metro or metro only
Improved service frequency	Headway reduced from 307 seconds (current situation) to 125 seconds (with the project)
Reduction in operation of public transit buses	Fewer public transit buses running at selected points on the corridor, because of the modal shift to metro
Increased demand	Increase in passengers/day for Line 5
Service for low-income groups	Absolute increase in the number of low-income users of Line 5

## II. FINANCING STRUCTURE AND MAIN RISKS

### A. Financing instrument and contractual clauses

- 2.1 The São Paulo Metro Line 5 extension project will be executed as an investment loan. The term of the loan will be 25 years with a 4.5 year disbursement period, as shown in the following schedule (in thousands of U.S. dollars).

	2010	2011	2012	2013	2014	TOTAL
IDB	43,520	94,110	144,279	146,338	52,711	<b>480,958</b>
São Paulo	13,812	28,645	42,943	42,944	14,796	<b>143,140</b>
<b>TOTAL</b>	<b>57,332</b>	<b>122,755</b>	<b>187,222</b>	<b>189,282</b>	<b>67,507</b>	<b>624,098</b>

### B. Environmental and social risks and mitigation measures

- 2.2 The proposed program will have positive environmental and social impacts. The limitations of São Paulo's mass transit system have resulted in excessive use of private vehicles, with direct adverse impacts on congestion, air quality, and accident rates. Congestion has increased in recent years at annual rates of 20%, costing an estimated US\$6 million a day in wasted time and fuel. By improving the quality of the transit system and attracting passengers who currently use buses or private vehicles, the project will promote a modal shift, thereby helping to reduce traffic congestion, environmental pollution, and greenhouse gas emissions (paragraph 1.12), while also reducing traffic accidents.
- 2.3 The physical works in the proposed operation are complex and large in scale, although those with the greatest impact will be performed underground. METRÔ conducted a comprehensive environmental impact assessment (EIA) of the Adolfo Pinheiro-Chácara Klabin extension of Line 5, which was made public on 8 April 2009 and discussed at a public hearing on 7 May. METRÔ also prepared a detailed basic environmental plan of the project (paragraph 2.5). The preliminary

permit (*licença prévia*) for the Purple Line extension was issued by the Department of the Environment on 2 February 2010. METRÔ is expected to present the detailed basic environmental plan, together with a request for an installation permit to the Department of the Environment in March 2010. METRÔ has obtained expropriation orders for the entire project, including the switchyard, and appraisals of the affected properties have already been concluded.

- 2.4 The project will affect 351 properties, of which 108 are residential, 212 are used for business or service activities, and 31 are vacant lots. A total of 59 properties located along the Largo Treze–Adolfo Pinheiro segment now under construction and at the Guido Caloi rail yard have already been acquired. It was originally thought that a further 75 properties, most of them commercial, would be affected, but negotiations with the local population made it possible to avoid this. Some of the properties will be affected only temporarily, i.e. during construction, because of installations and detours. Given the socioeconomic characteristics of the area through which the line passes, the project will affect only 16 low-income families. METRÔ has developed a Resettlement Plan in compliance with Operational Policy OP-710.
- 2.5 The potential adverse impacts, associated primarily with the construction phase (more traffic and traffic accidents, groundwater contamination, geotechnical instability, noise, vibrations, and dust), will affect the quality of life of the neighboring population, but they will be temporary and reversible and will be mitigated using tried and tested measures included in the social and environmental programs of the Basic Environmental Plan (PBA) (see optional link 9) that METRÔ has produced as a condition for obtaining an installation permit (*licença de instalação*). Those measures include the following plans and programs: (i) environmental control during construction; (ii) environmental education for construction; (iii) air quality monitoring; (iv) noise and vibration monitoring; (v) emergency response; (vi) environmental control during operation; (vii) environmental compensation; (viii) public relations; (ix) resettlement and reintegration of people and businesses; (x) archaeological investigation and recovery; (xi) institutional coordination; (xii) integration of mass transit and road systems; (xiii) monitoring of travel conditions; and (xiv) monitoring of changes in land use in the project area.
- 2.6 To ensure proper implementation of the project, the following must be submitted as **conditions precedent to the first disbursement: (i) evidence that the installation permit has been submitted; and (ii) the Resettlement Plan must have been presented, in accordance with Operational Policy OP-710.**
- 2.7 As a **special execution condition, the borrower will be required to present within 18 months after the first disbursement the letter of commitment approved by the Department of the Environment for implementation of the environmental compensation program.** METRÔ will submit semiannual progress reports to the Bank on environmental supervision of the works and implementation of the PBA social and environmental programs.

- 2.8 The project has been classified as a category “B” operation, in accordance with the Bank's Environment and Safeguards Compliance Policy (operational policy OP-703).
- 2.9 METRÔ has the capacity to guarantee sustainable project implementation, and it has an Environmental Management and Sustainability Advisory Service whose responsibilities include implementing the METRÔ program to reduce greenhouse gas emissions, instituted in 2005. That unit will ensure implementation of the social and environmental measures called for in the EIA and the PBA. The firms hired to manage and supervise the works will also have teams specialized in environmental and social issues.

**C. Fiduciary risk**

- 2.10 An analysis of the State of São Paulo's borrowing capacity shows that the State has generated primary surpluses the last seven years in a row, confirming its ability to repay the loan and provide counterpart resources. It has also adhered to the limits set by the Fiscal Accountability Act: its debt/income ratio is 229% (limit: 236%); its payroll/revenue ratio is 49.9% (limit: 60%); and its investment outlays/revenue ratio is 14.1% (limit: 17.1%). The State has the financial capacity to make the local counterpart contributions and the corresponding payments on the Bank's loan. As a special execution condition semiannual progress reports enabling the Bank to monitor implementation of the project and the financial situation of the borrower and METRÔ (paragraph 3.7).
- 2.11 In institutional and fiduciary terms, METRÔ has had satisfactory prior experience in executing large, complex operations with international lending institutions (IDB, World Bank, and the Japan International Cooperation Agency) and is currently implementing project BR-L1162 using Bank procedures (paragraph 1.9).

**D. Other issues and risks**

- 2.12 *Economic feasibility.* The economic assessment (see optional link 2) quantified the benefits to users in terms of reduced travel times and operating costs, less air pollution, fewer accidents, and lower road maintenance costs, as well as the economic costs of investment, operation, and maintenance resulting from implementation of Line 5. The period of analysis was 30 years, including the construction stage. The economic internal rate of return for the project was estimated at 16.7% and the net present value at US\$1,208.8 million (discounted at 10%), with a cost-benefit ratio of 1.56. Sensitivity analyses showed the project to be robust under less favorable scenarios: a 10% reduction in time savings for users would cut the internal rate of return (IRR) to 15.8%; if the benefits from lower operating costs were reduced by 10%, the IRR would be 16.1%. A significant increase in the investment cost (50%) would bring the IRR down to 11.2%.
- 2.13 *Execution risks.* Although the works present a considerable degree of technical complexity, METRÔ has recent experience in executing works and purchasing equipment and systems, for which capable suppliers and supervision and construction firms are widely available on the domestic and international markets.

As to technical and operational sustainability, METRÔ has a track record as an efficient service operator. As the project consists of purchasing equipment and systems, the main risks lie in the potential for overpricing and delays in implementation resulting from: (i) delays in the timetable for tunnel and station construction caused by potential obstacles to expropriation; (ii) disputes arising in the procurement and awarding of contracts for rolling stock and systems; and (iii) problems in the production and delivery of the trains and systems.

- 2.14 The project's estimated unit costs are based on final prices obtained in recent bidding for trains and operating systems financed by the World Bank/IBIC program and the previous IDB program. No appreciable risk of overpricing is anticipated.
- 2.15 A communication-based train control (CBTC) system, using state-of-the-art technology, will be employed to operate trains on line 5. Its use of digital radio communications significantly reduces equipment requirements along the tracks, at stations, and aboard the trains, thereby cutting maintenance time and costs. This technology reduces power consumption and wear and tear on the trains and the track. The system, to be financed out of the counterpart funding, will be deployed along the entire line, including the maintenance yards, and would allow driverless operation. The CBTC system is being installed by METRÔ on other lines. **As a special execution condition, a safety audit must be carried out by a recognized independent entity as a precondition for licensing and release of the system for commercial operation.**
- 2.16 *Financial position of METRÔ.* Under the Fiscal Accountability Act, METRÔ is considered a public enterprise not dependent on the State Treasury, as it does not receive transfers for payroll expenses. Its fare revenue (US\$569 million in 2008), together with transfers arising from the introduction of the mass transit pass (US\$116 million), exceed the costs of services provided (US\$583 million), producing an operating surplus. This will continue to be the case when the system is expanded. The company's accounts, however, which reflect capital depreciation and financial results, show recurring losses.

### III. IMPLEMENTATION AND MANAGEMENT PLAN

- 3.1 **Borrower, executing agency, and guarantor.** The borrower will be the State of São Paulo, and the executing agency will be the Metropolitan Transportation Department. The Federative Republic of Brazil will guarantee the financial obligations arising from the loan contract signed by the borrower and the Bank.
- 3.2 **Implementation arrangements.** The Metropolitan Transportation Department (STM), will be entitled to delegate execution of the project in full or in part to Companhia do Metropolitano de São Paulo (METRÔ). To enable METRÔ to serve as project executing agency, the STM and METRÔ will sign and implement a subsidiary execution agreement with terms previously agreed with the Bank. **Signature of the execution agreement will be a contractual condition precedent to the first disbursement.**



- 3.3 STM's functions will include: (i) overseeing compliance with the conditions set forth in the loan contract; (ii) representing the state government vis-à-vis the Bank; and (iii) maintaining technical, financial and administrative information systems for the project. STM will be responsible to the Bank for: (a) opening separate and specific bank accounts for the loan proceeds and the local counterpart contribution; (b) keeping an adequate system of internal controls and accounting and financial records on sources and uses of project resources; (c) keeping supporting documentation on eligible expenditures for verification by the Bank and the external auditors; (d) preparing and submitting disbursement requests and the corresponding expense vouchers; and (e) preparing such other reports as the Bank may request.
- 3.4 To fulfill these tasks, STM has a Metropolitan Transportation Investment Program Coordination Unit (UCPITM) with responsibility for: (i) planning execution of the loan and preparing annual work plans (AWPs); (ii) preparing and updating the procurement plan; (iii) reviewing bidding documents for the contracting of consulting services, works, and goods to ensure they are consistent with the Bank's procurement policies; (iv) supervising and monitoring the status of contracts for consulting services and goods; (v) processing the corresponding payments; (vi) preparing financial statements and disbursement requests; and (vii) monitoring and evaluating program execution.
- 3.5 **Procurement.** METRÔ will handle procurement for the project. All goods, works, and services will be procured in accordance with the Bank policies set forth in documents GN-2349-7 and GN-2350-7, approved in July 2006, as detailed in the procurement plan, attached as Annex III. Procurement of goods, works, and consulting services financed by the project will be subject to ex ante review until the Bank authorizes ex post reviews.
- 3.6 The project calls for advance contracting and retroactive recognition of expenditures of up to US\$43.5 million<sup>1</sup> charged against the loan and up to US\$90.3 million charged against the local counterpart contribution, incurred to commission consulting studies and procure goods (including the first payment for trains and/or systems).
- 3.7 **Evaluation and monitoring.** METRÔ will submit to the Bank within 30 days after the end of each six-month period, semiannual progress reports indicating the status of each component and the project's overall performance, based on the agreed indicators in the results matrix (Annex II) as well as the status and results of the PBA social and environmental programs. The reports will include all information and data available at the time of presentation, with respect to: (i) activities completed for each project component and the PBA; (ii) updated physical execution and disbursement timetables; (iii) achievement of execution indicators; (iv) a schedule of activities for the subsequent six months; (v) the status of the project's

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<sup>1</sup> The amount proposed for retroactive recognition of expenses applied to the financing is consistent with Operational Policy OP-504. Only expenses incurred since 29 May 2009, the date on which the Project Profile was approved, will be eligible for retroactive recognition.

- financial execution and the resource flow envisaged for the subsequent six months; (vi) summary of the financial situation of the borrower and METRÔ that permits monitoring of the situation; (vii) possible issues that could put project execution at risk; and (viii) in the annual report, the AWP, including the updated procurement plan. In addition there will be a final project evaluation, which will include at least: (a) the results of financial execution by component; and (b) fulfillment of the established targets, in accordance with the agreed outcome indicators.
- 3.8 **Special account.** METRÔ will make arrangements to open a special account to manage proceeds from the Bank's loan and the local counterpart contribution.
- 3.9 **Revolving fund.** A revolving fund equivalent to 10% of the total loan amount will be set up, pursuant to Bank procedures, for the purpose of making project disbursements. This percentage is being requested because of the high amount of the contracts for procurement of systems and equipment. In the market, such contracts usually call for an initial payment of at least 10% of the contract amount at signature. STM, through the UCPITM, will control use of the fund, prepare disbursement requests on behalf of the borrower, and deliver reports to the Bank on the status of the fund within 60 days after the end of each calendar six-month period.
- 3.10 **External audit.** Throughout the execution period, METRÔ will submit annual consolidated project financial statements to the Bank within 120 days after the end of the respective fiscal year. For this purpose, it will commission an external audit by an independent auditing firm acceptable to the Bank and in keeping with Bank requirements. The firm will be selected and contracted according to procedures established by the Bank. The costs of the audit are part of the project cost. In addition, semiannual audits of disbursements will be conducted and certified by the external auditors.

Anexo I  
Confidencial

Annex I  
Confidential

**SÃO PAULO METRO LINE 5 (PURPLE LINE) EXTENSION PROJECT  
RESULTS FRAMEWORK**

<b>Project objective</b>	The <b>goal</b> is to improve urban mobility in metropolitan São Paulo. The <b>purpose</b> is to enhance transit mobility, connectivity, safety and comfort for a large number of low-income residents of the western and southern areas of metropolitan São Paulo by extending METRÔ's Line 5 (Purple Line).					
<b>Outcome indicators</b>	<b>Base year 2009</b>	<b>Year 1 2010</b>	<b>Year 2 2011</b>	<b>Year 3 2012</b>	<b>Year 4 2013</b>	<b>Frequency <i>Source, comments</i></b>
<b>Operations and ridership</b>						
Number of passengers per day	130,000	251,000	294,000	300,000	628,000	METRÔ; operating reports; semiannual
Travel time between selected stations						
Largo 13-Chácara Klabin (minutes)	72				21	METRÔ; operating reports; semiannual; the baseline reflects travel times by bus
Capão Redondo-Sé (minutes)	99				44	
Train occupancy (passengers/m <sup>2</sup> )	< 6		<6		6	METRÔ; operating reports; semiannual
Frequency of service (seconds)	307		307		125	METRÔ; operating reports; semiannual
Number of stations with bus connections	2 of 6		3 of 7		17 (all)	METRÔ; operating reports; semiannual
Number of users with income of less than four minimum wages	68,000				276,000	METRÔ; two-year surveys
Public transit buses in the corridor						
Number of buses	955				586	SPTrans and METRÔ
Frequency (morning rush hour)	411				241	
<b>Physical indicators</b>						
Train fleet (units)	8				34	METRÔ; operating reports; semiannual
Incorporation of trains						
New			1	25	26	METRÔ; operating reports; semiannual
Refurbished			6	2	8	
Completion of CBTC systems (%)		18	52	30		METRÔ; operating reports; semiannual
Completion of other systems (%)		22	74	100		METRÔ; operating reports; semiannual
Evaluation studies (%)			20	20	60	METRÔ; semiannual progress reports

**SÃO PAULO METRO LINE 5 (PURPLE LINE) EXTENSION PROJECT (BR-L1227)**  
**SUMMARY PROCUREMENT PLAN**

Description	Estimated cost (US\$)	Procure- ment method	Review	Financing source and percentage		Pre- qualification (Yes/No)	Estimated dates	Status
				IDB %	Local %		Publication of Specific Procurement Notice	
1. GOODS								
1. Telecommunications and control system	79.493.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
2. Power supply system	222.781.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
3. Auxiliary station and track systems	14.298.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
4. Lighting	20.728.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
5. Tray cabling	11.168.000	ICB	Ex ante	72%	28%	No	December 2009	Pending
6. Escalators and moving walkways	81.305.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
7. Elevators	8.714.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
8. Main ventilation system	51.102.000	ICB	Ex ante	77%	23%	No	December 2009	Pending
9. Refurbishment of existing trains	19.498.000	ICB	Ex ante	100%	0%	No	February 2010	Pending
10. Auxiliary maintenance equipment	49.158.000	ICB	Ex ante	77%	23%	No	January 2011	Pending

Description	Estimated cost (US\$)	Procurement method	Review	Financing source and percentage		Pre- qualification (Yes/No)	Estimated dates	Status
				IDB %	Local %		Publication of Specific Procurement Notice	
2. WORKS								
No works will be contracted with IDB funds.								

Description	Estimated cost (US\$)	Procure-ment method	Review	Financing source and percentage		Pre-qualification (Yes/No)	Estimated dates	Status
				IDB %	Local %		Publication of Specific Procurement Notice	
3. CONSULTING SERVICES								
1. Audit	400,000	QCBS	Ex ante	50%	50%	No	August 2010	Pending
2. Monitoring of human impacts	1,100,000	QCBS	Ex ante	100%	0%	No	January 2011	Pending

ICB: International competitive bidding; LIB: Limited international bidding; NCB: National competitive bidding; S: Shopping; DC: Direct contracting; FA: Force account; PSA: Procurement through specialized agencies; PA: Procurement agents; IA: Inspection agents; PLFI: Procurement in loans to financial intermediaries; BOO/BOT/BOOT: Build, own, operate / Build, operate, transfer / Build, own, operate, transfer; PBP: Performance-based procurement; PLGB: Procurement under loans guaranteed by the Bank; CPP: Community participation procurement; QCBS: Quality- and cost-based selection; QBS: Quality-based selection; FBS: Fixed budget selection; LCS: Least-cost selection; QQS: Selection based on the consultants' qualifications; SSS: Single-source selection.