Report Number: ICRR0022646

## 1. Project Data

| Project ID | Project Name |
|---|---|
| P116170 | BR Sao Paulo Metro Line 5 |
| **Country** | **Practice Area(Lead)** |
| Brazil | Transport |

| L/C/TF Number(s) | Closing Date (Original) | Total Project Cost (USD) |
|---|---|---|
| IBRD-78550 | 30-Jun-2014 | 650,400,000.00 |
| **Bank Approval Date** | **Closing Date (Actual)** | |
| 20-Apr-2010 | 30-Dec-2020 | |

| | IBRD/IDA (USD) | Grants (USD) |
|---|---|---|
| Original Commitment | 650,400,000.00 | 0.00 |
| Revised Commitment | 650,400,000.00 | 0.00 |
| Actual | 650,400,000.00 | 0.00 |

| Prepared by | Reviewed by | ICR Review Coordinator | Group |
|---|---|---|---|
| Kavita Mathur | Elisabeth Goller | Victoria Alexeeva | IEGSD (Unit 4) |

## 2. Project Objectives and Components

### a. Objectives

**Original objective**. The project development objective (PDO) was to improve mobility for public transport users in the Capão Redondo-Largo Treze-Chácara Klabin corridor in a cost-efficient and environmentally friendly way (Loan Agreement page 6 and PAD para 19).

**Revised objective.** The revised PDOs were: (a) to improve the mobility of public transport users in the Capão Redondo-Largo Treze-Chácara Klabin (Line 5) and Vila Sonia-Luz (Line 4) Corridors in a cost-efficient

and environmentally-friendly manner; and (b) to facilitate the integration between metro and bus at the metro stations (First Amendment to the Loan Agreement, page 2 and Restructuring Paper RES27607).

In this review, the achievement of the PDO is assessed separately for the three sub-objectives to "improve mobility for public transport users in the Capão Redondo-Largo Treze-Chácara Klabin (Line 5) corridor in a cost-efficient and environmentally friendly manner", “improve the mobility of public transport users in the Vila Sonia-Luz (Line 4) corridors in a cost-efficient and environmentally friendly manner” and " facilitate the integration between metro and bus at the metro stations". The objectives are denotated as objectives 1, 2, and 3, respectively. This is in line with the assessment in the ICR.

**b. Were the project objectives/key associated outcome targets revised during implementation?**
Yes

**Did the Board approve the revised objectives/key associated outcome targets?**
Yes

**Date of Board Approval**
15-Jun-2017

**c. Will a split evaluation be undertaken?**
Yes

**d. Components**
The project comprised of two components:

Component A. **Infrastructure and Equipment** (appraisal estimate US$2,260.55 million (excludes contingencies, expropriation costs and detailed project design); actual cost US$3,248.5 million). This component included three sub-components:

1. Provision of financing for acquisition and/or installation of: (i) at least twenty-six new train sets, Electric Multiple Units of six cars each, and related accessories, to operate on the Extended Line 5; (ii) Communication Based Train Control signaling systems for the Extended Metro Line 5 ; and (iii) platform screen doors for all stations of the Extended Line 5.
2. Carrying out of works and provision of financing for: (i) the rehabilitation and modernization of eight trains which were already operating on the existing part of Line 5; and (ii) the installation of the energy supply, telecommunications and control and auxiliary systems required for the Extended Line 5.
3. Carrying out of civil works for the construction of approximately 12 km of tunnel and eleven new stations, the railway track and the Guido-Caloi train yard.

Revised Component A (June 2017 restructuring). The activities under the revised components are in addition to the ones in the original component. The changes refer to the inclusion of civil works for Line 4. This includes:

- Acquisition and/or installation of information and communication (ICT) equipment to interconnect the operational control centers of the Metro lines into a unified network.
- Provision of financing for the: (i) completion of infrastructure and equipment investments initiated during the Line 4 Phase 2 project, including: (i) the civil works of the four stations of Line 4 initiated during the Line 4 Phase 2 project; (ii) the civil works for one new station (Vila Sonia), its access tunnel of about 1.5 km extension, and a bus terminal at the Vila Sonia yard; and (iii) acquisition and installation of escalators, platform doors, and signaling and telecommunication systems necessary to operate the stations referred in (i) and (ii).

Component B. **Technical Assistance and Institutional Development** (appraisal estimate US$83.3 million; actual cost US$202.9 million). This component included:

1. Provision of financing and technical assistance for: (i) supervision of the manufacturing and delivery of the new trains acquired under Component A; (ii) supervision of the supply and installation of the CBTC signaling systems; and (iii) carrying out of specific studies to support the development of São Paulo Metro's climate change strategy and to assess the impact of the Extended Line 5 on greenhouse gas emissions.
2. Carrying out a study assessing the impact of the Extended Line 5 on the low-income population in the Capão Redondo - Chácara Klabin Corridor.
3. Provision of financing for Project management and civil works supervision consultants.

Revised Component B (June 2017 restructuring). The activities under the revised components are in addition to the ones in the original component. They include technical assistance for: (i) supervision and project management of civil works under the revised Part A of the project, (ii) supervision of the supply and installation of the systems included in the revised Part A of the project, and (iii) data collection and users' perception surveys and studies to support strategic planning.

## e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

**Project Cost**. The actual project cost was US$4,112.5 million, significantly higher than the estimate at the moment of the 2017 restructuring of US$3,108.6 million (ICR Annex3), and the originally estimated cost at project appraisal of US$2,813.9 million (PAD, Annex 5). The figures in the ICR, Annex 3 are not in line with the ICR datasheet, page 2, because as per clarifications of the Bank task team, the datasheet does not reflect the appraisal estimate for Line 4, added to the project through the 2017 restructuring, and for expropriations and detailed project design.

**Financing**. The actual and planned IBRD loan amounts were US$650.4 million. It was expected to be used in full for the original activities of Line 5. At the 2017 restructuring, the US$210 million loan savings from the Line 5 project - derived from (a) favorable prices from the international competitive bidding of the trains and systems, (b) an appreciation of the United States Dollar relative to the Brazilian Real after project appraisal, and (c) a reduction in the expected goods and services taxes to be paid by Metro - were reallocated to finance the remaining Bank-appraised civil works for Line 4 Phase 2.

The disbursement for the activities related to Line 5 was US$398.99 million, and for the ones related to Line 4, Phase 2 was US$252.36 million (ICR Annex 3, see column Actual Since 2018), which is equal to US$651.3 million (the project team explained that the small difference between the amount in the ICR

datasheet page 2 and in Annex 3 is because the costs in Annex 3, are in constant dollars of 2008, while the loan is the sum in current dollars in different years).

**Borrower Contribution**.

The actual Borrower contribution was US$3,086.4 million, substantially higher than the appraisal estimate at the moment of the 2017 restructuring of US$1,921.9 million. The originally estimated Borrower contribution at project appraisal was US$1,647.6 million (IEG calculation, based on ICR, Annex 3). The actual Borrower contribution includes a contribution from National Economic and Social Development Bank (BNDES) of US$1,878.0 million, which was not planned at appraisal (ICR Annex 3). These figures are not fully in line with the ICR datasheet, page 2, for reasons similar to the ones pointed out for the total project cost.

**Co-financing**. The project was co-financed by the Inter-American Development Bank (IADB) and the Japan Bank for International Cooperation (JBIC). The actual IADB co-financing was US$367.1 million, lower than the appraisal commitment of US$515.9 million (ICR Annex 3). The actual JBIC co-financing was US$7.6 million, slightly lower than the appraisal estimate of US$9.2 million. The IADB figure in Annex 3 is not fully consistent with the ICR datasheet and the PAD as the IADB financed project designs (US$35 million), were not considered as part of the reported project financing in the ICR datasheet and the PAD.

**Dates**. The project was approved on April 20, 2010, became effective on November 12, 2010, and closed on December 30, 2020 after a 6.5-year delay (78 months).

**The closing date was extended four times under the following six project restructurings**:

i. In June 2014, the closing date was extended by 30 months, from June 2014 to December 2016 because of delays in the start of Line 5 civil works due to legal injunctions for awarding contracts, delays in obtaining environmental licenses, and completing the resettlement process;
ii. The next two extensions added a new project component related to the civil works of Line 4 Phase 2. The restructuring was split into two: first in December 2016, the closing date was extended for 6 months, from December 2016 to June 2017, to provide the State of São Paulo (SSP) additional time to make the case for the restructuring and for the Federal Government to accept it; second in June 2017, it was extended by 18 months, from June 2017 to December 2018, together with changes in the PDO, results framework, components and costs, and implementation schedule; and
iii. In October 2018, the closing date was extended by 24 months, from December 2018 to December 2020 to enable the installation of the tracks, which was delayed.

The project was restructured in September 2019 to change the results framework. In December 2020, the project was restructured to reallocate funds between disbursement categories.

**Split Rating**. In line with the ICR, this review will apply the split rating methodology. It will assess objective 1 based on the original targets, the targets revised through the 2017 restructuring, which lowered the level of ambition of three PDO indicator targets, and the targets revised with the 2019 restructuring, which dropped two PDO indicators and increased the level of ambition of a third PDO indicator target. The reason for dropping one of the PDO indicators is that the project had another indicator to more accurately measure the achievement. The other PDO indicator was dropped because it would have been difficult to measure and had been replaced with two similar indicators in the 2017 restructuring. The review will assess the new objective 2, introduced with the 2017 restructuring, based on the original targets and the targets revised with the 2019 restructuring, which lowered the level of ambition of one of them. It will assess the new

objective 3, also introduced with the 2017 restructuring, based on the original targets and the targets revised with the 2019 restructuring, which lowered the level of ambition for two of them.

## 3. Relevance of Objectives

### Rationale

**Country and Sector Context.** At appraisal, Line 5 was completed from Capão Redondo to Largo Treze and was fully operational. However, for Line 5 to have a significant impact on mobility in the São Paulo Metropolitan Region (SPMR), it needed to be extended from Largo Treze to Chácara Klabin, thereby linking the very busy Santo Amaro area to the expanded city center (PAD para 3). With this extension, Line 5 was to enhance accessibility to important employment areas as well as health and education facilities, thus enhance the mobility for people that previously had only access to poor road-based transportation services, with long travel times caused by road congestion for buses and by frequent breakdowns for trains. The average duration of a trip by public transport for low- income group was 1.5 hours, and in some more peripheral areas it exceeded two hours.

**Alignment with São Paulo's Strategy.** The project objectives were fully aligned with Sao Paulo's Urban Transport Master Plan (PITU), which aimed at improving mobility in the SPMR by prioritizing the construction of key missing links of the metro network to enable better integration between the existing commuter rail and the bus network with the metro (PAD page 1). In addition, the SPMR aimed at improving rail-based urban transport in low-income areas to increase accessibility to employment centers, health, education and leisure facilities (PAD page 5).

**Alignment with the World Bank Strategy.** At appraisal, the PDO was consistent with the World Bank Group's Country Partnership Strategy (CPS) for 2008-2011 which emphasized increased efficiency in the public sector and the appropriate targeting and delivery of support systems to the poor. The revised PDO, which included the completion of Line 4 under the existing objective “to improve mobility for public transport users” and added another objective “to facilitate the integration between metro and bus at the metro stations” was consistent with sub objective 3.3 “Improving transport infrastructure and management” of the CPS for the period 2012-15, which supports improved mobility and intercity transport; and objective 2 “Improve quality and expand provision of public services for low income households". The project objectives remained aligned with the Focus Area 3 "inclusive and sustainable development" of the Country Partnership Framework (CPF) for Brazil for Fiscal Year 2018 to 2023. The CPF emphasizes greening of transport, reducing the heavy reliance on road-based transport, decreasing motorization, and providing high quality public transport. The integration objective is fully aligned with the “inclusive” part Focus Area 3 as the population living in low-income areas require a higher number of transfers to complete their trips (ICR para 23).

**Previous Bank Experience**. The World Bank financed several urban transport projects in Sao Paulo. These included (i) the **São Paulo Metropolitan Transport Decentralization Project** (P006379), approved in 1992, which succeeded in the decentralization and modernization of the federally-owned Brazilian Urban Transport Company (CBTU) and laid the foundations for metropolitan coordination; (ii) the **São Paulo Integrated Urban Transport Project** (P006559) (the Barra Funda-Roosevelt link), approved in 1998, resulted in connecting the two suburban railway networks and improving the Luz and Brás train stations; (iii) the **Metro Line 4 Phase 1 Project** (P051696), approved in 2002, which increased connectivity between the

existing metro and suburban rail lines and created an integrated fare for municipal buses (Bilhete Unico Integrado); and (iv) the **Sao Paulo Trains and Signaling Project** (P106038) which was approved in May 2008 to finance trains and signaling systems for both rail-based systems - suburban train and metro - of SPMR (PAD page 22).

The project was important to enhance mobility in the SPMR and there was full alignment between the project's development objectives and the country and World Bank strategies. The implementation capacity of the Sao Paulo State Secretariat for Metropolitan Transport and the Metro was adequate to implement the technically complex project activities. The project's PDO, however, did not evolve over time since it was similar to the ones of previous projects. Therefore, on balance, the relevance of objectives is rated **substantial**.

### Rating
Substantial

## 4. Achievement of Objectives (Efficacy)

### OBJECTIVE 1
#### Objective
To improve the mobility of public transport users in the Capão Redondo and Largo Treze-Chácara Klabin (Line 5) corridor in a cost-efficient and environmentally friendly manner.

#### Rationale
The project's **theory of change** indicates that the project's inputs would be used to finance (a) civil works, such as construction of tunnels and new metro stations; (b) the acquisition of trains and provision of equipment; (c) the acquisition and installation of the energy supply, telecommunications and control and auxiliary systems; (d) the carrying out of studies, for instance, to estimate greenhouse gas emission, develop São Paulo Metro's climate change strategy, and to assess the impact of Line 5. This was to result in outputs such as fully operational stations on Line 5 extension, new trains, and completed studies. These outputs were expected to result in the outcome of improved mobility for public transport users in the Capão Redondo-Largo Treze-Chácara Klabin corridor in a cost efficient (because of more people using the metro system and hence improving the operator's working ratio) and environmentally friendly manner (because of a shift of car users to public transport). In the long run, these results were expected to improve and integrate the public transport system in the SPMR, promote social equity through enhanced accessibility to transport services, jobs, and public services for low-income areas, improve the financial sustainability and stability of public transport services in the SPMR, and reduce greenhouse gas emissions.

The key assumptions for achieving this objective were: (a) there are no restrictions on mobility or exogenous changes in the behavior of users; (b) there is adequate funding to maintain the infrastructure and equipment; and (c) the government continues to provide affordable integrated fares.

**Outputs**

- At project closing, all eleven stations that were part of the Line 5 extension were fully operational. These included: Adolfo Pinheiro, Alto da Boa Vista, Borba Gato, Brooklin, Campo Belo, Eucaliptos, Moema, AACD-Servidor, Hospital Sao Paulo, Santa Cruz, and Chacara Klabin.

- As targeted, 26 new trains were delivered for the operation of Line 5.

- Communications-Based Train Control signaling systems were implemented and platform screen doors installed in all Line 5 stations.

- The following studies were completed: (a) two environmental studies (i) to support Metro's climate change strategy, providing an initial inventory of the primary GHG emissions by Metro, and (ii) assessing the impact of the Extended Line 5 on low-carbon construction processes and materials, which were applied in the construction of Line 4 Phase 2 and Line 5 (ICR para 34); (b) study (still ongoing) to understand the impact of improved mobility of low-income populations in the influence area of Line 5 (the baseline was collected in 2017 and the endline will be collected post COVID -19 once mobility patterns recover since survey fieldwork was temporarily suspended due to COVID -19); and (c) studies and technical assistance to support strategic planning and fare policy.

**Outcomes**

This section looks at the outcomes of mobility improvements for public transport users, cost-efficiency of mobility, and the environmental friendliness of mobility separately based on the original outcome targets.

The project substantially improved the mobility of public transport users in the Capão Redondo-Largo Treze-Chácara Klabin corridor of Line 5. Travel time (defined as travel plus average waiting time for all indicators) from Largo Treze (the last station on Line 5 before the extension) to Chacara Klabin (the last station on Line 5 after the extension) dropped to 25 minutes in December 2019 (pre-COVID) and 26 minutes in 2020, compared to the original target of 21 minutes. Although the target was not achieved, this was significantly lower than a 72-minute travel time before the project. The slight increase in the travel times in 2020 was due to an adjustment of the metro timetables because of COVID-19. According to the project team, the Metro was running with 17-29 percent lower frequencies during the months most affected by the pandemic.

Travel time between Capão Redondo (the first station on Line 5) to Se, a central station downtown, passing through all new Line 5 stations and connecting to Line 1, was halved, dropping from 99 minutes to 50 minutes in 2020, but it is short of the original target of 44 minutes. Before COVID-19 in 2019 the travel time was 49 minutes.

The mobility in the corridor was also improved because of the bus-train integration mentioned under objective 3 and the integration between Metro stations, enabling the passenger to move more easily from one train or mode to the other.

The ease to move was enhanced through increased service quality, which was improved through low noise levels of trains, air conditioning, universal accessibility for people with disabilities, CCTV cameras in all trains

and stations, platform doors that open when the train arrives to enhance safety, speed, and regularity in boarding times.

However, the mobility benefits did not accrue to as many people and low-income users as originally expected because of COVID-19. The incremental ridership on Line 5 in 2020 was 187,000 daily passengers, significantly short of the original target of 334,000 daily passengers. Before COVID-19 in 2019, the daily incremental ridership was 413,000 passengers, exceeding the original target. In 2020, the number of users per day on Line 5 of households with less than 4 minimum salaries was 193,000, substantially lower than the original target of 276,000. The pre-COVID figure in 2019 was 329,000 users, exceeding the original target.

The ICR points out that the total ridership on Line 5 grew rapidly after the opening of the eleven stations between 2017 and 2019, but the growth was curtailed by the COVID-19 pandemic restrictions. The average daily ridership increased by 45 percent, from 255,000 in 2017 to 370,000 in 2018. It further increased by 54 percent, from 370,000 in 2018 to 568,000 in 2019. In 2020, due to pandemic restrictions, the annual ridership declined by 42 percent, from 568,000 in 2019 to 332,000 in 2020.

According to the Bank project team, in 2021 the ridership on Line 5 has slightly picked up: in August 2021 the number of passengers on Line 5 was 34 percent lower compared to August 2019 (there were still high number of COVID-19 cases and lingering restrictions to mobility).

Accessibility to jobs and public services also increased because of the expansion of Line 5 for households in the area of influence of new stations. According to a job accessibility analysis, the region around the Se station in downtown of the SPMR, which has a high concentration of jobs, became much better connected with the area served by Line 5.

The cost-efficiency of mobility in the Line 5 corridor was also negatively affected by COVID-19. With the extension of Line 5, the working ratio (operating cost to operating revenue) of the operator, which is a proxy for financial sustainability and the indicator available to measure cost-efficiency, decreased from 1.88 at appraisal to 0.73 in 2017, meeting the original target of a ratio under 0.75. The operator of Line 5 maintained a working ratio of under 0.75 in both 2018 and 2019. Although the ICR does not include the 2020 working ratio, according to the Bank project team, it is unlikely that this ratio went up substantially due to COVID-19 because (i) although the ridership went down, the metro operator adjusted the service frequency and so reduced costs, and (ii) the metro operator's contract contains a minimum ridership guarantee, which requires the government to provide compensation if the ridership falls below a certain threshold. However, as seen above, while the original incremental ridership target on Line 5 was exceeded in 2019, the achievement was significantly lower in 2020 because of COVID-19. This lower demand is one of the factors that contributed to a significantly lower ex-post Economic Rate of Return (ERR) for Line 5 compared to that at appraisal (see section 5).

The ICR does not report on the achievements for the indicators "working ratio of Metro as a whole" and "Number of bus kilometers/peak hour in the corridor after project" because they were dropped with the 2019 restructuring for valid reasons pointed out at the end of section 2.

The project improved mobility in an environmentally friendly way, but the environmental benefits were also negatively impacted by COVID at least in the short run. Without considering the impact of COVID, gross GHG emissions savings resulting from Line 5 over the economic lifetime of the assets were estimated at 2,960,000 tCO2eq, with the savings resulting from the modal shift from more GHG-intensive

travel modes, such as cars and buses to the metro. The economic benefits related to GHG emissions savings were expected to amount to US$75.6 million over 50 years (ICR para 55). Although no data is available, the actual reductions in GHG emissions from Line 5 are lower than they could have been without the COVID-19 pandemic, which caused people to use more individual than public transport at least as long as the pandemic is not fully under control (some people might have shifted definitively to individual motorized transport). The project had, however, no GHG emission target.

In sum, the project improved mobility for public transport users in the influence area of Line 5 with minor shortcoming, and the impact of COVID-19 on ridership reduced the benefits of the improved mobility for users, the environmental benefits, and the cost-efficiency of the new mobility solution. Overall, the achievement of this objective is rated substantial, with moderate shortcomings

### Rating
Substantial

## OBJECTIVE 1 REVISION 1

### Revised Objective
To improve the mobility of public transport users in the Capão Redondo and Largo Treze-Chácara Klabin (Line 5) corridor in a cost-efficient and environmentally friendly manner.

### Revised Rationale
The **theory of change** and key assumptions remained unchanged. Three outcome targets were revised at 2017 restructuring.

**Outputs**

Same as those reported under original objective 1.

**Outcomes**

This section assesses the outcomes of mobility improvements for public transport users, cost-efficiency of mobility, and the environmental friendliness of mobility separately based on the revised outcome target set at the 2017 restructuring.

The project improved the mobility of public transport users in the Capão Redondo-Largo Treze-Chácara Klabin corridor of Line 5. The travel time from Largo Treze to Chacara Klabin dropped to 25 minutes in December 2019 (pre-COVID) and 26 minutes in 2020, nearly reaching the revised target of 25 minutes. The travel time between Capão Redondo to Se dropped to 49 minutes in 2019 and 50 minutes in 2020, nearly reaching the revised target of 49 minutes.

The mobility in the corridor was also enhanced through other improvements, such as better integration, mentioned under the objective 1 (original targets) above.

The incremental ridership on Line 5 in 2020 was 187,000 daily passengers, short of the revised target of 280,000 daily passengers. Before COVID-19 in 2019, the daily incremental ridership was 413,000 passengers, significantly exceeding the revised target. In 2020, the number of users per day on Line 5 of households with less than 4 minimum salaries was 193,000, substantially lower than the revised target of 331,000. The pre-COVID figure in 2019 was 329,000 users, nearly meeting the revised target.

The targets related to cost-efficiency of mobility in the Line 5 corridor were not revised, and as mentioned under objective 1 (original targets) above, the degree to which this outcome was achieved, was negatively affected by COVID-19.

The project had no indicator to measure its impact on the environmental-friendliness of the new mobility solution, so nothing changed with the 2017 restructuring. As mentioned under objective 1 (original targets) above, the project provided improved mobility in an environmental-friendly way, but the expected environmental benefits were negatively impacted by the reduced ridership because of COVID-19.

In sum, the project improved mobility for public transport users in the influence area of Line 5. However, the impact of COVID-19 on ridership reduced the benefits of the improved mobility for users, the environmental benefits, and the cost-efficiency of the new mobility solution. Overall, the achievement of this objective is rated **substantial**, with minor shortcomings.

### Revised Rating
Substantial

## OBJECTIVE 1 REVISION 2

### Revised Objective
To improve the mobility of public transport users in the Capão Redondo and Largo Treze-Chácara Klabin (Line 5) corridor in a cost-efficient and environmentally friendly manner.

### Revised Rationale
**The theory of change** and key assumptions remained unchanged. One outcome target was revised and two indicators dropped during 2019 restructuring.

**Outputs**

Same as those reported under original objective 1.

**Outcomes**

This section assesses the outcomes of mobility improvements for public transport users, cost-efficiency of mobility, and the environmental friendliness of mobility separately based on the revised outcome target set at the 2019 restructuring.

The project improved the mobility of public transport users in the Capão Redondo-Largo Treze-Chácara Klabin corridor of Line 5. The travel time from Largo Treze to Chacara Klabin dropped to 25 minutes

in December 2019 (pre-COVID) and 26 minutes in 2020, nearly reaching the revised target of 25 minutes. The travel time between Capão Redondo to Se dropped to 49 minutes in 2019 and 50 minutes in 2020, nearly reaching the revised target of 49.

The mobility in the corridor was also improved through other improvements, such as better integration, mentioned under the objective 1 (original targets) above.

The incremental ridership on Line 5 in 2020 was 187,000 daily passengers, significantly short of the revised target of 559,000 daily passengers. Before COVID-19 in 2019, the daily incremental ridership was 413,000 passengers, also significantly lower than the revised target. In 2020, the number of users per day on Line 5 of households with less than 4 minimum salaries was 193,000, substantially lower than the revised target of 331,000. The pre-COVID figure in 2019 was 329,000 users, nearly meeting the revised target.

The targets related to cost-efficiency of mobility in the Line 5 corridor were not revised, and as mentioned under objective 1 (original targets) above, the degree to which this outcome was achieved, was negatively affected by COVID-19.

The project had no indicator to measure its impact on the environmental-friendliness of the new mobility solution, so nothing changed with the 2017 restructuring. As mentioned under objective 1 (original targets) above, the project provided improved mobility in an environmental-friendly way, but the expected environmental benefits were negatively impacted by the reduced ridership because of COVID-19.

In sum, the project improved mobility for public transport users in the influence area of Line 5. However, the impact of COVID-19 on ridership significantly reduced the benefits of the improved mobility for users. COVID-19 also negatively affected the environmental benefits and the cost-efficiency of the new mobility solution. Overall, the achievement of this objective is rated **substantial**, moderate shortcomings.

### Revised Rating
Substantial

## OBJECTIVE 2
### Objective
Not Applicable

### Rationale
Not Applicable.

### Rating
Not Rated/Not Applicable

## OBJECTIVE 2 REVISION 1

### Revised Objective

To improve the mobility of public transport users in the Vila Sônia-Luz (Line 4) corridor in a cost-efficient and environmentally-friendly manner.

### Revised Rationale

The **theory of change** and key assumptions are the same as for objective 1. Objective 2, introduced with the 2017 restructuring, is identical to objective 1, except that it covers a different corridor.

**Outputs**

At project closing, four out of the five stations from Phase 2 of Line 4 were fully operational: Fradique Coutinho (opened in November 2014), Higienopolis-Mackenzie (opened in January 2018), Oscar Freire (opened in April 2018), and São Paulo-Morumbi (opened in October 2018). 99 percent of Vila Sonia (the last station on Line 4) was completed. According to the Bank task team, it is currently expected to be opened on December 16, 2021. The ICR notes (para 35) that the remaining works for the station are being financed with resources from SSP

The studies listed under objective 1 are relevant for this objective too.

**Outcomes**

This section assesses the outcomes of mobility improvements for public transport users, cost-efficiency of mobility, and the environmental friendliness of mobility separately based on the original outcome targets introduced with the 2017 restructuring.

The project partially improved the mobility of public transport users in the Vila Sonia – Luz Corridor and is expected to substantially improve it once the Vila Sonia station is in operation. “Travel time between pairs of stations of Line 4: Vila Sonia - Luz (minutes, at peak hour)” dropped significantly from 55 minutes to 32 minutes in 2019 and 2020. It is, however, short of the original target of 20 minutes because passengers had to get off at the previous Sao Paulo Morumbi station and take a bus to Vila Sonia. According to the ICR, the target is expected to be fully achieved with the opening of the Vila Sonia station.

The mobility in the corridor was improved because of the bus-train integration mentioned under objective 3 (original targets), the integration between metro stations, and the service quality improvements mentioned under objective 1 (original targets).

By project end, passenger could not board or alight at the Vila Sonia station and the original target of 47 million “total annual passenger boarding in Vila Sonia (both directions, in millions)” was not achieved. For the Sao Paulo Morumbi station, in 2019 the total annual passenger boardings was 16.8 million for one direction. Assuming that the number of boardings and alightings are the same, this corresponds to 33.6 million boardings in both directions. In 2020, it dropped to 19.2 million. Between May and September 2021, the passenger boardings in this station have constantly increased but in September 2021 they were still only 67 percent of the 2019 average (data on boardings for the Sao Paulo Morumbi station provided by the Bank task team). According to the Bank task team, the Vila Sonia station ridership is expected to be higher than the one of Sao Paulo Morumbi because Vila Sonia is the final station and a significant share of the ridership would come from travelers transferring from buses, traveling from the peripheries of the metropolitan area. The ICR points out that the project is likely to achieve the revised target of 26.5 million annual passenger boardings in Vila Sônia once the station is inaugurated and the impact of the COVID-19

pandemic subsidies, however, the original 47 million is not expected to be achieved given the updated demand model estimations (ICR para 36).

The mobility in the corridor improved in a largely cost-efficient way. The private operator of Line 4 maintained a healthy working ratio below 0.75 in 2018 and 2019 (ICR para 37). The 2020 ratio is not available, but for the same reasons as pointed out for the original objective 1, it is unlikely that it went up substantially due to COVID-19. As seen in section 5, the ex-post ERR of Line 4 was significantly higher than the one for Line 5 and higher than the 2017 ex-ante estimate for Line 4, despite the project delays, changes in cost, and the COVID-19 pandemic impact on passenger demand. The project had no indicator to measure cost-efficiency of Line 4.

he project improved mobility of public transport users in the Vila Sonia – Luz Corridor in an environmentally friendly way, but the environmental benefits are negatively impacted by COVID at least in the short run. Without taking COVID into account, in Line 4 Phase 2, gross GHG emission savings were estimated as 2,880,000 tCO2eq, which are valued US$74.6 million over 50 years (ICR para 55). Similarly, to what is pointed out for the original objective 1 above, the current GHG emission reductions from Line 4 are lower than they could have been because of the COVID pandemic, but the project had no GHG emission target.

In sum, the project partially improved the mobility for public transport users in the Vila Sonia-Luz (Line 4) corridor. With the opening of the Vila Sonia station, planned for mid-December 2021, important additional mobility improvements are likely to be realized. The project is however not expected to benefit the amount of passengers originally forecasted at this station because, based on more recent demand data for the metropolitan area, the original target was unrealistic. The cost-efficiency of Line 4 was largely achieved despite the impact of COVID-19 on ridership. The latter did negatively affect the environmental benefits of Line 4 by project end. Therefore, the achievement of this objective is rated **modest**.

### Revised Rating
Modest

## OBJECTIVE 2 REVISION 2
### Revised Objective
To improve the mobility of public transport users in the Vila Sônia-Luz (Line 4) corridor in a cost-efficient and environmentally-friendly manner.

### Revised Rationale
The **theory of change** and key assumptions remained unchanged. One outcome target was revised during 2019 restructuring.

**Outputs**

Same as those reported under original objective 2.

**Outcomes**

This section assesses the outcomes of mobility improvements for public transport users, cost-efficiency of mobility, and the environmental friendliness of mobility separately based on the revised outcome target set at the 2019 restructuring.

The project partially improved the mobility of public transport users in the Vila Sonia – Luz Corridor. The travel time target was not revised. Therefore, as mentioned under objective 2 (original targets) above, while this target was only partially achieved by project end, it is likely to be achieved with the opening of the Vila Sonia station envisaged for mid-December 2021. The target for the "annual total annual passenger boarding in Vila Sonia (both directions, in millions)" was reduced from 47 million to 26.5 million in 2019 and, as mentioned above, is likely to be achieved once the station is inaugurated and the negative impact of the COVID-19 pandemic on ridership subsidies.

There were not indicators to measure the cost efficiency and environmental friendliness of improved mobility and what is mentioned under objective 2 (original targets) applies.

In sum, the project partially improved the mobility for public transport users in the Vila Sonia-Luz (Line 4) corridor. With the opening of the Vila Sonia station, planned for mid-December 2021, important additional mobility improvements are likely to be realized. This opening and the easing of the COVID-19 pandemic is also expected to attract a sufficiently large number of passengers, to meet the revised boarding target for this station. The cost-efficiency of Line 4 was largely achieved despite the impact of COVID-19 on ridership. The latter did negatively affect the environmental benefits of Line 4 by project end. Therefore, overall, the achievement of this objective is rated **substantial** with minor shortcomings.

### Revised Rating
Substantial

## OBJECTIVE 3
### Objective
Not Applicable.

### Rationale
Not Applicable.

### Rating
Not Rated/Not Applicable

## OBJECTIVE 3 REVISION 1
### Revised Objective
To facilitate the integration between metro and bus at the metro stations.

### Revised Rationale

Objective 3 was introduced under the 2017 restructuring.

The **theory of change** indicates that the project's activities of constructing of metro stations (discussed under the first objective) with bus terminals at these stations, which enable to connect with multiple bus lines, would have as output the necessary facilities to physically connect between the metro and buses. In addition, (i) technical assistance activities to reorganize the bus network in the influence area of Lines 4 and 5 to reduce bus services and feed passengers into Metro stations and to revise the fare level to optimize ridership and enhance affordability, and (ii) the policy dialogue with the Borrower would lead as outputs to the reorganization of the bus network and the adoption of a new fare structure conducive to integration. In turn, these outputs were expected to result in the outcome of facilitating the integration between the Metro and buses at the metro stations. In the long run, this result was expected to attract more public transport users, hence reduce GHG emissions, improve air quality, and promote social equity by increasing affordable access to economic opportunities and urban amenities for low-income residents. The key assumption was that the State and the Municipality of São Paulo would coordinate their transport policies to restructure the bus network and optimize the integrated fare level to facilitate metro-bus integration.

**Outputs**

On Line 5, the project financed the construction of a bus terminal next to the Santa Cruz metro station. On Line 4, bus terminals were constructed next to the São Paulo-Morumbi, Butanta, and Pinheiros stations. Once the Vila Sonia station becomes operational, it will have a major bus terminal connecting multiple bus lines (ICR para 40). According to the Bank project team, these bus terminals allow for the seamless transfers of passengers between buses and Lines 4 and 5. The team also pointed out to IEG that these terminals are large. For example, the bus terminal at Pinheiros station serves 41 bus lines, at Morumbi station it serves 21 bus lines, and at Butanta station it serves 22 bus lines.

The project supported the development of a public transport fare model for the SPMR. The model enables fare simulations based on passenger trips and costs and revenue distribution by mode and line. The fare simulation model was used to simulate the optimum integrated fare levels to reach the desired ridership and affordability.

According to the Bank project team, the project financed the strategic transport plan, which, among others, included transport modeling to support the reorganization and rationalization of the bus routes. This activity built on the initial bus network restructuring plan and followed the principles of bus-rail integration.

The Bank project team also informed IEG that the World Bank through the fare simulation model, continued the policy dialogue with the key stakeholders regarding the impact of fare policies to facilitate both the adoption of an optimum integrated fare level and the restructuring of the bus network to avoid overlaps with metro services and support integration.

**Outcomes**

The physical integration of the Metro stations and the bus system was substantially achieved. At project closing, all Line 5 stations were integrated with buses as originally targeted, and 91 percent of Line 4 stations were integrated with buses against the original target of 100 percent. The ICR notes that this target would be achieved once the Vila Sonia station opens in December 2021. However, the achievement is not fully

attributable to the project because not all metro stations have bus terminals, and as explained by the Bank project team to IEG, the bus stops close to the metro stations existed already before the project.

Despite the fact that at appraisal (i) the State and the Municipality of São Paulo had started to coordinate their transport policies and planned to restructure the bus network to integrate the municipal buses with the suburban rail and metro services (PAD page 26) and (ii) the technical assistance and policy dialogue during project implementation, the State and the Municipality of São Paulo did not restructure the bus network and adopt a new optimized, integrated fare structure. Both are difficult decisions; the first, because of the strong opposition of bus operators and the social implications on them since many drivers, fare collectors, and other related workers would lose their jobs, and the second, because of the important budget implications for both the State and the Municipality of São Paulo.

Nevertheless, the number of passengers on Line 5 that transferred from buses increased from 32.2 million per year in 2016 to 50.0 million per year in 2019, a 55 percent increase (no targets were set). At the end-of-line station, Capao Redondo, transfers from buses increased from 16.0 million to 21.6 million between 2016 and 2019, representing 75 and 76 percent of all trips (ICR para 42). The ICR does not mention if and how the COVID-19 pandemic impacted transfers from buses to the metro line. The project did not have a target that measured the passenger that integrate.

The number of buses running in the corridor of Line 5, which was one of the outcome indicators to measure integration, did fall considerably. In 2020, the total number of buses was 412, achieving the original target of under 652 (the baseline was 955). The number of buses in 2019 (pre-COVID) was 682, slightly higher than the original target of 652. The full achievement of the target in 2020 is not attributable to the project interventions but due to travel restrictions under COVID-19.

The frequency of buses operating in the corridor of Line 5 during peak hour, however, did not go down as expected. In 2020, the frequency of buses during peak hour was 459 (488 pre-COVID), 44 percent higher than the original target of below 258 and a baseline of 411. In the pre-COVID period it was 47 percent higher.

Normally, if the number of buses goes down, the frequency is also expected to decrease. An increase in frequency with significantly lower buses could mean that buses are covering lower distances, hence instead of providing point to point connections, they actually do serve the metro lines (however, this is an assumption that would have to be confirmed).

In sum, the physical integration of the metro and the bus system was largely achieved and is likely to be achieved with the opening of the Vila Sonia station. The planned bus route restructuring did not materialize, but the targeted reduction in the number of buses in the Line 5 corridor was nearly achieved even before the COVID-19 pandemic. The bus frequency during peak hour did not go down. The planned fare optimization to support integration did also not materialize. Nevertheless, a significant number of bus users did integrate with the metro. Overall, the rating of this objective is **modest.**

**Revised Rating**
Modest

## OBJECTIVE 3 REVISION 2

### Revised Objective
To facilitate the integration between metro and bus at the metro stations.

### Revised Rationale
The **theory of change** and key assumption remained unchanged. Two outcome targets were revised during 2019 restructuring.

**Outputs**

Same as those reported under the original objective 3.

**Outcomes**

As mentioned under objective 3 (original targets) above, the physical integration of the metro stations with the bus system was substantially achieved and is likely to be fully achieved with the opening of the Vila Sonia station in December 2021. Even if the State and the Municipality of São Paulo did not restructure the bus network and adopt a new optimized, integrated fare structure to support integration, the number of passengers on Line 5 that transferred from buses increased substantially.

With the 2019 restructuring, the target for the number of buses in the corridor of Line 5 was increased significantly 1031 to reflect that the bus network was not restructured. With 682 buses in 2019 and 412 buses in 2020, this target was largely exceeded even before the COVID-19 pandemic.

The same happened to the target for the frequency of buses operating in the corridor of Line 5 during peak hour, which was increased from 258 to 438. The revised target was nearly achieved in 2020, when the number of buses was 459 (5 percent short of the revised target). Before COVID-19, the number of buses was 488, about 10 percent short of the revised target.

In sum, the physical integration of the metro and the bus system was largely achieved and is likely to be achieved with the opening of the Vila Sonia station. The planned bus route restructuring did not materialize, but the targeted reduction in the number of buses in the Line 5 corridor was exceeded even before the COVID-19 pandemic. The bus frequency during peak hour nearly reached the revised target in 2020, but was about 10 percent short in 2019. The planned fare optimization to support integration did also not materialize. Nevertheless, a significant number of bus users did integrate with the metro. Overall, the rating of this objective is **substantial**, with moderate shortcomings.

### Revised Rating
Substantial

## OVERALL EFFICACY
### Rationale
**PDO 1**. The project improved mobility for public transport users in the influence area of Line 5 with minor shortcoming, and the impact of COVID-19 on ridership reduced the benefits of the improved mobility for

users, the environmental benefits, and the cost-efficiency of the new mobility solution. The efficacy is rated **substantial**, with moderate shortcomings

**PDO 2**. Not applicable.

PDO 3. Not applicable.

The overall efficacy is rated **substantial**, with moderate shortcomings.

### Overall Efficacy Rating

Substantial

## OVERALL EFFICACY REVISION 1

### Overall Efficacy Revision 1 Rationale

**PDO 1**. The project improved mobility for public transport users in the influence area of Line 5. However, the impact of COVID-19 on ridership reduced the benefits of the improved mobility for users, the environmental benefits, and the cost-efficiency of the new mobility solution. The achievement of this objective is rated **substantial**, with minor shortcomings.

PDO 2. The project partially improved the mobility for public transport users in the Vila Sonia-Luz (Line 4) corridor. With the opening of the Vila Sonia station, planned for mid-December 2021, important additional mobility improvements are likely to be realized. The project is however not expected to benefit the amount of passengers originally forecasted at this station because, based on more recent demand data for the metropolitan area, the original target was unrealistic. The cost-efficiency of Line 4 was largely achieved despite the impact of COVID-19 on ridership. The latter did negatively affect the environmental benefits of Line 4 by project end. Therefore, the achievement of this objective is rated **modest**.

**PDO 3**. The physical integration of the metro and the bus system was largely achieved and is likely to be achieved with the opening of the Vila Sonia station. The planned bus route restructuring did not materialize, but the targeted reduction in the number of buses in the Line 5 corridor was nearly achieved even before the COVID-19 pandemic. The bus frequency during peak hour did not go down. The planned fare optimization to support integration did also not materialize. Nevertheless, a significant number of bus users did integrate with the metro. The achievement of this objective is **modest.**

With PDO 1 rated substantial, with minor shortcomings, PDO 2 and 3 rated modest, the overall efficacy rating is **modest.**

### Overall Efficacy Revision 1 Rating

Modest

### Primary Reason

Low achievement

## OVERALL EFFICACY REVISION 2

### Overall Efficacy Revision 2 Rationale

**PDO1**. The project improved mobility for public transport users in the influence area of Line 5. However, the impact of COVID-19 on ridership significantly reduced the benefits of the improved mobility for users. COVID-19 also negatively affected the environmental benefits and the cost-efficiency of the new mobility solution. The achievement of this objective is rated **substantial**, moderate shortcomings.

**PDO 2**. The project partially improved the mobility for public transport users in the Vila Sonia-Luz (Line 4) corridor. With the opening of the Vila Sonia station, planned for mid-December 2021, important additional mobility improvements are likely to be realized. This opening and the easing of the COVID-19 pandemic is also expected to attract a sufficiently large number of passengers, to meet the revised boarding target for this station. The cost-efficiency of Line 4 was largely achieved despite the impact of COVID-19 on ridership. The latter did negatively affect the environmental benefits of Line 4 by project end. Therefore, the achievement of this objective is rated **substantial** with minor shortcomings.

**PDO 3.** The physical integration of the metro and the bus system was largely achieved and is likely to be achieved with the opening of the Vila Sonia station. The planned bus route restructuring did not materialize, but the targeted reduction in the number of buses in the Line 5 corridor was exceeded even before the COVID-19 pandemic. The bus frequency during peak hour nearly reached the revised target in 2020, but was about 10 percent short in 2019. The planned fare optimization to support integration did also not materialize. Nevertheless, a significant number of bus users did integrate with the metro. The rating of this objective is **substantial**, with moderate shortcomings.

The achievement of all three objectives is substantial, with moderate shortcoming. The overall efficacy is **substantial**.

### Overall Efficacy Revision 2 Rating

Substantial

## 5. Efficiency

**Economic Efficiency**

At appraisal, the project carried out a cost-benefit analysis (CBA) for Line 5. The analysis used a 30-year time horizon and a 10 percent discount rate. The benefits were derived from (i) time savings for users of all public transport modes, (ii) operating cost savings for all modes, (iii) road maintenance cost savings, (iv) accident savings, and (v) air pollution savings. Costs are represented by (a) investment costs for the acquisition of civil works, expropriation, trains and signaling systems and (b) operating costs including personnel, consumption and maintenance of Metro infrastructure, fleet and systems. The cost-benefit analysis resulted in an Economic Rate of Return (ERR) of 16.7 percent a net present value (NPV) of US$1,208 million (PAD Annex 9).

The *ex-post* ERR for Line 5 was 4.5 percent and the NPV was US$409 million, based on the discount rate of 4 percent and a time horizon of 50 years. The ICR notes that the use of a lower discount rate is aligned with 2016 World Bank guidance “Discounting costs and benefits in economic analysis of World Bank Projects”. The

analysis used the same benefits as at appraisal except for the updated demand figures based on the 2017 origin and destination data. The analysis also used the actual cost data. Although justified for this type of project, the use of a lower discount rate and a longer evaluation period compared to the appraisal CBA increases the economic feasibility of the project and makes the ex-ante and ex-post CBA results not comparable. Therefore, the ICR (para 44) recalculated the appraisal EER based on the updated mode shift estimates and using a 4 percent discount rate. This resulted in a 10.1 percent ERR at appraisal. The ICR does not report the NPV.

The lower *ex-post* ERR compared to the ex-ante analysis for Line 5 was due to (a) cost overruns; (b) use of updated demand data, which showed a lower mode shift from bus and car; (c) project implementation delays; (d) the gradual rise in ridership after station openings instead at the full demand being realized all at once; and (e) the impact of COVID-19.

A CBA was conducted at appraisal for the investments for Phase 2 of Metro Line 4. The estimated ERR at appraisal was 7.6 percent, with an NPV of US$46 million. The CBA was updated in 2016; it used the updated 2007 origin and destination survey data and took into account the impact of the opening of Metro Line 5 on the demand of the Line 4 stations. The estimated ERR was 9.4 percent (with a discount rate of 6 percent), and the NPV was estimated at US$439 million (ICR Annex 4 para 110). The CBA was once more update in 2017, considering sunk costs and the opening of an additional station. The analysis again used a discount rate of 6 percent and resulted in an ERR of 8.7 percent and a NPV of US$141 million (ICR, para 110). The ICR does not mention that time horizon used for these evaluations.

The *ex-post* CBA for Line 4 used the same methodology and assumptions as the analysis for Line 5 (including the discount rate and evaluation horizon) and the updated demand and cost data. It resulted in an ERR of 10.2 percent and a NPV of US$908 million. The ICR, para 112 notes that ex-post ERR is slightly higher than the ERR calculated at appraisal due to the use of a lower discount rate and a longer evaluation horizon. The project's sensitivity analysis showed that using a 6 percent discount rate (the same as at appraisal), the project still has a positive NPV of US$363 million (the ERR remains the same).

**Administrative Efficiency**

Line 5 experienced cost overruns of 34 percent (actual cost US$3.77 billion compared to US$2.81 billion estimated at appraisal) and delays of about 5 years (see section 2). The cost overruns were in the civil works category, which was 93 percent above the appraisal estimate after considering contingencies. There were substantial cost savings of 43 percent in both systems and in rolling stock (ICR para 46).

Line 4 Phase 2 incurred only minor cost overruns of 7 percent, but the project was executed over a much longer time frame compared to the expectations at appraisal (Line 4 was expected to be completed in 2012).

Given the substantial administrative inefficiency in project implementation, and the significantly lower ERR than estimated at appraisal for Line 5 (even if the ERR for Line 4 improved compared to the ex-ante estimate), the project's efficiency is rated modest.

Note: The ERR for this project is only available for Lines 4 and 5 separately. Therefore, the information in the ERR table below only refers to Line 5.

## Efficiency Rating

Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

| | Rate Available? | Point value (%) | *Coverage/Scope (%) |
|---|---|---|---|
| Appraisal | ✓ | 16.70 | 80.00<br>☐ Not Applicable |
| ICR Estimate | ✓ | 10.10 | 94.00<br>☐ Not Applicable |

* Refers to percent of total project cost for which ERR/FRR was calculated.

## 6. Outcome

**Outcome under original objective and targets**. With a substantial relevance of objectives and efficacy (with moderate shortcomings) and modest efficiency, the overall outcome under the original objective and outcome targets is rated **Moderately Satisfactory (4)**.

**Outcome under 2017 revised objectives and targets**. With substantial relevance of objectives and modest efficacy and efficiency, the overall outcome under the revised objectives and targets is rated **Moderately Unsatisfactory (3)**.

**Outcome under 2019 revised targets**. With substantial relevance of objectives and efficacy and modest efficiency, the overall rating is **Moderately Satisfactory (4).**

**Overall outcome**. The disbursement percentage at the restructuring in 2017 and 2019 were 52 percent, 38 percent and 10 percent out of a total financing of US$650.4 million. The overall outcome rating is moderately satisfactory, the weighted value is 3.6 (0.52*4+.0.38*3+ 0.1*4=3.6) (rounded up to 4).

### a. Outcome Rating

Moderately Satisfactory

## 7. Risk to Development Outcome

**Travel Demand Risk.** The public transport demand might not recover back fully after COVID. Some travelers may shift to cars or motorcycles, which may lead to increased motorization. Some commuting and shopping trips will likely be altogether forgone, especially for travelers that will be able to work remotely after the pandemic and for shopping trips replaced by delivery options.

In addition, the ICR mentions (para 68) that affordability for informal workers could also negatively affect the demand for metro services. Since bus-bus transfers are free of charge whereas bus-metro transfers have to

be paid for (SPMR requires employers to pay for transport costs of their employees, but this policy does not cover informal workers) and the metro corridors continue to be well served by buses, especially along the Santo Amaro Corridor (the area of influence of Line 5 includes four low-income municipalities and highest proportion of informal jobs), affordability issues may discourage the integration between buses and the metro and reduce the metro demand.

**Financial Risk**. The ICR mentions (para 93) that the private operators of Lines 4 and 5 had strong balance sheets and had achieved a healthy financial performance prior to the COVID-19 pandemic. The concession contract was designed with a minimum demand guarantee, i.e., if ridership falls below a minimum threshold the government will compensate the private operators. Therefore, the financial risk for operators in the short run is low. In the long run, if the travel demand does not significantly pick up after the pandemic, there is a significant financial risk both for the private operators and the Borrower.

**Operations and Maintenance (O&M) Risk.** The O&M risk is low. *ViaMobilidade* is the operator of Line 5 and has a 20-year concession for the operations and maintenance since 2018. *ViaQuatro* is the operator for Line 4, with a concession contract of 30 years awarded in 2010 that also includes maintenance.

**Government Ownership/Commitment Risk.** This risk is low because in March 2021 the SSP announced a project to further expand Line 5 with additional track of 4.33 km.

## 8. Assessment of Bank Performance

### a. Quality-at-Entry

The project design included lessons from previous World Bank financed rail projects in São Paulo and other urban transport projects. This includes: (i) strengthening of sector policy to minimize distortions resulting from inefficient physical and financial coordination between modes and to promote multimodal integration; (ii) procurement of civil works should be relatively advanced to minimize delays; (iii) availability of counterpart funds and fiscal space for the project must be assured to avoid costly construction delays; and (iv) careful scrutiny of demand forecasts. The PAD notes (para 26) that the recommendations from the Independent Evaluation Group "A Decade of Action in Transport: An Evaluation of World Bank Assistance to the Transport Sector, 1995-2005" were also considered in terms of building up the sector's monitoring and evaluation efforts and aligning them with the new World Bank transport strategy, which emphasized urban transport and multimodal transport.

The environmental and social aspects of project preparation were satisfactory. The financial management arrangements were also satisfactory. Metro had extensive experience with the World Bank's fiduciary requirements under the Phase 1 of Metro Line 4 Project and the São Paulo Trains and Signaling Project. However, the project had shortcomings in its quality of entry:

- Risk mitigation strategies were not sufficient to avoid three substantial risks that materialized during implementation: (i) delays in non-World Bank financed components, such as civil works which were stalled for two years at the beginning of the project, (ii) civil works costs were higher than those confirmed at appraisal, and (iii) lower than expected demand due to issues of competition and affordability (ICR para 60).

- The design of the project's results framework, namely the selection of outcome indicators, had important shortcomings (see section 9a below).

Therefore, the quality at entry quality at entry was **moderately satisfactory**.

### Quality-at-Entry Rating
Moderately Satisfactory

### b. Quality of supervision

The Bank project team was proactive in financing the additional civil works for Line 4, utilizing US$210 million from loan savings from this project. In 2016, the Borrower had requested an Additional Financing for Line 4 additional civil works. This was not approved due to the fiscal constraints and the political situation in Brazil.

At least two supervision missions were carried out per year. Safeguards supervision and the Bank's fiduciary support were satisfactory. The ICR indicates (para 89) that the technical capacity of the World Bank team was adequate to sustain a dialog with the client, as well as bringing insights from international experience. Given the very high capacity of the staff of São Paulo Metro, the World Bank also helped create opportunities for them to provide technical support to peers in Latin America. The World Bank supported the São Paulo Metro in the development of a new Origin-Destination survey and the development of an innovative application to collect data.

As for Phase 1 of Line 4, the São Paulo Metro and the World Bank agreed to hire a project management oversight consultant Service (PMOC) to provide an independent view of the project progress and evaluate risks and their mitigation, which could inform the President of Metro and the Secretary of Transport in critical decisions. The ICR does not mention if the PMOC was hired for Line 5 too.

One shortcoming of supervision was that the Bank team did not adequately restructure the results framework, including "lowering the bar" for several outcome targets close to project end at least partially to match achievements on the ground.

Overall, the quality of supervision was **satisfactory**.

### Quality of Supervision Rating
Satisfactory

### Overall Bank Performance Rating
Moderately Satisfactory

## 9. M&E Design, Implementation, & Utilization

### a. M&E Design

The project included the following original outcome indicators (a) travel time plus waiting time between 2 pairs of stations (to measure mobility); (b) percentage of new stations integrated with bus lines (integration related objective); (c) number of passengers boarding in new stations; (d) number of low-income (less than 4 minimum salaries) riding on Line 5; (e) number of bus-km in the corridor; and (f) Metro and Line 5 working ratio.

These indicators, together with the additional evidence provided in the ICR, were largely sufficient to measure the achievement of the objectives. In terms of M&E design shortcomings, the project did not define the key terminology, such as cost-efficiency, environmental friendliness, and integration. Regarding the outcome indicators, although it is important to monitor who and how many people use a new mass transport system, the “number of passengers” is not necessarily the best indicator to measure improved mobility because passenger numbers can go up or down for reasons unrelated to the quality of mobility (in this project because of COVID-19). In addition, the project lacked indicators to measure the environmental friendliness of mobility for both Lines and the cost-efficiency of the mobility for Line 4. The project could have included indicators to measure GHG reduction or improvements in air quality and affordability. It could also have measured the number of metro services in the corridors or the average percentage of income spent by metro users for commuting (i.e. service frequency and affordability as aspects of improved mobility). Finally, the project should have had an indicator to measure the number of people integrating from buses in key stations.

Baselines were provided and target values set at appraisal. However, some of the targets set at appraisal or with the restructurings were not fully adequate and had to be revised (see below under M&E Implementation).

According to the PAD (page 32), the Project Management Unit was responsible for monitoring the outcome indicators. The data collection was to be done by the operating divisions of each of the transport agencies involved in the project and was to be verified by the project management consultants.

### b. M&E Implementation

During implementation, some targets for outcome indicators were revised in the 2017 and 2019 restructurings mainly because new travel data for the metropolitan area became available and partially also to match achievements on the ground. However, these revisions did not correct some of the shortcomings mentioned in the M&E Design section.

The data was collected, analyzed and reported semi-annually by the Project Management Unit. The monitoring of indicators was carried out in a timely manner (ICR para 72).

The project not only monitored the indicators but other aspects, such as accessibility. It also collected additional data for the ICR, such as on fare integration and proximity to bus stops around the stations (ICR, para 69). The project also carried out an assessment of the new metro lines on climate change and other studies and technical assistance activities that included the collection and processing of mobility data for the Sao Paulo metropolitan area.

The ICR indicates that an impact evaluation on living and travel conditions was being conducted in the areas of influence of Line 5 with project funds. The baseline data was collected in 2017 and

the endline will be collected post COVID-19 once mobility patterns recover since survey fieldwork is temporarily suspended. The World Bank project team explained that uncertainty has prevented the client from providing a timeline for completion.

### c. M&E Utilization

The ICR reports (para 73) that the M&E was utilized to monitor project performance. However, the project's results framework did not provide sufficient details to become a usable tool for project redirection and resource allocation. However, the project used data and information produced under the project for decision making on mobility in the metropolitan area. Once the impact evaluation of Line 5 is completed, the results will also be used to inform policymaking and future investment decisions.

Although the design of the project's results framework had important shortcomings, the project dedicated significant efforts to data collection, processing, planning, and monitoring. Therefore, on balance, the quality of M&E is rated **substantial**.

### M&E Quality Rating

Substantial

## 10. Other Issues

### a. Safeguards

The project was assigned an **Environmental Category "A"** and four safeguards policies were triggered: Environmental Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12); Physical Cultural Resources (OP/BP 4.11); and Pest Management (OP 4.09). The safeguards category was not changed at restructuring.

The ICR notes (para 75) that all safeguards instruments were prepared according to World Bank guidelines, including Resettlement Action Plans (RAPs).

**The ICR reports (para 75) that the compliance with the environmental safeguards was rated between moderately satisfactory and satisfactory**, with the latter rating prevailing over the last 5 years. The environmental management of civil works for both Lines 4 and 5 did not experience any major negative impacts. The most critical environmental aspects during the project were: (i) on Line 5, the stabilization of the slope in Patio Guido Caloi, and (ii) on Line 4, the excavation of the tunnel under the Itarare stream and the management of contaminated areas. The Bank project team informed IEG (email dated August 17, 2021) that the processes for the remediation of the contaminated area were completed and "*the Rehabilitation Terms for the contaminated areas are being issued".*

Regarding the Environmental Health and Safety (EHS) management of workers and communities, the Bank project team explained (email dated August 17, 2021) that equipment such as ambulances able to enter tunnels, was procured, to respond to possible emergencies. Also, at construction sites measures were put in place for emergency evacuation.

The compliance with the "**Pest Management"** safeguards policy is not discussed in the ICR. The project team confirmed (email dated August 17, 2021) that the project complied with the Pest Management Safeguard policy.

**According to the operations portal, the compliance with Involuntary Resettlement Safeguards Policy was satisfactory**. The construction of Line 5 resulted in land acquisition, which affected 355 buildings (239 housing units and 116 commercial units). The ICR reports (para 77) that most of the project-affected people received cash compensation. However, there were 48 vulnerable families which received special attention and were given options to: (a) choose between cash compensation, or (b) a voucher for housing purchase or a new housing unit in a residential complex built by the State Company of Urban Development and Housing. Owners of commercial locations received cash compensation and got an option to provide evidence and request compensation for "foregone profits". The project team confirmed (email dated August 17, 2021) that the project complied with the Involuntary Resettlement Safeguard policy for Line 4.

The compliance with the "**Physical Cultural Resources**" safeguards policy is not discussed in the ICR. According to the project team (email dated August 17, 2021) "*the project complied with the Physical Cultural Resources Safeguard policy*".

### b. Fiduciary Compliance

**Financial Management** (FM). There were no FM issues (ICR para 79). The Project Management Unit (PMU) was well staffed with skilled and experienced financial management staff. Fiduciary compliance was satisfactory throughout the project, except in 2010 (the first year of implementation), when FM was rated moderately satisfactory. This was due to some minor issues on financial reports and external audits. These were addressed adequately. The project team clarified that at project start, IFRs would be automatically generated from the São Paulo Metro Information Technology (IT) system. However, due to the complexity of the IT system, the reports were created manually in excel. The FM Specialist reviewed each report to ensure that the IFRs accurately reflected the Project's total expenditures.

All financial audit reports were received on time. The auditors expressed unqualified opinions on the Project's financial statements and the reports were considered acceptable by the World Bank.

**Procurement**. The ICR reports (para 79) no procurement issues. The Project Management Unit was well staffed with skilled and experienced procurement staff. In the beginning of the project, there were significant delays due to contractual and procurement-related impasses. Delays in the procurement of civil works were caused by the anti-corruption investigation *Lava-Jato* which involved large Brazilian infrastructure contractors, who were also part of the project. These allegations were not related to this project. The project team clarified that although only civil works contracts were suspended, the uncertainty created by this situation prevented other World Bank-financed contracts (for rolling stock and systems) from progressing satisfactorily, causing delays in the procurement process. As a result, there was limited progress on project execution between 2010 and 2012. Thereafter, the procurement performance improved.

### c. Unintended impacts (Positive or Negative)

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### d. Other

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## 11. Ratings

| Ratings | ICR | IEG | Reason for Disagreements/Comment |
|---|---|---|---|
| Outcome | Moderately Satisfactory | Moderately Satisfactory | |
| Bank Performance | Satisfactory | Moderately Satisfactory | Due to moderate shortcomings in quality at entry. |
| Quality of M&E | Substantial | Substantial | |
| Quality of ICR | --- | High | |

## 12. Lessons

Following lessons are adapted from the ICR:

**For complex International Federation of Consulting Engineers (FIDIC) contracts, failure to put in place a conflict resolution mechanism early might cause problem and delays in contract implementation.** São Paulo Metro hired specialists to support arbitration processes to enhance the agency's capacity to negotiate with the contractor after the termination of the first contract for Line 4 Phase 2 civil works due to the non-performance of the contractor. São Paulo Metro also had difficulties to find a de facto independent engineer with knowledge of (FIDIC) contracts. This caused problems and delays. By providing FIDIC training to experienced project supervision professionals and putting the conflict resolution mechanism in place immediately after contract effectiveness the project could have to speeded up conflict resolution and reduced the need for cases being taken to arbitration.

**It is important to include contractual clauses to deal with possible risks of scheduling mismatch between different components of the project.** Managing interfaces between civil works, equipment, and systems is one of the most complex parts in large infrastructure undertakings. Each of these elements has a different type of provider, procurement and implementation timing, and risks associated. The project experience showed that the bidding process for the acquisition of the rolling stock and systems was conducted at about the same time as the bidding process for the civil works. However, significant delays in the civil works led to a situation in which trains were completed and delivered, but the storage areas planned were not ready because the project's train yard was not yet completed. The best course of action is to include clauses under the existing contracts to determine alternative solutions to mitigate the risk of mismatch between schedules.

**All relevant data from national and international sources needs to be reviewed for estimating costs at appraisal to avoid that these are over- or underestimated.** The project succeeded at significantly reducing the cost of the acquisition of rolling stock and systems, generating savings of about US$210 million, given that the winning offer was significantly below the anticipated cost. During appraisal, Metro had considered a conservative cost estimation for the acquisition of the 26 trains, based on prior bidding processes in Brazil that did not have the participation of new market players from Korea and China. Thus, it is important that cost estimates gather all the relevant data and evidence from recent national and international experience.

## 13. Assessment Recommended?

Yes

Please Explain

Assessment is recommended mainly to assess how metro and bus integration happened and what the broader project impacts are given the delay in the completion of the impact assessment due to COVID-19.

## 14. Comments on Quality of ICR

This is a very well-written and candid ICR, which provides a detailed overview of this complex project in line with the OPCS guidelines. The project context and background are clearly presented with very useful graphs of the metro system. The project description and the many changes introduced by various restructurings are nicely and clearly laid out, also with the support of tables or graphs. The ICR provides a good discussion on the indicator targets changes, explaining which of them were reduced and increased in ambition and the reasons for such changes. This focus on clarity and detail, however, made the ICR significant longer than the standard 15 pages. Cutting back on some narrative especially in the context and background section would not have jeopardized the ICR's clarity.

The ICR strongly focuses on results, and the quality of evidence is mostly excellent. For example, metro passenger numbers are present through graphs as trends over time, and not just as the results by project end. The ICR also uses evidence from other sources not linked to indicators to support the project's achievement. The quality of analysis is good, and the narrative and available evidence supports the ratings. The ICR contains an excellent discussion of the COVID-19 impact on project outcomes. The ICR also includes a detailed, well-grounded, and candid discussion of the shortcomings in the results framework. The ICR's lessons are clear, useful, and based on evidence.

However, the ICR could have discussed the theory of change for the new objective 2 "to facilitate the integration between metro and bus at the metro stations" in more detail and provide a more comprehensive picture of the respective achievements.

On balance, given the great complexity of this project, the excellent quality of this ICR outweigh its shortcomings. Therefore, overall, the quality of the ICR is rated **high**.

### a. Quality of ICR Rating

High