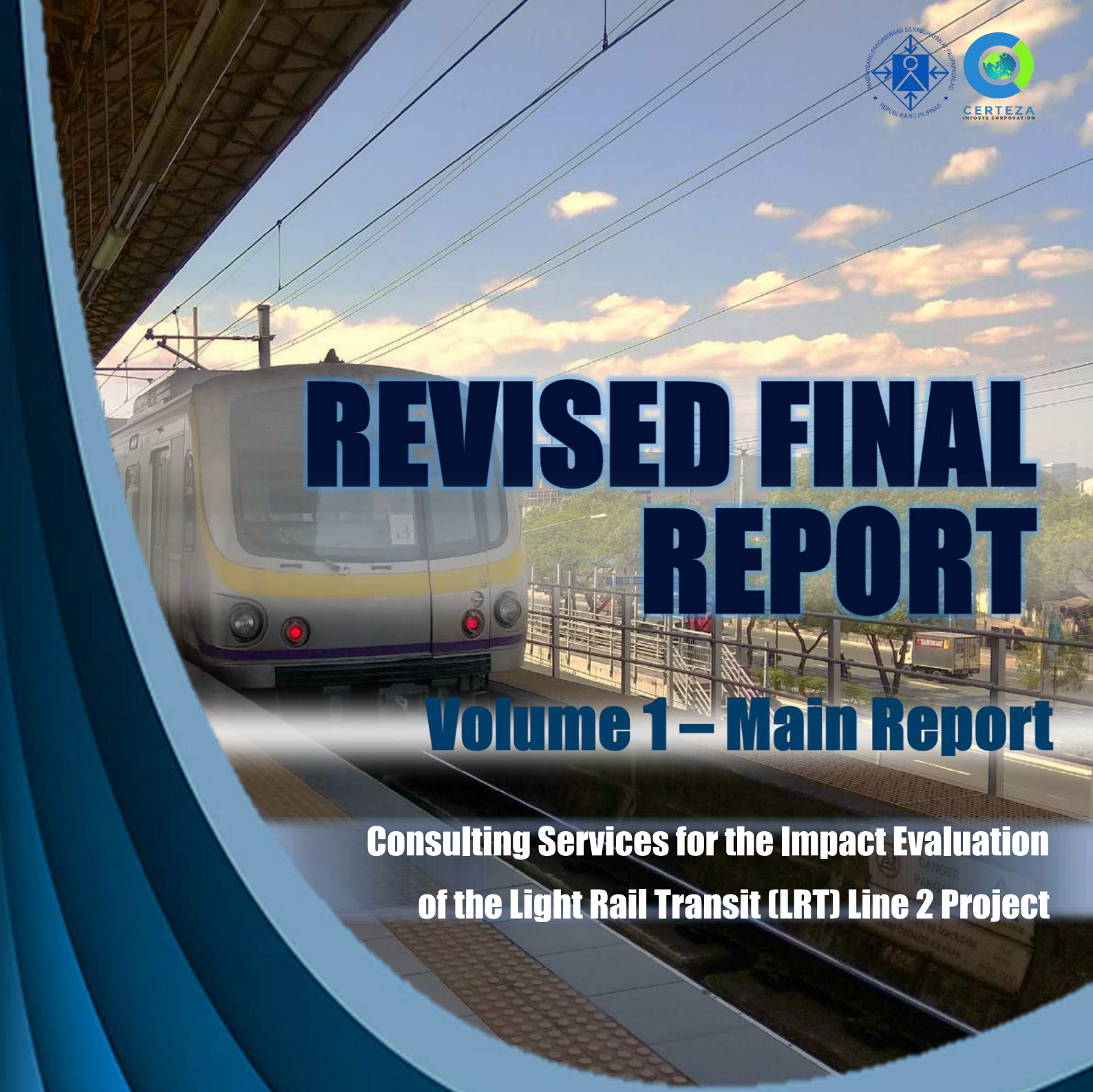

REVISED FINAL REPORT

Volume 1 – Main Report

Consulting Services for the Impact Evaluation of the Light Rail Transit (LRT) Line 2 Project

December 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
A/C	Air Conditioning
AC infra	Ayala Corporation's Infrastructure
AUV	Action Utility Vehicle
AV	Audio Video
BIR	Bureau of Internal Revenue
BMB	Biodiversity Management Bureau
BPO	Business Process Outsourcing
BRT	Bus Rapid Transit
CBA	Cost Benefit Analysis
CCTV	Closed Circuit Television
CIC	Certeza Infosys Corporation
COA	Commission on Audit
CPI	Consumer Price Index
DBM	Department of Budget and Management
Def.	Definition
DENR	Department of Environment and Natural Resources
DID	Difference-in-Differences
DOF	Department of Finance
DPWH	Department of Public Works and Highways
DILG	Department of Interior and Local Government
DOTr	Department of Transportation
EDSA	Epifanio de los Santos Avenue
Est.	Estimate
EIRR	Economic Internal Rate of Return
EV	Electric Vehicle
FGD	Focus Group Discussion
FIES	Family Income and Expenditure Survey
FIRR	Financial Internal Rate of Return
FS	Feasibility Study
FTA	Federal Transit Authority (United States)
GPS	Global Positioning System
GOCC	Government-Owned and Controlled Corporation
GOP	Government of the Philippines
Ha.	Hectare
HH	Household
HUDCC	Housing and Urban Development Coordinating Council
ICC	Investment Coordination Committee
IEC	Information and Education Campaign
IT	Information Technology
ITDP	Institute for Transportation and Development Policy
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KEQ	Key Evaluation Questions
KII	Key Informant Interview
LGUs	Local Government Units
Log frame	Logical Framework
LOS	Level of Service

LPTRP	Local Public Transport Route Plan
LRT	Light Rail Transit
LRMC	Light Rail Manila Corporation
LRTA	Light Rail Transit Authority
LRT2	Light Rail Transit Line 2
LTFRB	Land Transportation Franchising and Regulatory Board
MC	Motor Cab
MDBs	Multilateral development banks
ME	Monitoring and Evaluation
MES	Monitoring and Evaluation Staff
MMDA	Metro Manila Development Authority
MMETROPLAN	Metro Manila Transport, Land Use and Development Planning Project
MMSMRTD	Metro Manila Strategic Mass Rail Transit Development
MMUTIS	Metro Manila Urban Transportation Integration Study
MPLRC	Metro Pacific Light Rail Corporation
MRT	Mas Rapid Transit
NA	No Answer
NAIA	Ninoy Aquino International Airport
NCR	National Capital Region
NEDA	National Economic and Development Authority
NEDA – ME	Monitoring and Evaluation
NEDA – MES	National Economic and Development Authority – Monitoring and Evaluation Staff
NGOs	Non-Government Organizations
NHA	National Housing Authority
NMT	Non-Motorized Transport
NMTDP	National Medium-Term Development Plan
NPV	Net Present Value
NR	No Response
NRRS	Non-Rail Rider Survey
OECF	Overseas Economic Cooperation Fund
O&M	Operations and Maintenance
PA	Public Address
PARDS	Passenger Assist Railway Display System
PIDS	Philippine Institute for Development Studies
PISTON	Pinagkaisang Samahan ng mga Tsuper at Operator Nationwide
PMC	Project Management Committee
PNR	Philippine National Railways
PNT	People Near Transit
PPP	Public Private Partnership
PRFS	Pasig River Ferry Service
PSA	Philippine Statistical Authority
PSM	Propensity Score Matching
PUB	Public Utility Bus
PUJ	Public Utility Jeepney
PUVMP	Public Utility Vehicle Modernization Program
PWDs	Person with Disabilities
Qtr	Quarter
R - 6	Radial Road 6
R - 7	Radial Road 7

RA	Republic Act
RAP	Resettlement Action Plan
R&D	Research and development
RDC	Regional Development Council
RDD	Regression Discontinuity Design
RROW	Road Right of Way
ROW	Right of Way
RRS	Rail Rider Survey
SBEs	Small Business Entrepreneurs
SDR	Social Discount Rate
SIA	Social Impact Assessment
SIRNMM	Study on Standardization for Integrated Rail Network of Metro Manila
SUV	Sport Utility Vehicle
TBD	To Be Determined
TBSI	Track Mate Business Solutions, Incorporated
TNVS	Transport Network Vehicle Services
TOC	Theory of Change
TOR	Terms of Reference
TRB	Transportation Research Board (United States)
TRIP	Three-Year Rolling Infrastructure Program
TTS	Travel Time Simulation
UV	Utility Vehicle
VOC	Vehicle Operating Cost
WACC	Weighted Average Cost of Capital
WWII	Second World War

At a Glance

Light Rail Transit Line 2 IMPACT EVALUATION

Economic Impact

1 Absence of LRT2 on its current route will make the R-6 corridor Manila's most congested road.

184,476 AVERAGE DAILY PASSENGERS

TO MEET THIS DEMAND, IT WILL TAKE ABOUT...

13,177 PUJs OR **18,488** UV EXPRESS OR **38,895** CARS

2 LRT2 generates expected impacts

- Reliably faster travel --- about 9 to 19 mins faster across stations within the rail line.

- Significant travel time reduction for trips beyond east and west endpoints

The endpoints are important for most trips.

MARIKINA to DIVISORIA

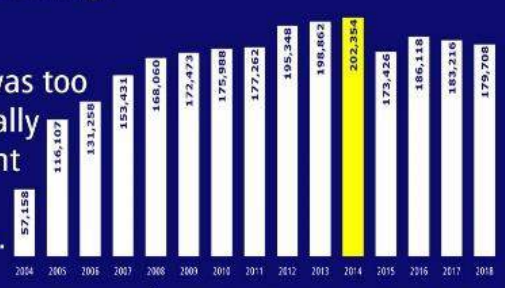
3 HOURS PUJs VS **1 HOUR** LRT2

More than **90%** of satisfied LRT2 riders enjoy these three key features

- LRT2 riding experience can be improved when technology-based features are introduced

PHP 92 MILLION Estimated 2018 value of vehicle operating cost savings

3 Ridership projection was too optimistic that naturally resulted to non-attainment of the targeted **510,000** average daily passengers.



Highest LRT2 daily ridership attained was in 2014 at 202,354

Construction and Implementation

4 **SIGNIFICANT IMPLEMENTATION DELAYS**
Planned 2001 operations for Santolan to Cubao moved to Q3 2003, and Cubao to Recto moved to 2004.

5 Negative effects of project delays:
- price escalations
- interest charges
- foreign exchange risks

6 ROWA + PROC. Right of Way Acquisition and Procurement are the biggest delay factors for the LRT2 project

Operations

7 **EIGHT** operational train sets **TEN** non-operational train sets

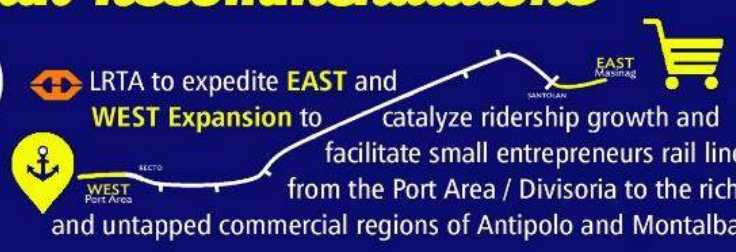
LRT2 was originally designed to operate on 18 train sets.

8 SLOW PROCUREMENT PROCESS for and components is a major constraint to maintenance and sustainability

9 **Fair Box ratio** is below **100%**
Rail revenues cannot cover operational expenses. This is still an effect of low daily ridership.

Main Recommendations

10 LRTA to expedite **EAST** and **WEST Expansion** to catalyze ridership growth and facilitate small entrepreneurs rail line from the Port Area / Divisoria to the rich and untapped commercial regions of Antipolo and Montalban.



11 LRTA to immediately address parts procurement issue by collaborating with DOST, DTI engineering universities and capable local fabricators to handle **spare parts localization.**

12 LRTA should proactively develop rail transit as core of an efficient integrated transport system closely linked to feeder modes in one to two years with serious consideration for Bus Rapid Transit.

SOURCES: EVALUATION TEAM, LRTA

Executive Summary

The Light Rail Transit Line 2 ("LRT2") Project is a 13.8-km line with 11 stations running in the east- west direction from Santolan, Pasig up to Claro M. Recto Avenue in Manila. Its objective is to provide an alternative transport system that is safe, comfortable, efficient and affordable. Line 2 was originally scheduled to be operational first quarter of Year 2001. Santolan to Cubao operations began third quarter of 2003, Cubao to Recto services, first quarter of 2004.

This LRT2 Project impact evaluation study aimed to:

1. Ascertain whether the project appraisal assumptions were met and the intended project benefits were realized;
2. Provide lessons learned during project implementation and operation and maintenance; and
3. Capture any unintended benefits which can be attributable to the project.

The study was supported under the National Economic and Development Authority Monitoring and Evaluation (NEDA M&E) Fund. The gist of the study is shown on the above infographic "At a Glance". The study was conducted from January 2018 to June 2019, including two extensions.

The evaluation was based on the retrofitted Theory of Change, Updated Logical Framework, and Evaluation Operational Framework tying six key evaluation questions with effectiveness, efficiency, impact, sustainability and relevance criteria. The Integrated Transport System Approach provides a wholistic framework for the evaluation. Baseline-Constrained Evaluation Strategies were developed to address data limitations.

The household survey covered 807 samples in 41 barangays in project and non-project areas. Key Informant Interviews involved 209 informants in six implementing agencies. Ten Focus Group Discussion sessions were completed. The Rail Rider Survey (RRS) covered 1,591 respondents in 11 stations. A perception survey formed part of the RRS. Traffic Count was done in two major intersections. The Vehicle Operating Cost Survey gathered data on fuel and other costs. Travel Time Simulation, Station Observation and Profiling, and on-line survey were also used for data collection.

Quantitative data analysis tools included Single Difference Analysis/ Descriptive Statistics and Difference-in-Differences Analysis which estimated project net impact by comparing changes in outcomes before and after the project and similar outcomes in the non-project area. Propensity Score Matching (PSM) enhanced the comparability of the samples in the project and non-project areas by matching groups using propensity scores. Case studies complemented quantitative data.

IMPACT EVALUATION RESULTS

Key Evaluation Question #1: Was LRT2 Project implemented according to how it was originally planned?

Project implementation was delayed for three (3) years and five (5) months, attributable to: (1) acquiring road right-of-way (RROW), which in turn required design changes; and (2) procurement. Delays exposed the project to higher prices and interest charges, exacerbated by foreign exchange fluctuations.

The projected ridership level of 510,000 daily was too optimistic. Actual levels range from 175,156 to 202,333 (2012-2017). The original projection exceeds even the full system capacity of 463,650

passengers derived in the course of this study. Over-projection ("Pickrell effect") drove Vehicle Operating Cost, time savings, and other targets to correspondingly high levels.[1]

In 2008/ 2009, 14 out of the 18 train sets were operational. Currently (2018), only eight (8) are running. Delays in procurement of spare parts translate to lower operating capacity. LRTA resorts to usable parts from other non-operating trains. Rolling stocks across urban rails vary in specifications, obviating parts interchangeability.

Compared to two (2) other route options, the current Aurora Route is the best choice since it traverses Radial Road 6 (R-6), a high-volume corridor with numerous traffic generators – a major requirement for sustainable mass transit. At its midpoint, however, R-6 has low density communities of more than three (3) kilometers in diameter that do not need public transport.

Major Recommendations. To boost ridership, LRTA should expedite operation of the Masinag extension (within 2019) to open up new passenger markets in terms of growing settlements in eastern Metro Manila. At the west end, LRTA should expedite the Tutuban extension (next three years), and up to Port Area (next six years) – with the aim of putting in place the R-6 Small Entrepreneurs Rail Line anchored to Divisoria.

DOTr should delegate procurement to LRTA (starting 2019) as the agency accountable for efficient operation of all rolling stocks. LRTA should consider three (3) options, individually or in combination: (i) include parts in a 20 to 30-year agreement with train supplier; (ii) include parts as an obligation of the local train supplier partner; and (iii) support R&D and local manufacture.

In partnership with private investors, LRTA should build major transport hubs in both east and west endpoints in support of a more efficient feeder transport system (next one to two years). By including park and ride facilities, the desired road-to-rail shift will be accelerated.

Beyond extension lines and transport hubs, LRTA should program investments based on a comprehensive, multi-year rail master plan as general reference integrating socio-economic, environmental, land use and "transport plan-based ROW acquisition" considerations (next two years). The master plan should be legislated.

As ROW issues persist and affect major projects across agencies/ sectors. ICC (next one to two years) should consider setting up an inter-agency council that can more efficiently address ROW issues and constraints in project implementation.

<u>Key Evaluation Question #2: Is the project being operated according to how it was intended?</u>

The "tipping point" for LRT riders is shorter travel time. Majority (81%) ranked comfort, accessibility, affordability (travel expense), and safety <u>after</u> travel time, with a very wide margin. As part of travel time, queue time on average is 2.1 minutes. The average waiting time (for train arrival) at a station is 3.0 minutes, consistent with the standard headway at 2 minutes and 9 seconds.

Perception survey results show that passengers gave good ratings on access leading to stations, stairs, escalators and lifts, and queuing at ticket booth/ vending machines and turnstiles. Those boarding near end-stations rated comfort higher than those boarding at middle stations. Riders noted that elevators,

[1] In the 1990s, similarly high projections as for LRT2 were being made in the United States until a landmark study of 19 projects conducted by a transport economist, Don H. Pickrell, created the "Pickrell effect" of improving forecasts.

escalators and rest rooms were sometimes out of order. Similarly, perceptions on safety and security are high.

Non-rail operations are activities not directly required to operate the rail system. LRTA is incorporating commercial operations as added attraction and convenience to the riding public, and generating needed additional income. The business sector is involved, e.g., as advertisers or as Wi- Fi service provider.

LRT2 is being operated and maintained as planned. Even though LRT2 is a government-owned and operated urban rail, its performance has been better than Line 1 and Line 3 considering that up to the time of the evaluation, LRT2 had not experienced any major breakdown or disruption in operations. During the course of the study, it was noted that LRTA responded swiftly to the train collision on May 18, 2019 as well as to three (3) other incidents.

Major Recommendations. With emerging urban work shift patterns and 24/7 business operations, LRTA should trial test (within 2019) an extension of rail operating hours up to 12:00 midnight, to gauge effects on ridership and financial viability. The one-hour extension could raise revenues by roughly 5%.

LRTA should further upgrade (within 2019) the Passenger Assist Railway Display System (PARDS) to include IT/ smartphone applications to reduce queueing time. PARDS can also include regular on- line surveys to enable LRTA to more regularly "engage in a conversation" with riders.

<u>Key Evaluation Question #3: Were the intended economic benefits of the project realized? By how much? How could cost recovery be improved?</u>

A substantial majority (93%) of households living within the project impact area have members who take LRT2. There are slightly more male (52%) than female riders. Out of every 10 riders, four (4) are studying while three (3) are working. In addition, majority (88%) of riders do not own a vehicle. Riders are on average 38 years old. Around 3% are children, while 10% are senior citizens.

Majority of riders fall under two (2) professions that are building blocks for inclusive and sustainable development: students (44% of total) and employees (31%). Six out of every ten reached high school, and less than one-fourth are college graduates. Over half (56%) are middle income (PhP 15,917 to PhP 50,250 monthly income). One-third are lower income (max. PhP 15,917 monthly income vs. income threshold of PhP 10,481 in 2018).

With average LRT2 trip length going up from 6.6 km (1991) to 8.05 km (2018), and estimated VOC savings per kilometer increasing from PhP 0.15 (1991) to PhP 0.17 (2018), LRT2 is generating VOC savings with an estimated annual value of PhP 92.1 million (2018), compared to the optimistic projection of PhP 1,000 million (1991).

LRT2 is generating travel time savings with an estimated annual value of PhP 339 million (2018), compared to the optimistic target of PhP 1,400 million (1991). Compared to the baseline figure of 10.3 minutes, the current <u>net</u> travel time reduction is computed at 8.8 minutes, which however is statistically insignificant. Nonetheless, without LRT2, transport chaos would occur along R-6.

LRT2 fares are competitive over longer distances compared to alternative transport modes. Travel expenses expectedly rose over time as prices hardly ever go down. Nominal daily expenses of LRT2 riders averaged PhP 62.00 per round trip. Travel expense increased by an average of PhP 20.00 in the project area, which converts to PhP 10.00 in 2006 prices. Considering an average of nine years' use of LRT2, the yearly travel expense increase is 4% in the project area.

Major Recommendations. Project evaluators, in analyzing transport and other expenses, should take into account both nominal and real expenses. Fares can be seen to go down: (i) in terms of a benchmark fare charged by alternative transport mode/s; and/ or (ii) by deflating current expenses so that these will be comparable to a given base year.

Project evaluators should assess savings based not only on the train ride itself but rather on the entire "LRT experience", from entering the station, queueing, and exiting the station. Beyond LRT2, time savings analysis must cover the entire origin-to-destination journey, including connecting rides via feeder transport.

FINANCIAL PERFORMANCE AND ECONOMIC IMPACT

Based on projected VOC and travel time savings as quantifiable benefits, the project was deemed economically viable given the 1990s circumstances when it was proposed. The Economic Internal Rate of Return (EIRR) which was estimated at 18%, was still greater than the prevailing 15% Social Discount Rate.

As a social investment, LRT2 is expected to charge affordable fares. It is implied that the project will not be able to fully recoup its investments. However, LRTA has to maintain sufficient resources to fulfill its mission.

The baseline projected Farebox Ratio is 381% to 403%. From 2008 to 2017, the Farebox Ratio was less than 100%. The below-par ratio can be attributed to the amount of operating cost, cost structure, and low ridership.

Major Recommendations. As LRT2 patrons value faster travel time much more than transport expenses, and to enhance financial viability, LRTA should consider a slight fare increase of PhP 1.00 to PhP 2.00 (within 2019) across the current destination-based fare matrix. LRTA should balance two (2) considerations: (1) financial sustainability; and (2) affordability by patrons.

LRTA should aggressively pursue strategies to raise non-rail revenues (starting 2019), through institutional tie-ups with business groups, tourism agencies, and advertising firms. LRTA should continue to pursue naming rights to stations such as done for LRT1 Monumento Station.

<u>Key Evaluation Question #4: Were there any unintended economic/financial benefits realized and costs incurred due to the project?</u>

LRT2 as "school bus service" has unintended significant impact on education. It is conveying around 100,000 students daily in a manner that is safe, comfortable, efficient and affordable. Contrary to initial concerns, LRT2 also impacts positively on alternative transport (esp. PUJs as feeder transport). On the other hand, LRT2 triggered a process of unintended agglomeration of business establishments and condos/ dorms around train stations. LRT2 itself is now a traffic generator.

Major Recommendation. Recognizing the project's agglomeration effects, LRTA, MMDA, Land Transportation Franchising and Regulatory Board (LFTRB) and Local Government Units (LGUs) should collaborate more closely to better rationalize feeder transport and traffic management in the vicinity of the LRT2 stations (starting 2019).

<u>Key Evaluation Question #5: Is the project contributing to an alternative transport system that is affordable, safe, comfortable, reliable, efficient and sustainable?</u>

LRT2 operations along R-6 provided the ideal transport solution to address the growing road congestion dilemma. The daily person-trips served by LRT2 would require an equivalent of about 13,177 PUJs or 18,488 UV Express – or even 2,635 buses. Without LRT2, R-6 will be one of the most congested roads in Metro Manila.

LRT2 is currently operating inefficiently due to low revenues. The number of operational rolling stocks is half the original fleet. This poses risks in LRTA's operations as units start to break down, considering the whole system is over 15 years old. LRT2 is unsustainable given its current situation. The main challenge to LRTA is to increase daily ridership to about half a million passengers.

The project continues to be highly relevant to transport sector objectives. The project goal was initially couched in terms of an alternative system, as rail is more efficient, environment-friendly and thus, more sustainable than vehicles running on internal combustion engines. The urban pattern of Metro Manila along with transport traditions, however, calls for complementation rather than competition between light rail services and other means of transport.

Major Recommendation. LRTA must address (starting 2019) inefficiency (esp. spare parts procurement), unsustainable operations (based on fare box ratio), and certain comfort issues – while building on its good performance relating to reliability, affordability, safety and security.

Key Evaluation Question #6: To what extent has the project contributed to the overall goal of sustained public transport-based development?

LRT2 democratized transport by improving access to more destinations. LRT2 riders feel it is now easier to go to: (a) schools, 82% of respondents; (b) work, 82%; (c) government offices, 64%; (d) hospitals, allied medical services and place of worship, 59%; (e) commercial or trading centers, 56%; and (f) police stations and local security offices, 56%.

LRT2 can serve as "commodities transit" for small business entrepreneurs (SBE), transporting retail items in manageable packages, broadly replicating the concept of a farm-to-market road. Divisoria and Antipolo can become end-to-end SBE supply hubs generating livelihood opportunities.

One indicator of sustainable LRT2 benefits is "length of loyalty", i.e., number of years patrons have been using LRT2. Two-thirds of riders have been taking LRT2 for seven (7) or more years. Almost a fifth, for 13 to 15 years. A complementary indicator of benefit is "intensity of loyalty", i.e., frequency of using LRT. Forty-two percent of HH respondents took LRT2 at least 1-2 time weekly.

Traffic volume is expectedly rising along with the Metro Manila population (est. 10.0 m in 2000 vs. 12.9 m in 2015). LRT2 is impacting significantly in reducing traffic volume along R-6. The traffic volume count in Aurora Boulevard and EDSA indicates high dependence on private vehicles. On the other hand, the Recto–Rizal Avenue traffic count shows a greater role of public transport.

Major Recommendations. Public transport has to continually adapt to rising traffic volume. LRTA should consider investing in BRT (next two to three years) running under the LRT2 viaduct. A one-km. mass transit track is 10 times the cost of a BRT track. BRT can ferry the same number of passengers, without the heavy infrastructure required for light rail.

LRTA should diversify operations to include feeder transport (next one to two years) to enhance patronage and further promote LRT2 services. This is commonly done in many countries where the same agency operates not only trains but also linked transport services under the same "brand". For instance, LRTA can operate buses as feeder transport.

Part I:
Context and Methodology

1. Introduction

This Evaluation Report is a contractual deliverable of the Consultant, Certeza Infosys Corporation (CIC Study Team) to the NEDA-MES pursuant to the Terms of Reference (TOR) for the *Consulting Services for the Impact Evaluation of the Light Rail Transit (LRT) Line 2 Project.* This Report will present the CIC Evaluation Team's findings, conclusions, and recommendations from the combined formative (process) evaluation, and impact (results) evaluation of the LRT2 Project.

The General Appropriations Act for FY 2016 and 2017 provided a Monitoring and Evaluation (M&E) Fund to support M&E initiatives towards gauging the success of development interventions. Among these initiatives is the conduct of impact evaluations to study the contribution of projects and programs towards achieving poverty reduction and inclusive growth objectives. The impact evaluation studies shall be used as reference by policy-/decision-makers in the appraisal and approval of future similar development projects.

1.1. LRT2 Project Objectives, Outputs, Timetable and Cost

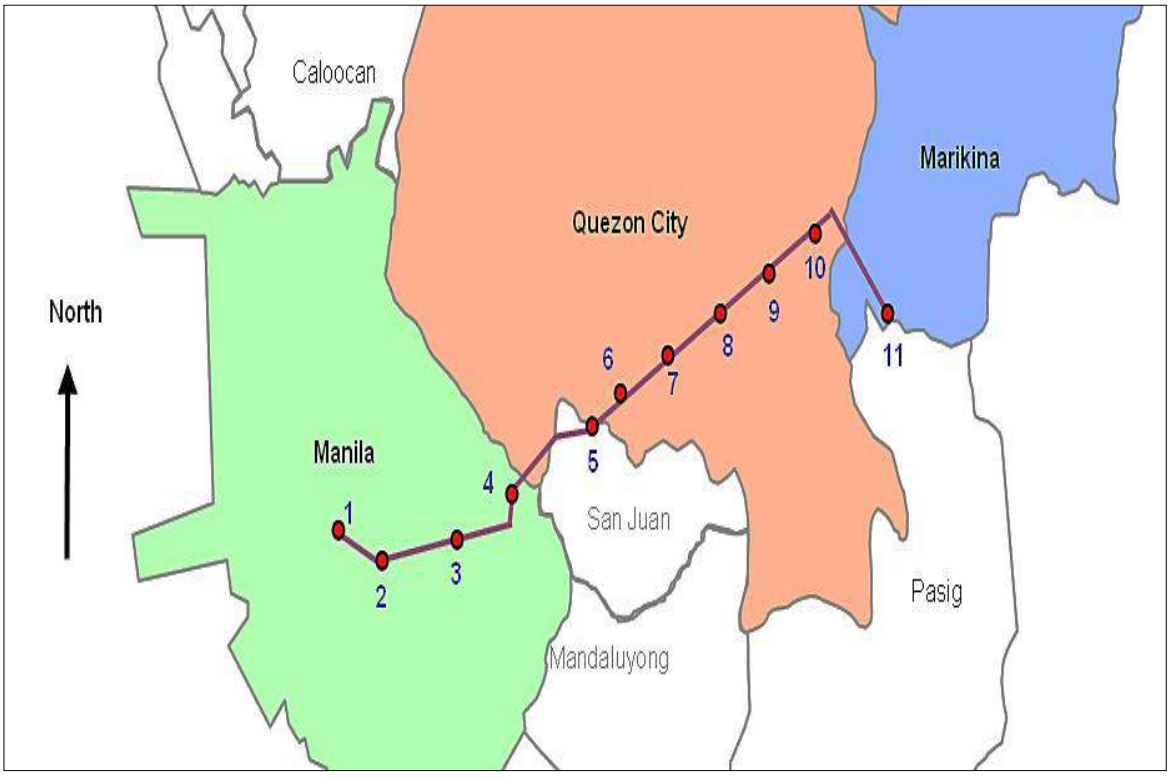


Figure 1. LRT2 Project Location

Source: metromaniladirections.com

The LRT2 Project is a 13.8-kilometer elevated rail line (Figure. 1) serving an average of around 200,000 passengers daily. LRT2 is connected to three (3) other rail lines in Metro Manila, namely: LRT Line 1 running north to south from Roosevelt to Baclaran; MRT Line 3 along EDSA from Taft

Avenue to North Avenue; and the PNR Metro Commuter Line (heavy rail) stretching from Tondo, Manila to the southern and northern edge of Metro Manila.

LRT2 was included in the National Medium-Term Development Plan (NMTDP) 1993-1998 as one of the "flagship projects" of the Ramos Administration. It aims to provide an alternative transport system that is safe, comfortable, efficient and affordable, with the overall goal of sustained public transport-based development. LRT2 is comprised of eleven (11) stations (Figure 1), running generally in the east-west direction from the depot/ east-end station located in Santolan, Pasig City and up to Claro M. Recto Avenue in Manila. The inter-connectivity between LRT2 and other rail lines is as follows: The LRT2 Recto Station is a four-minute walk (300 meters) from the LRT1 Doroteo Jose Station. The LRT2 Pureza Station is a nine-minute walk (700 meters) from the PNR Sta. Mesa Station. And the LRT2 Araneta Center-Cubao Station is a ten to twelve-minute walk (600 meters) from the MRT Line 3 Cubao Station.

1.1.1. Goals and Objectives of LRT2 Project

The project "goal" or higher-level objective to which the project will contribute is: "Sustained public transport development". The project "purpose" that LRT2 is fully accountable to achieve and which will contribute to goal achievement is: "LRT2 capacity, efficiency and dependability established" and "LRT2 economic multiplier effects generated and resulting to further socio-economic improvements". The project purpose can be achieved if the planned project outputs are produced as planned. These outputs are: "Infrastructure: depot, viaduct and track works, stations and train sets" and "O&M systems and facilities". The means-end/ cause-and-effect connectivity between and among the project goal, purpose and outputs is shown in Figure 2 below. The more detailed (updated) Project Logframe is provided as Annex 2.

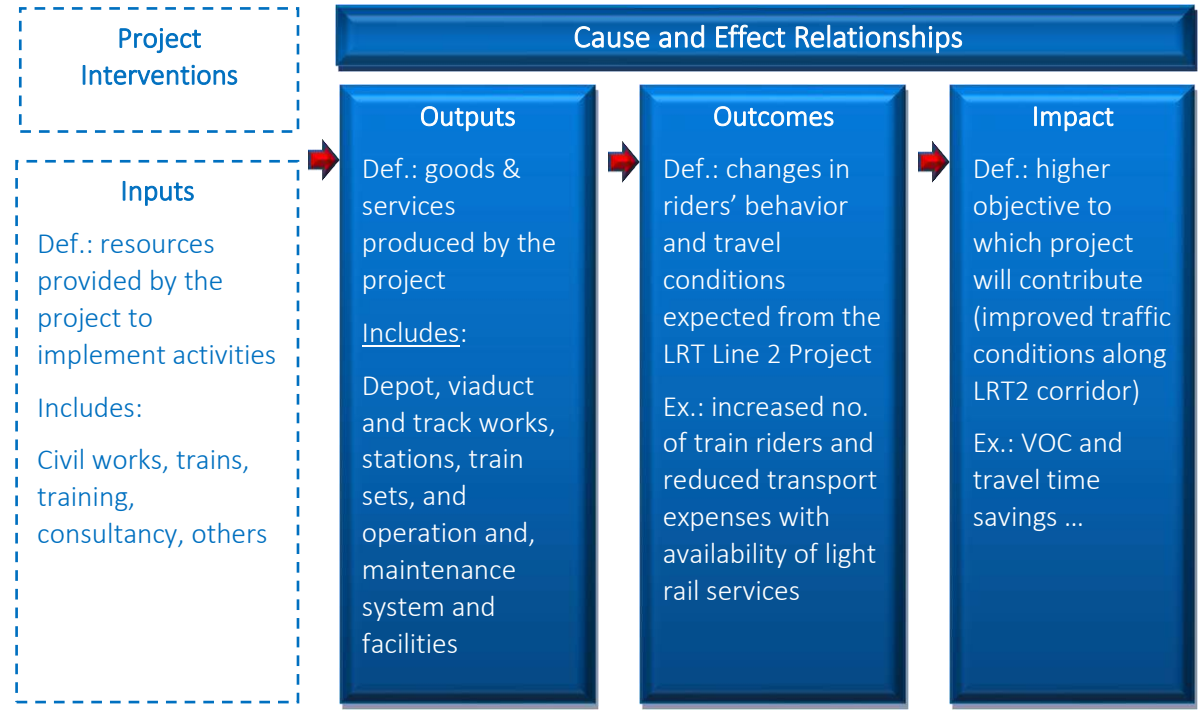


Figure 2. LRT2 Project Results Framework

Source: Evaluation Team

1.1.2. Project Timetable

The project was implemented in four (4) contract packages:

Package 1: Depot;
Package 2: Substructure, columns, and Katipunan underground station;
Package 3: Superstructure and stations; and
Package 4: Systems, vehicles and track works.

The table below compares the original and final completion schedule of each package. It shows significant delays in all four (4) packages, ranging from 5.6 months for Package 4 (Systems, vehicles and track works) to 48.6 months for Package 3 (Superstructure and stations). A summary of implementation delays is provided below. As will be discussed in Part II Sec. 1.1 of this Report, Line 2 was originally scheduled to be operational first quarter of Year 2001. The Santolan to Cubao services became available third quarter of 2003; the Cubao to Recto started first quarter of 2004.

Table 1. Chronology of Project Implementation

Contract Package	Original Completion Schedule	Original Construction Period (Months)	Final Completion Date	Revised Construction Period (Months)	Time Extensions (Months)	Percent Increase in Const. Period
P1	O2 Sept. 1999	27.7	15 Oct. 2002	47.6	19.9	72
P2	30 June 1999	26.1	25 Feb. 2003	66.2	40.1	154
P3	14 March 2000	33.3	31 Oct. 2004	81.9	48.6	146
P4	23 Jan. 2001	40.9	30 Sept. 2004	46.5	5.6	14

Sources of data: (1) Source: NEDA-Project Monitoring Staff, 15 May 2001; and (2) ICC Secretariat Justification for Increase in Cost (presented in Project Evaluation Report dated 17 Nov. 2003).

1.1.3. Project Cost

Total project cost amounted to PhP 29.50 billion. Of the total amount, PhP 19.775 billion (66%) was financed under three (3) loan agreements with the Japan Bank for International Corporation (JBIC), while the balance was covered by local funds.

Figure 3 shows the location of LRT2 vis-à-vis the current Metro Manila rail system, including LRT Line 1, MRT Line 3, and the PNR Metro Commuter Line. And looking forward to the future, Figure 4 depicts LRT2 in relation to the planned urban rail transport network, including the Mega Manila Subway line 9. In evaluating any mass transport-oriented system, an inter-disciplinary team will need to appreciate the complete picture, which in this case, encompasses the entire network of existing and planned rail lines shown on Figure 4 – because the essence of a mass transport system is seamless connectivity within and beyond the network. Urban Rail System maps plus heavy rail (PNR) maps are necessary tools to effectively examine the core purpose of mass transit via networking and connectivity, and to properly evaluate the performance of the current system in the context of the broader picture.

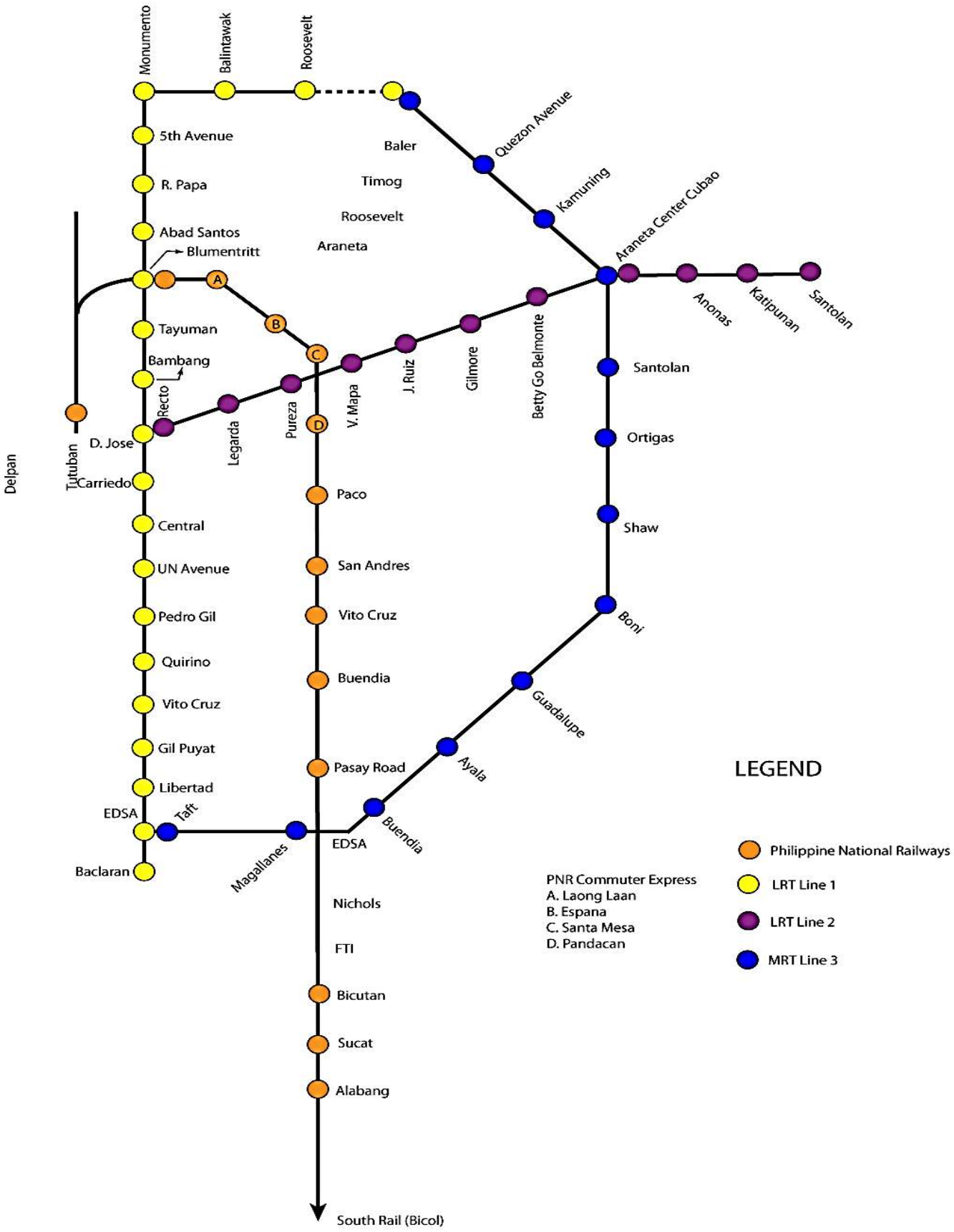


Figure 3. LRT2 in Context of Current Urban Rail Transport Network

Source: https://njytolentino.files.wordpress.com/2012/09/metro-manila-subway-ap.png

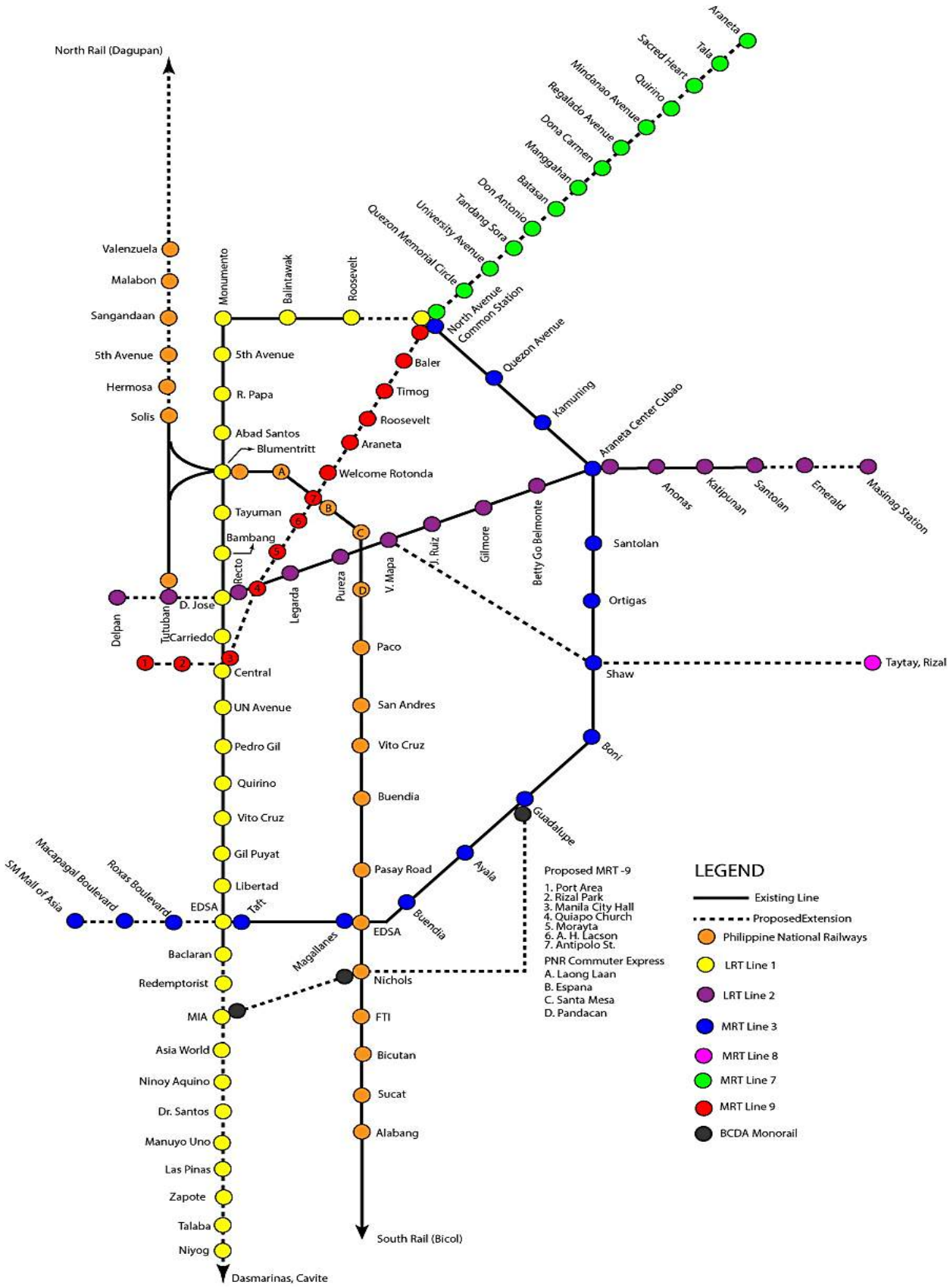


Figure 4. LRT2 in Context of Current and Planned Urban Rail Transport Network

Source: https://njytolentino.files.wordpress.com/2012/09/metro-manila-subway-ap.png

1.2. Previous Studies on LRT2 Impact

This impact evaluation exercise referenced a wide range of studies and reports. (See Bibliography at the end of this Report.) From among the long list of documents reviewed, three (3) served as key references for the purpose of establishing both spatial and temporal patterns and trends in project impact generation, and are widely cited throughout this Report.

1.2.1. LRTA, Feasibility Study for LRT Line 1 Capacity Expansion Project and LRT Line 2 Project (Executive Summary) May 1991

Focusing on the Line 2 sections of the FS, the Evaluation Team obtained from this study useful information regarding the traffic, techno-engineering, economic, and financial aspects of the LRT2 Project. The study discussed the three (3) alternative routes considered. Most importantly, the Executive Summary made available much valued baseline data on ridership, average travel time and savings per LRT passenger, value of time savings, average trip length per LRT passenger, and VOC reduction per LRT passenger. The study also specified assumptions on the role of buses and jeepneys, transport fares in buses and jeepneys, LRT2 fare system, and train speed and headway. The FS indicated that 80% of total travel time savings is assumed to be attributable to the project. Finally, the FS also provided standards on train capacity and station capacity. (Note: The complete FS could not be accessed for the impact evaluation.)

1.2.2. JICA-NEDA Ex-Post Evaluation of the LRT2 Project (Metro Manila Strategic Mass Rail Transit Development I, II and III) July 2009

The Ex-Post Evaluation Study provided "mid-point data" to enable a time-series review and analysis of LRT2 performance and impacts: starting from 1991 (using the LRTA FS above), through 2008/ 2009 (Ex-Post Study discussed in this sub-section), and finally in 2018 (various surveys done for this current impact evaluation study). The Ex-Post Study assessed and rated LRT2 performance in terms of the following criteria: (1) Relevance (rated "a" as LRT2 continued to provide crucial transport services); (2) Efficiency (rated "b" due to unsuccessful negotiations for land acquisition, implementation delays, and significant cost increases); and (3) Effectiveness (rated "b" in consideration of the planned vs. actual number of passengers, number of running trains, and rates of return). As part of the ex-post study, a beneficiary perception survey with 3,604 respondents assessed accessibility and environmental and social benefits in project-affected areas. The survey showed among others that 91% of respondents perceived that LRT2 has helped assuage traffic jams; enhanced accessibility to work place (24% of respondents) and other destinations; and reduced transport cost (97% of respondents). The Study rated Sustainability as "b" and noted that "… the financial status of LRTA is in critical condition."

1.2.3. Memorandum from ICC Secretariat on the Proposed Extension of Closing Date of JBIC Loan No. PH-P185 17 Nov. 2003

This memo proposed an extension of 18 months and an increase in Project Cost by PhP 3.6 Billion for the Metro Manila Strategic Mass Rail Transit Development (Line 2) Project. It provides a narrative and analysis on the history and status of project implementation. It shows highlights in the project timetable; details project physical accomplishments as of 30 Sept. 2003; and presents financial status [(Investment Coordination Committee (ICC)-approved costs and cumulative disbursements (1997-Sept. 2003)]. It specified project components where costs increased. It delved into the major causes of implementation delays, notably in the acquisition of right of way, but also including changes in design due to site conditions, and relocation of utilities. It analyzed ridership and traffic, as well as conducted an economic analysis and break-even analysis of LRT2 operations. The logframe updated as of that time (2003) formed part of the memo.

1.3. Impact Evaluation Objectives, Timetable and Outputs

1.3.1. Evaluation Objectives

The LRT2 impact evaluation seeks to:

1. Ascertain whether the project appraisal assumptions were met and the intended project benefits were realized;
2. Provide lessons learned during project implementation and operation and maintenance; and
3. Capture any unintended benefits which can be attributable to the project.

The following are the evaluation's specific objectives:

1. Assess the parameters of the Project:

    - Compare the actual scope, costs and implementation schedule of the project vis-à-vis the NEDA Board-approved parameters;
    - Assess the technical components of the project (alignment, station configuration, depot locations, rolling stocks, etc.);
    - Determine and measure other economic and financial costs incurred and benefits realized throughout the project which were not identified during the evaluation phase;
    - Compare the expected benefits and costs of the project during the planning phase vis-à-vis actual benefits realized and costs incurred, to include:
        - Rail ridership and impact of the project on traffic conditions along the LRT2 corridor from Recto to Pasig such as, but not limited to, available modes of transportation, transport volume, modal shift, and travel patterns;
        - Savings in vehicle operating cost, travel time, and transport cost among road users from Recto to Pasig;
        - Road maintenance cost savings due to traffic diversion to light rail;
        - Price change in real estate due to subsequent developments that may be attributed to LRT2;
        - Effects on business activities arising from the project; and
        - Other indirect impacts, such as change in population density, changes in the economic organization, and similar change in the urban landscape (e.g., urban sprawl, gentrification) where the project was located.
    - Determine the specific features of the project which contributed to the aforementioned costs/ benefits to be identified/ measured; and
    - Assess project implementation (i.e., after approval until start of operations), operation and maintenance, and target vs. actual operational performance [e.g., speed, headway[2], queuing time, fare revenue, trouble-shooting response].

2. Develop a comprehensive impact evaluation framework and methodology to examine the relationship of the inputs, activities, outputs, and outcomes of the project to its impacts.

3. Identify and document innovative and effective approaches and strategies including lessons learned in the implementation of the project that could be adopted in the design or implementation of similar or relevant interventions in the future.

[2] "Headway" is defined as the time difference between any two successive vehicles when they cross a given point. Practically, it involves the measurement of time between the passage of one rear bumper and the next past a given point. Source: Tom V. Mathew and K V Krishna Rao, Introduction to Transportation Engineering, May 3, 2007.

1.3.2. Evaluation Timetable and Outputs

An overview of the approved work plan is shown below. The full detailed approved work plan updated as of May 2019 is provided in Annex 3.

Table 2. Approved Work Plan and Outputs

Major Activities	Main Outputs	Timetable
Component 1. Initial Assessment and Program Formulation	Inception Report; Progress Report	Submission: first week Nov. 2018 Approval: first week Jan. 2019
Component 2. Conduct of Data Gathering Activities	Interim Report; Progress Report	Submission: end March 2019 Approval: mid-April 2019
Component 3. Analytical Work	Draft Final Report; Progress Report	Submission: first week May 2019 Approval: third week of May 2019
Component 4. Reports Preparation, Revision and Submission	Final Report; Progress Report	Submission: First week June 2019 Approval: third week of June 2019

1.4. Impact Study Area

The feasibility study (FS) conducted at the project conceptualization phase identified at least three (3) major parameters in the selection of the location of the LRT2 Project. These include: a) heavy traffic conditions in the east-west corridor to central Manila; b) proximity to three (3) other rail lines in Metro Manila; and c) provision of additional/ alternative mass transport system. Based on these parameters, the geographical coverage of the impact evaluation will focus on two areas: a) Project Area and b) Non-Project Area.

1.4.1. Project Impact Area

The project "treatment sites" will consist of:

- Influence areas - barangays located within a 500-meter radius of an LRT2 station and are directly benefiting from the results of project interventions; and
- Outside influence areas - barangays located outside of the 500-meter radius, but within the 1,000-meter radius from the nearest LRT2 station that experience spill-over effects of project interventions.

The 500-meter radius adopted by this study draws from the principles underpinning Memorandum Circular 99-32 of the Department of Environment and Natural Resources (DENR)[3], which prescribes the proper dimensions for mine waste storage and location. The Circular states that a minimum of 500-meter perimeter shall be established and maintained in the area. Furthermore, the DENR Biodiversity Management Bureau (BMB) Technical Bulletin No. 2014-13 directs the use of 100-500 meters transect swim to record changes in priority marine organisms, resource use, and threats present in a marine area.

Following the above guidance, the Evaluation Team was able to specify the project impact areas, which are shown on the table below.

[3] Philippine Coastal Management Guidebook Series No. 5 (DENR, 2001), DENR Memorandum Circular 99-32 s 1999, BMB Technical Bulletin No. 2014-03, Revised Procedural Manual for DAO 03-30.

Table 3. Impact Study Area

Project Areas			
LRT2 Station	Influence Areas	Outside Influence Areas	Cities
Santolan	1. Calumpang (North)	1. San Roque	Marikina/ Pasig/ Quezon City
		2. Dela Paz	
	2. Santolan (Pasig)	3. Blue Ridge B	
		4. Jesus de la Peña	
Katipunan	1. Escopa IV	1. Loyola Heights	Quezon/ Marikina City
		2. Blue Ridge A	
	2. Escopa III	3. Escopa II	
		4. Barangka	
Anonas	1. Quirino 3-A	1. Botocan	Quezon City
		2. Milagrosa	
	2. Marilag	3. Sikatuna Village	
		4. Masagana	
Cubao	1. E. Rodriguez	1. San Roque	Quezon City
		2. West Kamias	
	2. Socorro	3. East Kamias	
		4. Dioquino Zobel	
Betty Go	1. Kaunlaran	1. Kamuning	Quezon City
		2. Bagong Lipunan Ng Crame	
	2. Immaculate Concepcion	3. Pinagkaisahan	
Gilmore	1. Valencia	1. Kristong Hari	Quezon/San Juan City
		2. Greenhills	
	2. Mariana	3. West Crame	
		4. Little Baguio	
J. Ruiz	1. Ermitaño	1. Mariana	San Juan /Quezon City
		2. Damayang Lagi	
	2. Pasadeña	3. Isabelita	
V. Mapa	1. San Perfecto	1. Doña Imelda	San Juan/Quezon/Manila City
		2. Barangay 602	
	2. Progreso	3. Tibagan	
		4. Santo Niño	
Pureza	1. Barangay 627	1. Barangay 555	Manila City
		2. Barangay 835	
	2. Barangay 628	3. Barangay 551	
		4. Barangay 621	
Legarda	1. Barangay 412	1. Barangay 479	Manila City
		2. Barangay 829	
	2. Barangay 638	3. Barangay 439	
		4. Barangay 642	
C.M. Recto	1. Barangay 395	1. Barangay 653	Manila City
		2. Barangay 262	
	2. Barangay 392	3. Barangay 323	Manila City
		4. Barangay 289	
11 Stations	22 Influence Barangays	42 Outside Influence Barangays	5 Cities

Source: Evaluation Team

1.4.2. Non-Project Area

The impact evaluation "control sites" meanwhile, are located outside the above-mentioned 1,000-meter radius, and selected considering the parameters used in the selection of the LRT2 location, e.g., population, road dimensions. Using these parameters, the comparable non-project area identified for this impact evaluation is located along the Quezon Avenue-España Boulevard corridor (Radial Road 7 or R-7). The non-project area, which will be used for the Difference-in-Difference (DID) analysis, must have physical, socio-economic and other characteristics that are similar to those in the project area; this is discussed in the next section below.

1.4.3. Comparison between Project Area and Non-Project Area

Using the same parameters in the selection of the location of the construction of LRT2, the table below summarizes the comparison of the project area with the non-project area:

Table 4. Comparison of the Project Area and Non-Project Area

Parameters	Project Area[4] (both influence and outside influence areas)	Non-Project Area to be Covered by Household Survey[5]
Road designation based on Burnham's Manila Plan[6]	***Radial Road 6 (R-6)***	***Radial Road 7 (R-7)***
Urban Rail[7] built or planned	***LRT Line 2***	***MRT Line 9***
Daily Traffic condition/ volume of traffic[8]	*201,217*	*195,335*
Population/ Urban density[9]	*457.37*	*477.67*
Availability of alternative/ additional mass transport system[10]	*PUB, PUJ, UV, Taxi, TNVS*	*Public Utility Bus (PUB), PUJ, UV, Taxi, Transport Network Vehicle Services (TNVS)*
Road size	*Mostly 8 lane, 2-way esp. along Aurora Boulevard. Only few areas have wider roads like Katipunan and Santolan as well as in Sta, Mesa area*	*España Boulevard: 8 lane, 2-way* **Quezon Avenue: 12-lane, 2-way** *Quezon Avenue Extn: 8 lane, 2-way*
Railroad Crossing	*Near Pureza Station*	*Between Antipolo and Algeciras Streets*
Notable Flood prone area/s		***España Boulevard***

Source: Evaluation Team

ITALICS: similar **BOLD**: different

[4] R-6: Magsaysay Blvd and Aurora Blvd
[5] R-7: Quezon Avenue
[6] Is an old Land use plan (1905) of Manila, there were five inter-related major proposals in Burham's Plan of Manila and one of these is the establishment of a street system which would secure easy communication of transportation from every part of the city to every other sector or district.
[7] Please refer to system map in Figure 3 and 4.
[8] Average Annual Daily Traffic (AADT-MMDA, 2017) R-6 Traffic Volume, R-7 Traffic Volume.
[9] PSA, 2015 data on population. Computed by averaging the total population density per barangay. Population Density = Total Population/Land Area
[10] Data Source: AADT-MMDA,2017

The project area and non-project area show similarities especially on land use patterns, which is a mix of residential and commercial uses surrounding the two (2) radial roads (R-6 and R-7), as well as population density, alternative transport, and road size at certain portions including railroad crossing. Majority of the roads along the project area are not more than eight lanes, two-way thoroughfares. Some are smaller particularly on the eastern side approaching Manila which has higher urban density and narrow streets. The wider part of the road within the LRT2 route (R-6) is on the western side after the Cubao area approaching the Katipunan and Santolan stations.

On the other hand, the non-project area, the Quezon Avenue corridor (R-7), is almost double in width compared to España Boulevard. In both cases, the road is wider from the west and funnels down eastward. In the bigger picture map shown in Figure 5, both the project and non-project areas will eventually be under one mass transport system that will complement each segment of the urban rail network, whether at-grade or elevated. The old at-grade railway of the Philippine National Railway (PNR) is a vital link in the 2001 study by JICA entitled "Study on Standardization for Integrated Rail Network of Metro Manila (SIRNMM)".

The location of project and non-project areas is shown in the next figure below.

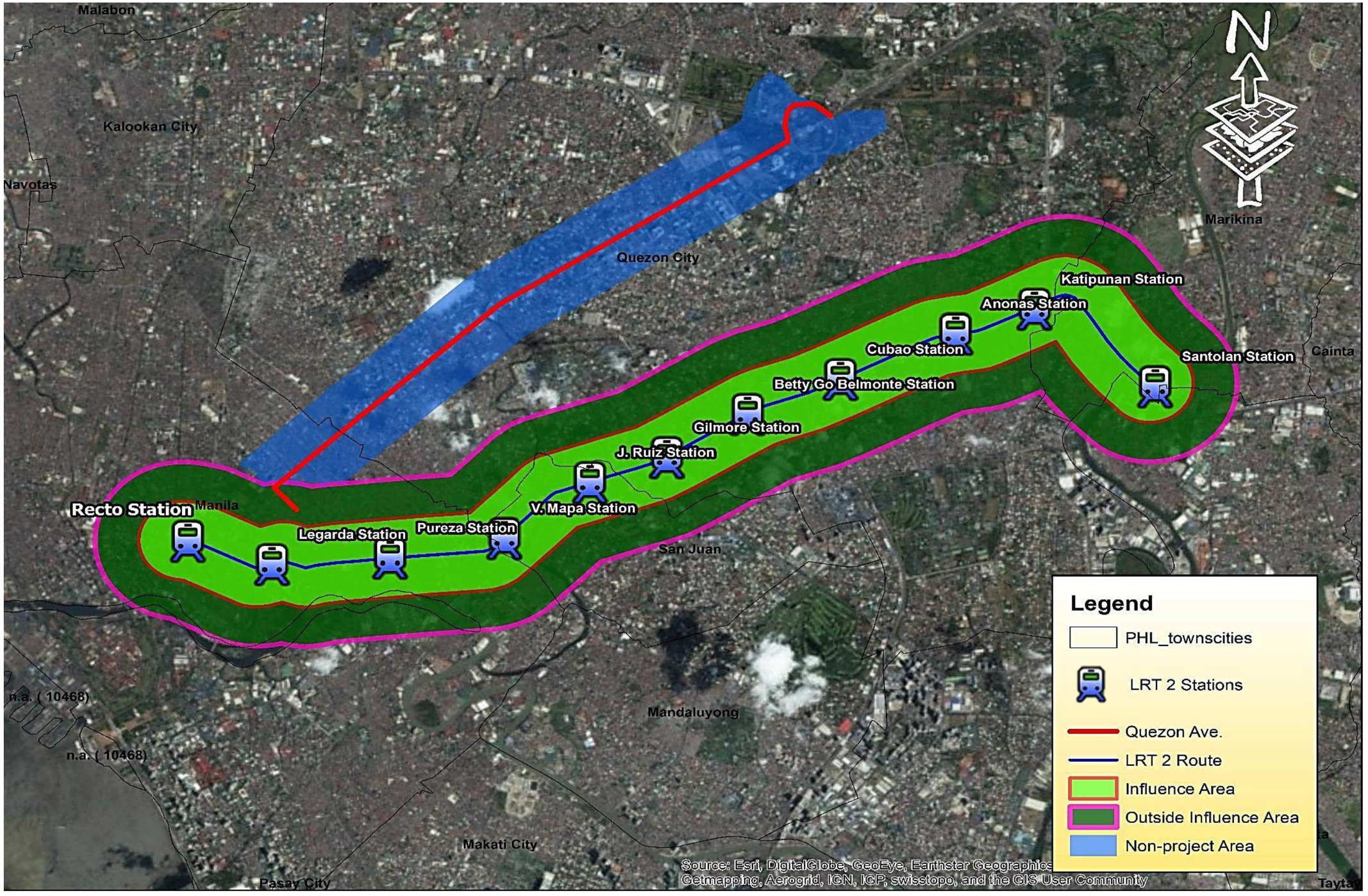


Figure 5. Geographical Extent of the Study Area

2. Impact Evaluation Design

This impact evaluation is designed around the six (6) Key Evaluation Questions (KEQ) specified in Sec. 2.3 of the TOR:

1. Was LRT2 Project implemented according to how it was originally planned?
2. Is the project being operated according to how it was intended?
3. Were the intended economic benefits of the project realized? By how much? How could cost recovery be improved?
4. Were there any unintended economic/financial benefits realized and costs incurred due to the project?
5. Is the project contributing to an alternative transport system that is affordable, safe, comfortable, reliable, efficient and sustainable?
6. To what extent has the project contributed to the overall goal of sustained public transport-based development?[11]

The evaluation used five (5) major criteria: (a) effectiveness; (b) efficiency; (c) impact; (d) sustainability; and (e) relevance. Together with the above six (6) key questions, these criteria can be regarded as providing the "basic evaluation framework". This is because the questions and criteria, taken together, clearly define the scope (boundaries) and focus (priority concerns) of the impact evaluation. The evaluation criteria were integrated with the six evaluation questions as summarized below and discussed in the ensuring sections of this report.

Table 5. Integration of Evaluation Criteria into Key Evaluation Questions

Key Evaluation Questions (KEQ)	Effectiveness	Efficiency	Impact	Sustainability	Relevance
1. Project implemented as planned?	√	√			
2. Project operated as intended?	√	√			
3. Intended benefits realized?			√	√	√
4. Unintended benefits?			√	√	√
5. Contribution to alternative transport system?			√	√	√
6. Contribution to overall goal?			√	√	√

Effectiveness and efficiency were integrated with the first two process-oriented KEQs. It is noted that effectiveness and efficiency criteria pertain to the process by which project inputs are converted to expected outputs and such outputs, to project outcomes. On the other hand, impact, sustainability and relevance criteria were integrated with the remaining four (4) impact-oriented KEQs that focus on the project's end-results in terms of socio-economic benefits generated.

Each of the logical framework assumptions was also assessed in terms of continuing relevance.

[11] In line with the TOR, the evaluation study in fact addressed more than the above six key questions.

2.1. Integrated Transport System Approach

As noted earlier, this impact evaluation was designed and conducted in the broader context of the current and planned Metro Manila rail and transport network (including Metro Manila Subway Line 9), because the essence of mass transport is seamless connectivity within the entirety of the transport system. For instance, one of the future major cogs in the system will be the PhP 356.96 billion Metro Manila Subway Line 9. By 2025, all 15 stations will be fully operational, connecting Quirino Highway to the Ninoy Aquino International Airport (NAIA) Terminal 3 in Pasay City within 30 minutes.[12]

As adapted to urban planning, an "integrated transport system" (Figure 6) is understood to mean a multi-modal transport network where different modes of road, rail, inland water, and even air (e.g., helicopter taxi) transport – including non-motorized (biking, walking) – are systematically inter-linked to smoothly and efficiently convey passengers and cargo between/ across urban centers and suburban/ peri-urban areas and beyond. LRT2 performance vis-à-vis impact indicators was studied in such integrated context. [13]Use of the integrated transport system approach expands on, rather than reduces or constrains, the scope of work specified in the evaluation TOR.

Figure 6. Integrated Transport

Source: EMBARQ India

Different modes of transport vary in their capital, technical, and O&M requirements. The competitiveness of each mode of transport will depend on travel time, fare, comfort and a host of other factors. While different modes of transport compete with each other, however, these also complement one another. In the case of LRT2, for instance, tricycles are found to predominantly provide the last mile connectivity to the commuters' homes, offices, or other destinations.

The main implications of the integrated transport system approach on the evaluation study are summarized in the table below.

[12] Rappler, Construction of Metro Manila subway begins, Feb. 27, 2019.
[13] This definition of integrated transport is adapted from: http://www.arthapedia.in/index.php?title=Integrated Transport System.

Table 6. Comparison between Integrated and Non-Integrated Transport System Approach

Comparators	Integrated approach	Non-integrated approach
1. **Transport modes studied**	LRT2 and all relevant land transport modes, plus non-motorized transport, walking, inland water, and air transport	LRT2 and selected land transport modes
2. **Connectivity**	LRT2 and all linked feeder transport (full connectivity) within and beyond direct impact areas	LRT2-focused (partial connectivity)
3. **Rail services covered**	Current/ operating rail services plus planned network expansion[14]	Current/ operating rail services
4. **Operational perspective**	Area-wide operations involving all transport modes and their combined transport impact	LRT2 operations
5. **Institutional framework**	Inclusive and disaggregated direct and indirect beneficiaries and affected groups	Direct beneficiaries not necessarily disaggregated

Source: Evaluation Team

Using the integrated transport system approach, the evaluation results will be more comprehensive than if an integrated approach were not used. For instance, the integrated system approach delves extensively into feeder transport modalities, which is not necessary if a non-integrated approach were used for this impact evaluation. Under an integrated approach, the incidence of benefits from LRT2 was disaggregated by socio-economic group, which would not have been necessary otherwise.

2.2. Project Design and Evaluation Framework

Guided by the aforementioned six (6) key questions, juxtaposed against five (5) major criteria, the Evaluation Team organized the evaluation based on the recommended retrofitted Theory of Change (TOC), Updated log frame, and Impact Evaluation Operational Framework.[15]

2.2.1. Theory of Change (ToC)

Figure 7 below illustrates how and why desired changes envisioned under the project are expected to happen based on a chain of events. The TOC maps out the predicted sequence of cause-and-effect relationships from the point a project starts to dispense particular inputs/ resources, through the unified technical and managerial process of converting such inputs to produce the project outputs, and so on. The project TOC is "retrofitted" because the original LRT2 project design documents did not include such a concept diagram.

[14] This study's coverage not only of current rail services but also of planned rail network expansion is strategically linked to the notion of "Transport Plan-Based Land Acquisition" (in contrast to project-based land acquisition) presented in Part II, Sec. 2 of this Report.
[15] CIC, Inception Report, Dec. 2018.

2.2.2. Updated Logical Framework

The Evaluation Team developed the TOC to guide re-updating of the Project Logframe that was updated in Year 2003 and attached to the Project Evaluation Report [16]. (The Logframe is provided in Annex 2.) The Team's re-update included a re-phrasing of the project purpose statement for which the project is fully accountable to achieve; disaggregating transport and behavioral change indicators to allow a more incisive study of project impact; and adding assumptions that are conditions important for project success, but lie beyond the full control of project managers.

2.2.3. Evaluation Operational Framework

The framework Portrays a "roadmap" (Table 7 below) that specifies the nuts and bolts of the impact study, built around the fundamentals in the retrofitted TOC and re-updated (Year 2018) log frame. Organized in accordance with the six key evaluation questions, the operational framework matches performance indicators with evaluation tools/ means of measurement. Its last column disaggregates the main evaluation questions based on the five major evaluation criteria previously enumerated in this Report.

The TOC diagram, Logframe, and evaluation framework might be regarded as a series of inter-connected and progressively detailed project evaluation frameworks. This is because the TOC establishes how and why desired changes envisioned under the project are expected to happen based on a chain of events. Building on the TOC, the Logframe then specifies particular indicators against which impact is to be evaluated. Finally, the Operational Framework ties together the six (6) main evaluation questions and the Logframe indicators, and then matches said indicators with particular evaluation tools.

The Impact Evaluation Operational Framework is shown below to serve as quick reference for the reader. As noted in the Evaluation Team's Inception Report, the operational framework provides a bird's eye view of the impact evaluation methodology. The framework helps to ensure completeness of indicators and specific questions to be studied. It ties together the TOR questions, log frame indicators, evaluation tools, and specific guide questions that steered data collection efforts for this impact evaluation. It can also be regarded as an executive summary of the detailed evaluation methodology to be described in Section 3 below. As can be seen from Table 7, the operational framework provides a "map" of the Key Evaluation Questions (KEQ), the corresponding indicators against which the evaluation is to be conducted, evaluation tools/ methodology (means of verification), and more specific guide questions that will drive data collection.

[16] ICC Secretariat, Proposed Extension of Closing Date of JBIC Loan No. PH-P185 by 18 Months and Increase in Project Cost by P3.6 Billion for the Metro Manila Strategic Mass Rail Transit Development (Line 2) Project, 17 November 2003.

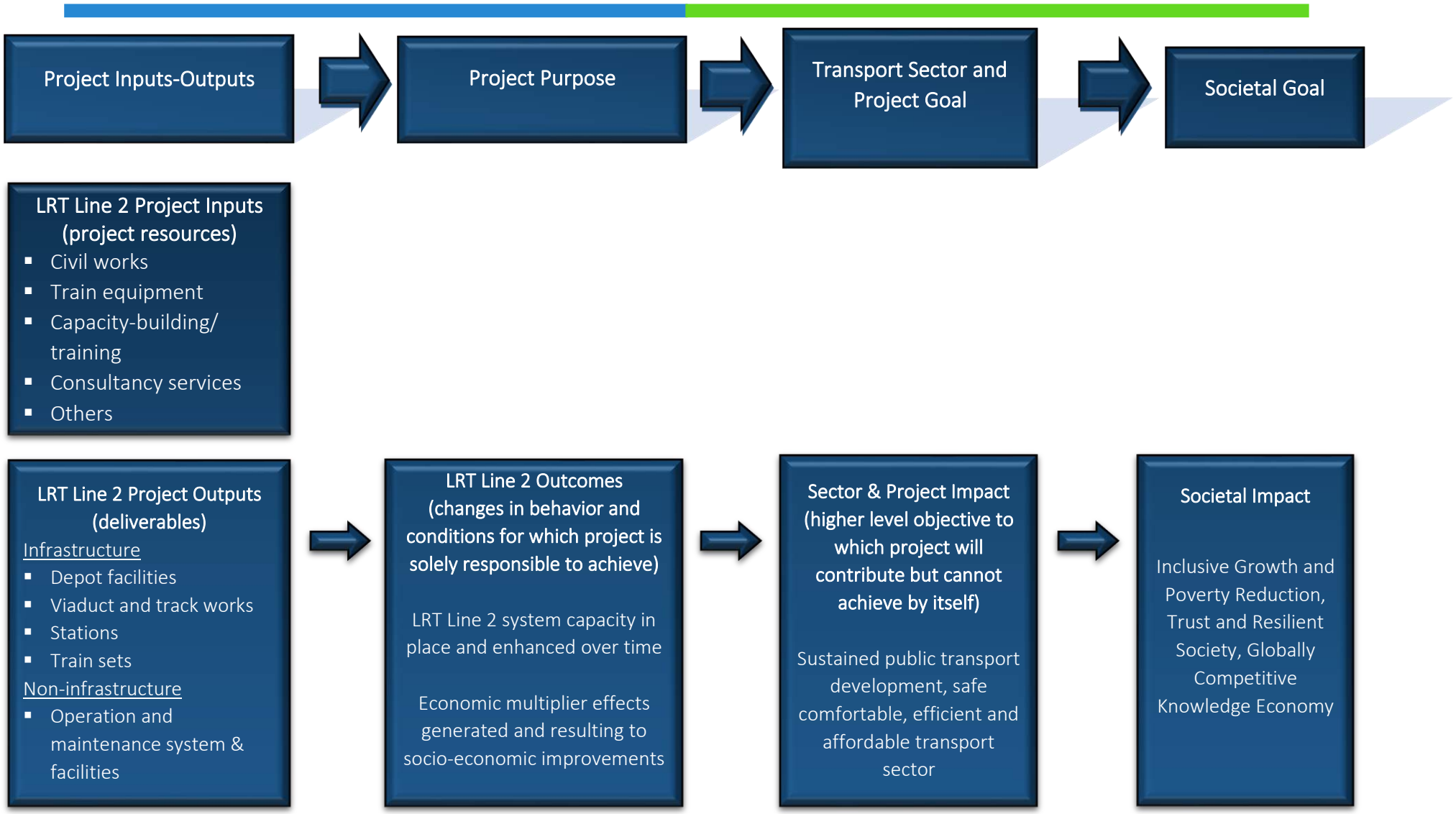


Figure 7. Retrofitted Theory of Change: LRT2 Project

Table 7. Impact Evaluation Operational Framework

Main Evaluation Questions (from TOR)	Indicators (from TOR and retrofitted log frame)	Evaluation Tools / Means of Measurement (from Evaluation Team)	More Specific Guide Questions (from Evaluation Team)
Formative (Process Evaluation)			
1) Was LRT 2 Project implemented according to how it was originally planned? Planned vs. actual implementation (capacity to deliver services)	LRT 2 system **capacity** indicators (critical factors to generate and sustain rail riders): ▪ Trains/ coaches ▪ Stations ▪ Trips ▪ Length of tracks ▪ Service (impact) area ▪ Emergency and safety facilities and services ▪ Interface with feeder transport ▪ Budget	Review of official documents/ secondary data KII with LRT personnel Station observation, video recording, or photo with checklist Queuing time simulation (ingress and egress) Analytical tool: comparative analysis	In which indicators is performance: ▪ Exceeding plans/ targets? ▪ At par with plans/ targets? ▪ Below plans/ targets? What key factors facilitated or constrained capacity to: (a) perform, i.e., deliver LRT2 services; and (b) continually improve performance? Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?
2) Is the project being operated according to how it was intended? Planned vs. actual operations (management)	LRT 2 system **management** indicators (critical factors to generate and sustain rail riders): ▪ System manual (document) ▪ Maintenance policies (document) ▪ Maintenance system – mechanics, electricians, equipment, tools, vehicles, etc. ▪ Days and hours of operation ▪ Conditions – trains, stations, ancillary facilities (elevators, escalators, first aid, rest rooms, special facilities for PWD and nursing mothers) o Accessibility o Sanitation o Security ▪ Downtime/ breakdown	Review of official documents/ secondary data Key Informant Interview with LRT 2 personnel ▪ Station observation - photo with checklist ▪ Travel time simulation	In which indicators is performance: ▪ Exceeding plans/ targets? ▪ At par with plans/ targets? ▪ Below plans/ targets? What key factors affected LRT2 services delivery in terms of: ▪ Effectiveness – ability to produce results ▪ Efficiency – ability to produce results in shorter time and/ or with less resources Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?

Main Evaluation Questions (from TOR)	Indicators (from TOR and retrofitted log frame)	Evaluation Tools / Means of Measurement (from Evaluation Team)	More Specific Guide Questions (from Evaluation Team)
	▪ Queuing time (station entrance ticket booth, time to buy ticket, enter turnstile, board train, and exit turnstile)		
Impact Evaluation			
3) Were the intended economic benefits (e.g., ridership, fare revenue, etc.) of the project realized? By how much? How could cost recovery be improved?	**LRT2 ridership benefit** indicators: ▪ Ridership volume and composition ▪ Travel time reduction ▪ Travel expenses reduction ▪ Unintended benefits **LRT 2 operator financial benefit** indicators: ▪ Fare revenues ▪ Cost recovery ▪ Net income **Other** financial benefit indicators form LRT2: ▪ Business establishments/ vendors linked forward or backward to LRT2 operations (multipliers) ▪ Business establishments/ vendors within LRT2 impact area – new and expansion (spatial dimension) ▪ Value of real property	Sample surveys: ▪ Riders ▪ Households ▪ Businesses – formal and informal (vendors) Use of the following statistical techniques, whichever is appropriate, to estimate causal effect, reduce imbalances/biases in the survey data and/or improve efficiency of the estimates: ▪ Difference in differences (DID) analysis; ▪ Post-stratification; ▪ Propensity score matching (PSM); and/or ▪ Fuzzy regression discontinuity. Transport and traffic analysis/ origin-destination study (desire lines) Key Informant Interview with LRT 2 personnel **Separate and combined** FGDs with: ▪ LRT staff	<u>Economic benefits</u> What, how, and to what extent have economic benefits reached riders? How is incidence of economic benefits distributed socially and geographically? What are the prospects for long-term sustainability of economic benefits? <u>Financial benefits</u> What, how, and to what extent have financial benefits (**specify**) been realized by: ▪ LRT2 operator? ▪ Businesses? (formal vs. informal) ▪ Property owners? To what extent is cost recovery: ▪ A desired and feasible objective of LRT2? ▪ Sustainable over the long-run? What are risks to sustaining economic benefits from LRT2 over the long-term? Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?

Main Evaluation Questions (from TOR)	Indicators (from TOR and retrofitted log frame)	Evaluation Tools / Means of Measurement (from Evaluation Team)	More Specific Guide Questions (from Evaluation Team)
		▪ LRT passengers No perception surveys. Will be for Question 5 below.	
4) Were there any unintended economic/ financial benefits realized and costs incurred due to the project? **Identifying potential and actual losers from LRT2 project** **Winners (economic and financial benefits) already covered above**	**LRT2 negative impact** indicators: Businesses affected (positively affected already covered above): ▪ Number ▪ Value involved Property owners (positively affected already covered above): ▪ Number ▪ Value involved Social impact indicators: ▪ Accessibility ▪ Live ability ▪ Overall quality of life Environment impact indicators: ▪ Noise level ▪ Air quality ▪ Aesthetics	Sample survey: ▪ Households ▪ Businesses ▪ LRT riders Survey data analyses using descriptive statistics, correlation, regression, DID, post-stratification, PSM, and/or fuzzy regression discontinuity, whichever is applicable Client perception (ratings integrated with above survey) **Separate and combined** FGDs with: ▪ LRT staff ▪ LRT passengers ▪ Other negatively impacted stakeholders	What, how, why, and to what extent have unintended **economic and/ or financial** costs burdened: ▪ Riders/ commuters disaggregated between men, women, passengers needing special assistance, and children? ▪ Pedestrians disaggregated between men, women, PWDs, and children? ▪ Businesses? ▪ Property owners? ▪ Other stakeholders? What, how, why, and what extent have unintended **other** costs burdened: ▪ Riders/ commuters (disaggregated)? ▪ Pedestrians (disaggregated)? ▪ Businesses? ▪ Property owners? ▪ Other stakeholders? How can negative impact (on losers) be mitigated? ▪ Riders/ commuters (disaggregated)? ▪ Pedestrians (disaggregated)? ▪ Businesses? ▪ Property owners? ▪ Others?

Main Evaluation Questions (from TOR)	Indicators (from TOR and retrofitted log frame)	Evaluation Tools / Means of Measurement (from Evaluation Team)	More Specific Guide Questions (from Evaluation Team)
			Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?
5) Is the project contributing to an alternative transport system that is affordable, safe, comfortable, reliable, efficient and sustainable? **Perception ratings to be compared with assessment based on other indicators above**	Modal split indicators: ▪ LRT2 ▪ Other public transport ▪ Private transport ▪ Non-motorized transport ▪ Other transport Perception ratings on LRT2 vs. non-LRT2: ▪ Affordability ▪ Safety/ accident risk/ security ▪ Comfort ▪ Reliability ▪ Efficiency ▪ Sustainability	Sample survey: ▪ Households ▪ LRT2 riders ▪ Riders of other transport modes Survey data analyses using descriptive statistics, correlation, regression, DID, post-stratification, PSM, and/or fuzzy regression discontinuity Perception survey: ▪ LRT2 riders ▪ Riders of other transport modes Key Informant Interviews with: ▪ Traffic managers and enforcers ▪ LGU reps	What are **specific** LRT2 contributions from the point of view of: ▪ LRT riders – disaggregated between men, women, passengers needing special assistance, and children? ▪ Riders of other transport modes? How do results in Question 5 compare to results in Question 3? How can positive contributions be further enhanced? What are risks to sustaining LRT2 as a desired alternative transport system? Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?

Main Evaluation Questions (from TOR)	Indicators (from TOR and retrofitted log frame)	Evaluation Tools / Means of Measurement (from Evaluation Team)	More Specific Guide Questions (from Evaluation Team)
6) To what extent has the project contributed to the overall goal of sustained public transport-based development?	Increases **attributable** to LRT2: ▪ Access to key destinations – no. of destinations; frequency of accessing ▪ Ease of passenger movement – volume, rate) Reduction of the following in non-LRT transport modes within LRT2 impact area: ▪ Travel time ▪ VOC ▪ Traffic volume ▪ Road maintenance cost ▪ Choke points	FGD with: ▪ Traffic enforcers ▪ Department of Public Works and Highways (DPWH) reps ▪ LGU reps Perception survey: ▪ Commuters ▪ Motorists Transport and traffic analysis/ origin-destination study	How has LRT2 specifically affected overall transport in the impact area? What are possible threats to sustaining project contribution to the overall sector goal? Which if any of the relevant project assumptions are no longer valid? What key lessons were learned?

Source: Evaluation Team

2.3 Baseline-Constrained Evaluation Approach

Before proceeding to present the detailed evaluation methodology in Section 3 below, it may be useful to briefly reiterate at this point that as discussed in the Inception Report, one limitation of this impact evaluation is lack of baseline data. Specifically, for example, there is no baseline for updated logframe indicators such as transport expenses, traffic volume, road maintenance cost and savings, and value of real estate property. The purpose of this section thus is to: (a) describe how the Evaluation Team coped with baseline data constraints; and (b) provide a sketch of a baseline-constrained evaluation approach developed for this impact study, and which *might be considered by NEDA-MES for use in future evaluations*.

It should be noted that baseline data are previously reported to be available for Project cost, depot/ stations, alignment, and rolling stocks. In addition, the Evaluation Team found additional key baseline data in the Executive Summary of the LRT2 Feasibility Study[17]. The additional baseline data include: (a) average trip length per rider (6.6 km); (b) annual VOC savings (PhP 184.3 million); (c) average travel time savings per rider (10.3 minutes); and (d) annual travel time savings (PhP 159.8 million, assumed at FS stage to be 80% of total time savings). Together with FS assumptions (e.g., value per hour saved per rider = PhP 5), then these values can be updated for this study.

Figure 8. Need for Baseline Data

Source: IFAD, Annual Performance Review Workshop, 2010

Given limitations in baseline data, the Evaluation Team employed a number of strategies in line with experiences in the M&E community of practice[18]. The LRT2 impact evaluation's "baseline-constrained evaluation approach", which might also be useful for future studies, includes three equally important "baseline reconstruction strategies": (a) recall; (b) mining secondary data in previous/ related studies; and (c) use of project management records. These strategies serve to achieve the primary objective of any baseline study, i.e., to determine what conditions were prevailing at the time project implementation began.

2.3.1 Recall

The impact evaluation HH survey, Rail Rider Survey (RRS)/ Commuter Survey, and Focus Group Discussion (FGD) extensively used recall as strategy for data collection. The objective was to ask individual respondents and group discussants to provide information on the key indicators by which LRT2 impact is being assessed. Sec. D3 of the HH survey questionnaire is devoted to "before

[17] FS for LRT Line 1 Capacity Expansion Project and LRT Line 2 Project Executive Summary, May 1991, pages 20 and 22.
[18] See for example, Michael Bamberger, Reconstructing Baseline Data for Impact Evaluation and Results Measurement, World Bank, November 2010.

LRT2 recall questions" on modes of transport to reach main destinations; travel time; and travel expenses. On the other hand, the RRS perception questions sought to detect changes with respect to, among other indicators: comfort, accessibility, reliability, and safety and security. Similarly, the FGD guide questions aimed to elicit the participants' recollection on pre-LRT2 transport modes by destination, riding comfort, and "livability" at the community level. Experience shows that although recall questions make surveys and discussions longer, it is well worth integrating such questions in data collection instruments.

Recall, when carefully designed and implemented, can be a useful baseline reconstruction tool with predictable and to some extent controllable errors. Recall involves two (2) types of risks: (i) unintentional distortion; and (ii) intentional distortion[19]. Unintentional distortion occurs when respondents or informants romanticize the past (e.g., "… many years ago, the air was much cleaner…"), or unintentionally adjust their response to what they think the facilitator wants to hear (e.g., LRT2 is very comfortable compared to any other mode of transport). Intentional distortion occurs when the respondents or informants anticipate that their answer might boomerang on them. For instance, barangay officials could overrate the post-LRT2 construction improvement in local traffic conditions for which they are responsible. The Evaluation Team recognized and considered the methodological risks of incorporating the recall strategy in the design and implementation of data collection activities.

2.3.2 Mining Secondary Data

This second strategy takes off from the Review of Literature (Impact Evaluation Inception Report, Annex A), which was further expanded during the actual data collection period to include additional reference materials that the Team was able to access. An ex-post evaluation conducted by a Japanese engineering consultant in 2009, for example, included a beneficiary perception survey in eleven (11) stations and their vicinity. [20]There were 3,604 respondents (51% female), at an average of 330 respondents per station. The results showed among others that: (a) improved accessibility to place of work, social services, and markets/ shops was perceived by 22 to 24% of the respondents; (b) 99% of respondents noted a decrease in travel time; and (c) 97% saw a reduction in transport cost. These findings will be matched directly with the current impact evaluation findings, enabling a comparison of Year 2009 ("baseline") and Year 2019 ("end line" or current) data.

Usually, there are many documentary sources that may provide information on the beneficiary population and comparison groups around the time the intervention began[21]. These will include studies and surveys such as the afore-cited ex-post evaluation example; studies conducted by international funding agencies such as recent transport and traffic studies conducted by JICA; and researches in the field of urban/ city planning. In using secondary data from previous studies as points of reckoning in assessing changes in indicators, care should be exercised to ascertain data quality, i.e., that we know where and when data were collected (data might have been collected long before the referenced study was published). Comparability between secondary and primary data can be enhanced using Propensity Score Matching (PSM), which has been adapted for application in this study.

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[19] Bamberger, *op. cit.*, page4.

[20] Sanshu Engineering Consultant, Ex-Post Evaluation of Metro Manila Strategic Mass Rail Transit Development I, II, III (conducted with the National Economic and Development Authority), 2009.

[21] Bamberger, *op. cit.*, page 2.

2.3.3 Use of Project Management Records

LRTA documents were found to be highly useful for this impact study, not only to provide some of the needed "baseline data" but also valuable progress data. For example, the LRTA database includes annual ridership data that can be compared with projections shown on the FS Executive Summary presented earlier. While project management is always a potential source of baseline data, the format and level of detail are not always in accordance with evaluation needs. LRTA ridership data, for instance, are not broken down by station to enable a derivation of average trip length per rider which is required for updating the VOC analysis. (Note: Average trip length data are derivable from the Travel Time Survey discussed below.) In this regard, LRTA personnel have patiently discussed with the Evaluation Team members the possibility of future reformatting of ridership data for evaluation purposes. In some other cases, management records, such as the final detailed FS, might no longer be available because so many years have elapsed since the time such detailed studies were submitted by consultants (Year 1991 or 27 years ago in the case of the detailed FS for LRT2).

As concluding note on this brief section on a baseline-constrained approach for impact evaluation, the Evaluation Team used not only baseline data but also "benchmark data" as reference points for evaluating project impact. As historically practiced in impact evaluations, the Team gave prominence to benchmarks – a standard or norm against which current indicator values can be assessed – as supplemental comparators particularly in situations where baseline data are limited[22]. Benchmarks can be obtained *inter alia* from previous studies, sector best practices, and transport system models. In this regard, the Evaluation Team's Interim Report illustrated use of a Proxemics (space allocation) standard of five square meters per person in computing the number of individuals who can be comfortably accommodated on the LRT2 station platform [23]. Benchmarks can also be used as comparator for traffic count in project areas, as well as for feeder transport per mode, and even in terms of degree of rider comfort.

[22] See for example, Swiss Agency for Development and Cooperation, Process Monitoring for Improving Sustainability: A Manual for Project Managers and Staff, July 1999, page 4-16.
[23] CIC, Interim Report, April 2019, page 13.

3. Evaluation Methodology

The LRT2 Impact Evaluation employed two (2) general categories of evaluation methodologies: (i) primary and secondary data collection methods; and (ii) statistical analysis methods such as single difference analysis and "difference-in-difference with propensity matching analysis". These methodologies were introduced previously in the Impact Evaluation Inception Report, updated in the Interim Report, and now will be re-updated in this section of the Final Report.

3.1 Data Collection Methods

The evaluation employed the following quantitative and qualitative methods in gathering the required primary data: (a) RRS; (b) Perception survey; (c) Survey of sample households; (d) Key Informant Interview (KII) of project implementers and businesses; (e) FGD with communities; (f) Traffic count; (g) Vehicle Operating Costs (VOC) analysis; (h) Travel time simulation; (i) Station observation and profiling; and (j) online survey. The methods are summarized in the table below.

Table 8. Summary of Data Collection Methods

Methods	Completion		Scope	
	Planned	Adjusted/ Actual	Planned	Actual
1. Rail Ridership Survey	Third week Feb.	Jan. 31 until Feb. 22, 2019	1,408 respondents	1,411
2. Perception Survey	Third week Feb	Jan. 31 up to Feb. 19, 2019	1,408 respondents	1,427
3. Household Survey	Third week Feb.	Jan. 31 up to March 14, 2019	800 respondents	807
4. KII with Implementers	Third week Feb.	Jan. 20 to March 20, 2019	5 agencies	5
5. KII with Business Enterprises	Third week Feb.	Jan. 29 to March 6, 2019	220 respondents	209
6. FGD with Communities	Third week Feb.	Second week April	10 barangays	10
7. Traffic Count	Mid-Feb.	Feb. 12 and Feb. 14, 2019	2 intersections	2
8. VOC	Third week Feb.	April 21-22 and 25, 2019	2-3 respondents (by transport mode)	20
9. Travel Time Simulation	First week Feb.	Jan. 31 and first of April 2019	2-3 respondents	2
10. Station Observation and Profiling	--	May 2, 2019	11 stations	11
11. On-Line Survey in Non-Project Area	--	May 2019	100 respondents	86

Source: Evaluation Team

3.1.1 Rail Rider Survey (RRS)

The RRS was designed to cover 1,408 commuters using LRT2 -- 50% male and 50% female – in all the stations and at varied times, i.e., during rush (peak) hours and non-rush (off-peak) hours. The method used in identifying the target respondents of the RRS was quota sampling, which involves the non-random selection of sample riders based on a specific characteristic of the population under study. In this case, sex (male or female). Selection and interviews were done until the target number of samples (quota) for each sub-group would have been reached – 704 males and 704 females. An equally distributed number of sample riders, i.e., 128 per station, was targeted for interview in the 11 stations (Table 9). This target sample size gives a margin of error of +/- 2.6 at 95% level of confidence.

Table 9. Rail Rider Survey Respondents

Stations	Peak		Off-Peak		Total
	A.M.	P.M.	A.M.	P.M.	
Santolan	32	32	32	32	128
Katipunan	32	32	32	32	128
Anonas	32	32	32	32	128
Araneta Center-Cubao	32	32	32	32	128
Betty Go-Belmonte	32	32	32	32	128
Gilmore	32	32	32	32	128
J. Ruiz	32	32	32	32	128
V. Mapa	32	32	32	32	128
Pureza	32	32	32	32	128
Legarda	32	32	32	32	128
Recto	32	32	32	32	128
Total	**352**	**352**	**352**	**352**	**1,408**

Source: Evaluation Team

The RRS is a face-to-face interview of rail commuters to learn about their trip patterns, travel characteristics, and other relevant pieces of information relating to their use of LRT2. The survey used a structured questionnaire that asked about the respondents' travel time and costs incurred in traveling from their point of origin to their destination at the time of interview in particular stations. Like the perception survey discussed below, the RRS was planned form 7:00 A.M. to 6:00 P.M., but had to be re-scheduled because LRT2 station personnel allowed interviews only starting 8:00 A.M. Thus, the survey hours for the morning peak were shortened. Three (3) interviewers were deployed to conduct the survey. The starting point for the interviews was Araneta Center – Cubao. The interviewers then proceeded to other stations based on a deployment schedule. Each interviewer had a daily target of 44 respondents, which was achieved each day.

The RRS was undertaken from January 31 until February 22, 2019. A total of 1,411 riders of LRT2 was interviewed, three respondents more than the targeted number, and composed of 730 males (52%) and 681 females (48%). This gives a margin of error of +/-2.6 at 95% confidence level. It might be noted that at the inception of this impact evaluation exercise, it was proposed that this ridership survey should target a total of only 200 commuters riding LRT2 including seniors and PWDs: 50% male and 50% female. However, the Evaluation Team deemed the original figure of 200 respondents, which was not imposed by the Philippines Statistics Authority (PSA), to be too small, considering that the daily LRT2 ridership is about 200,000. Hence, the target sample was increased up to the level that budgetary and time resources could allow, i.e., 1,408 (Table 9).

3.1.2 Perception Survey

A perception survey was undertaken as a component of the RRS since the perception survey will complement the quantitative RRS data on travel time and costs. The perception survey asked a total of 1,427 LRT2 riders (against a target of 1,408) to rate the benefits or impact of LRT2 on traffic; travel time/ speed; accessibility to place of work, government institutions, churches, schools, business centers and opportunities; environmental quality (air, noise); and overall security and safety. The perception survey target respondents are the same as the RRS respondents. They were chosen using quota sampling to cover varied types of riders (male, female, including seniors and PWDs) at various times of the day including peak and off-peak hours, and on different days of the week. The survey was conducted within a three-week period from January 31 up to February 19, 2019.

The survey was planned from 7:00 A.M. until 6:00 P.M., in order to cover both the morning and afternoon rush. The survey schedule was adjusted after LRT2 station personnel disallowed interviews between 7:00 AM to 8:00 AM. Three (3) interviewers were deployed to conduct the Perception Survey. The starting point for the interviews was Araneta Center – Cubao. The interviewers then proceeded to other stations based on a deployment schedule, and finally re-convened at the starting point at the end of the day. Each interviewer was assigned a daily target of 30 respondents, which was attained each day. The total target number of respondents is the same as the Rail Rider Survey (1,408), which was slightly surpassed (reaching a total of 1,427) because the interviewers maximized the available time for the survey.

3.1.3 Households (HH) Survey

The sample survey of households was conducted to determine the socio-economic impact of the LRT2 Project on commuters. Specifically, the HH survey aimed to: a) determine the extent of access and usage of LRT2 services among households; b) examine the nature and extent of intended and unintended benefits of the project on commuters and other stakeholders; and c) analyze the commuting experience, conditions and behavior of households in the project area, and compare these with those in the non-project area. The set of HH survey respondents was completely different from the RRS respondents.

The sample households for the project and non-project areas were selected separately using a two-stage stratified random sampling method. The first stage was selection of sample barangays; the second was selection of sample households. In the first stage, the selection of sample barangays started with the stratification or classification of barangays, which are located within the LRT2 Project area, into “influence” and “outside influence” areas, and “non-project area” according to its location (i.e., either Manila or Quezon City). Using systematic random sampling, 20 barangays were drawn from each of the four strata/ classifications, for a total of 40 sample project barangays (influence + outside influence areas) and 40 sample non-project barangays (Manila + Quezon City).

At the second stage of the sampling process, sample households were drawn from each sample barangay using systematic random sampling. The number of households drawn was fixed at 10 per barangay, based on the location of the housing/ dwelling units. The total number of sample households targeted to be interviewed was 800 households, with 400 coming from the project area, and 400 from the non-project area. This sample size will give a margin of error of +/- 4.89% at 95% confidence level.

The sample survey of households covered a total of 807 households (versus a target of 800) in 41 barangays (versus a target of 40). Half (404) of the sample household respondents are residing in areas/ barangays within the 1,000-meter radius from the LRT2 stations, referred to in Part I, Section

1.4.1 of this evaluation report as "project impact area" or treatment sites. The other half (403) of sample households comes from comparable areas/ barangays in Manila and Quezon City, outside the 1,000-meter radius, and located along the Quezon Ave.-España Blvd. corridor (Radial Road 7 or R-7), which this evaluation calls "non-project area" or control sites (Table 10). Per survey design, the minimum number of respondents in sub-locations (i.e., influence area, outside influence area, and non-project area) within the total survey area is 200.

Table 10. Number of Sample Household Respondents: Project and Non-Project Areas

Survey Areas	Sample barangays		Sample households		
	Target number	Actual	Target number	Actual	% share
a. Project Area					
Influence area	20	20	200	203	25.2
Outside influence area	20	21	200	201	24.9
Sub-total	*40*	*41*	*400*	*404[a]*	*50.1*
b. Non-Project Area					
Manila	20	20	200	201	24.9
Quezon City	20	20	200	202	25.0
Sub-total	*40*	*40*	*400*	*403[a]*	*49.9*
Total	80	81	800	807[a]	100

Source: Evaluation Team

The HH survey collected data about the commuting experience of respondents in the project and non-project areas, focused mainly on travel time and the cost of going to and from their usual destinations in 2018, as compared to the past (or before taking LRT2). Respondents were also asked to rate their traveling experience and various other aspects of using LRT2 and other means of transportation. The interviews were carried out over a one-and-a-half-month period from January 31 up to March 14, 2019.

Two (2) main challenges were encountered during the course of the HH Survey:

a. Difficulty in finding sample households in selected barangays/ areas that are largely comprised of business/ commercial establishments rather than residences and/ or gated communities and subdivisions; and
b. Non-availability of target respondents in many of the sample households, with only the *kasambahay* available during the time of visit by the Evaluation Team's interviewers.

To address the first challenge, and given the survey timetable, areas found to be predominantly commercial rather than residential were replaced by the most adjacent residential barangay. On the other hand, the second situation was managed by adjusting the schedule of household interviews in the afternoon and up to early evening, as well as during weekends – when the target respondents are more likely at home and available for interview. Also, to the extent practicable, the interviewers returned to the sample households (i.e., did a callback) to interview the target respondents at the specific time the respondents indicated they will be available.

Lessons learned from the above two challenges will be useful for future household surveys in highly urban areas.

3.1.4 Key Informant Interviews (KIIs)

KIIs were conducted with the following institutions/ sectors: (i) LRT2 project implementers; and (ii) business enterprises.

Project implementers interviewed were officers and representatives of the DOTr, (LRTA, involving a series of interviews), MMDA, NEDA, and JICA. The KIIs were meant to gather first-hand information from agencies involved in the LRT2 Project, using standard guide questions. Based on an interview guide, the informants were asked about the performance of their respective agency roles in the planning, management, and implementation of the project as well as challenges – and what measures are required to improve the operation of LRT2. Table 11 shows the details of the completed KII with implementers.

Table 11. Completed Key Informant Interviews (KII)

AGENCY	DATES	INFORMANTS
Light Rail Transit Authority (LRTA)	20 Jan. 2019; 11 Feb. 2019; 21 Feb. 2019	Planning Dept.; Corporate Planning and Research Division; Train Operations Division; Line 2 Rolling Stock and Inter-related Systems Division; Finance and Management Division
Metro Manila Development Authority (MMDA)	20 Feb. 2019	Road Safety Unit; Physical Planning and Spatial Development Service
Japan International Cooperation Agency (JICA)	21 Feb. 2019	Program Office
National Economic and Development Authority (NEDA)	26 Feb. 2019	Monitoring and Evaluation Staff (MES); Public Investment Staff (PIS); Infrastructure Staff (IS)
Department of Transportation (DOTr)	20 March 2019	Undersecretary for Planning and Project Development

Source: Evaluation Team

It was anticipated that individual informants will not be able to answer all the questions included in the interview guide, given the fact that LRT2 was planned in the 1990s, and started operations in 2004. Thus, the Evaluation Team cross-checked consistency of information from different informants and compared KII results with data generated using other data collection tools, including a review of secondary data initiated during the evaluation's inception stage.

KIIs were also conducted with business enterprises operating within the proximity of LRT2 stations. The interviews were carried out from January 29 until March 6, 2019. The target of 20 respondents in each station was met except in Katipunan Station that has few operating businesses, and which are also still new in the area. The total target number of respondents was 220; the actual number is 209.

KIIs of business enterprises covered vendors (35%), food service/eateries (17%), computer parts and services (6%), beauty and wellness/ barbershops (4%), sari-sari stores (4%), school and office supplies (3%), automotive parts & services (3%), gas station (3%), and a number of other types. Interview of business enterprises gathered further evidence on the economic impact of the project, which will be discussed later in the context of gentrification. Detailed KII documentation including additional information about the participants is provided in Annex 5. Changes in the impact area of LRT2 are shown in Annex 27.

The Evaluation Team also sought to obtain data from Real Estate Brokers to determine changes and trends in real property prices that might be attributable to LRT2. However, real estate brokers could not be found in the areas covered by the interviews. Analysis of real property prices was done instead by reviewing zonal values of land within the areas impacted by the LRT2 stations.

3.1.5 Focus Group Discussion (FGD)

Ten (10) FGD sessions with local communities were completed – four (4) in project influence areas, three (3) in outside project influence areas, and three (3) in non-project areas (Table 12). A total of 140 participants joined the FGDs, comprised of representatives from various sectors – barangay councils, women's groups, youth groups, transport groups, traffic enforcers, vendors, students and senior citizens' group. Barangay staff and officials constituted most of the discussants, with each group comprising 21% of total participants (Table 13). Summary documentation on completed FGDs including additional information about participants is provided in Annex 7.

The concerned Barangay Councils arranged the FGDs including invitation of participants. Barangay 642, an outside influence area barangay, needed to be replaced due to the barangay captain's refusal to allow the conduct of an FGD in his political jurisdiction. The FGD was then conducted in a replacement barangay (Barangay 557). The FGDs gathered information on the commuters' experiences and community-wide perceptions relative to benefits being derived from the presence of LRT2. The discussions also covered the overall contribution of the project to the transport sector goal of sustained public transport development that is safe, comfortable, efficient, and affordable.

Table 12. Location of Completed Focus Group Discussions (FGDs)

Survey Areas	Manila	Quezon City	Marikina	Pasig
Project Area - Influence	Barangay 627	Brgy. Quirino 3-A	Brgy. Calumpang	Brgy. Santolan
Project Area – Outside Influence	Barangay 557	Brgy. Escopa II	Brgy. Jesus dela Pena	
Non-Project Area	Barangay 527	Brgy. Old Capitol Site		
		Brgy. Roxas		

Source: Evaluation Team

Table 13. Summary of Participants in Completed FGDs

Barangay	Barangay Officials	Office of the Mayor	Barangay Staff	BPSO	Youth Group	Sports Group	Vendor' s Group	Transport Group	Traffic Enforcers	Students	Senior Citizen ' s Group	Civic Groups	Concerned Citizens	Housewife	Unidentified	Total
1. Brgy. Calumpang	6		1								1	2	2			12
2. Brgy. Jesus Dela Peña	2		2	2			3			2		1			3	15
3. Brgy. 527				1			3			1			7			12
4. Brgy. 627	2			2			2			2			1		2	11
5. Brgy. Escopa III	1		5	6				2			1	1			3	19
6. Brgy. Roxas	3		1	1	1			1				1				8
7. Brgy. Old capitol							1	1		2	2	1				7
8. Brgy. Quirino 3-A	6	1	4	1	1		1			1	1	2				18
9. Brgy. Santolan	2		14			1	2	1	1	4		1				26
10. Brgy. 557	5							1						6		12
Total	27	1	27	13	2	1	12	6	1	12	5	9	10	6	8	140
Percent	21%	1%	21%	10%	2%	1%	9%	4%	1%	9%	4%	7%	8%	4%	6%	100%

Source: Evaluation Team

3.1.6 Traffic Count

A traffic count was conducted in the vicinity of the LRT2 stations. Nine (9) types of transport modes were included in the count, including motor vehicles and non-motorized transport (NMT), which are both road users and which carry passengers and influence traffic flow and density. The traffic count was done in two (2) areas: (i) Recto – Rizal Avenue (Avenida) intersection in the east end of LRT2 in Manila; and (ii) EDSA - Aurora Boulevard intersection in Quezon City. In the case of EDSA, the northbound and southbound underpass roads were both accounted for. These two (2) areas were selected to represent major intersections along the LRT2 route. It was not deemed necessary to conduct a separate traffic count in the non-project area because sufficient comparisons can be made using household survey data, supplemented by the on-line survey in non-project areas.

The traffic count was carried out on February 12, 2019 (Tuesday) and on February 14, 2019 (Thursday). The main objective was to inventory transport modes plying around and near the LRT2 stations. Regardless if only a fraction of passengers will alight from their mode of transport and then transfer to LRT2, all the motorized and non-motorized vehicles accounted in the traffic count invariably contribute to traffic conditions in the area. In order to capture the morning and afternoon/ evening rush, the traffic count was carried out from 6:00 A.M. to 8:00 P.M.

Based on similar exercises previously conducted by the Evaluation Team on previous projects, the above-mentioned two days and time periods best represent the normal high-volume and normal low-volume flow of vehicles. Start of the workweek and weekends are regarded in transport studies as “irregular days”, as these include travelers going to their real/ permanent homes outside Metro Manila during the weekend, and then returning to their rented/ temporary residences at the start of the following week.

3.1.7 Vehicle Operating Cost (VOC) Analysis

The appropriate vehicle types to cover were judged to be: (a) private car (or any personal vehicle), (b) PUJ, (c) UV Express, and (d) bus. Taxis, trucks and motorcycles were excluded: taxis because of cheaper alternatives; trucks because these do not compete with LRT2; and motorcycles because of significant safety issues. As far as travel time is concerned, motorcycles can outpace other transport modes, but the risk of maneuvering along congested roads and vulnerability of riders are always high.

A total of 20 motorists was interviewed on April 21-22 and 25, 2019. One-half of the total are PUJ drivers; nine (9) are UV express drives; and the other is a private car owner. All of the interviews are on the road six (6) days a week, traversing generally the Antipolo to Claro M. Recto via Cubao route. See Annex 8 for the profile of VOC interviewees. The interviews sought information regarding trip frequency, mileage, fuel cost, oil cost, parts wear and tear or replacement cost, maintenance, labor, and insurance cost. The whole concept of VOC analysis is to examine the competitiveness of LRT2 vis-à-vis other public transport modes.

The inclusion of private cars is a critical point. The LRT2 Project logframe targets a “reduction in VOC for 600,000 road users equivalent to P 1,000 million (in 2004)”. Urban rails like LRT2 aim to reduce car trips though the specific number of cars was not quantified in LRT2 project preparation documents. A reduction of 500 to 1,000 car trips daily is a significant benefit that can translate to less road traffic, higher productivity (due to reduced delays from traffic jams), mitigated environmental impact, and reduced risk of road crash. The reduction of 500 to 1,000 car trips was estimated based on the projected daily number of riders in LRT2.

3.1.8 Travel Time Simulation (TTS)

The goal is to compare trips from east to west or west to east using LRT2 on the one hand, and other public transport modes similar to LRT2 on the other hand. Thus, TTS was designed to be conducted for LRT2 riders, and separately for commuters using public transport modes other than LRT2. Two (2) separate travel time simulation exercises were conducted. One was a monitored ride of LRT2, taking note of the time consumed and other details of the ride, in three (3) parts, namely: (i) accessing the train from the station's main entrance to the platform until boarding the train, (ii) during the train ride until the intended station is reached, and (iii) exiting the station, from alighting the train to the exit gate of the station.

Another TTS variant was a monitored ride using public transport modes other than LRT2, following a route that can compete with LRT2, and assuming a similar destination. Unlike the linear "access-ride-exit sequence" for TTS for LRT2, the variant for other public transport was iteratively conducted, based on the number of transfers a passenger needed to take to get to his/ her connecting ride following a typical routine: from a usual point of origin to a designated destination that can also be reached using LRT2. The simulations for LRT2 and for other public transport were conducted on different but typical days of the week. Hence, there is no issue of non-comparability.

3.1.8.1 TTS: LRT2

TTS using LRT2 was conducted on March 20 - 25, 2019. The time duration is from 6:00 AM to 6:00 PM. The routes of the simulation are from LRT2 Santolan Station to LRT2 Recto Station. A designated form was devised to capture the aggregate amount of time to be consumed across the aforementioned three parts of the simulation. LRTA has a record of travel time from their own end which totals around 18-23 minutes from the east end up to the west end, and vice versa. Except for unusual cases, the TTS for LRT2 was not expected to exceed 25 minutes, based on preliminary tests of this data collection tool. The results of travel time simulation can be compared with, and can serve to update, LRTA's own data. LRTA data can be used only as reference, as it is limited to the platform level only, and does not include the access and exit sequences.

3.1.8.2 TTS: Non-LRT2

Conducted on January 29 – 31 from 6:00 AM to 11:00 PM using PUJ, tricycle, UV Express and bus (for the origins and destinations, please refer in Annex 29); and April 30, 2019 from 2:30 PM to 10:00 PM, two (2) round trips were studied using the Cubao – Divisoria PUJ. TTS in other public transport modes was carried out for the Evaluation Team to gain comparative first-hand information on non-LRT2 travel. In the final analysis, time, fare or travel cost, convenience, and safety will be the factors to be accounted for in the comparative assessment. A different set of survey forms was used, compared to the LRT2 TTS. In order to recreate actual travel from home to place of work, the participants were instructed to follow their typical routine coming from their usual point of origin – whether house, rented space, or another dwelling place.

The destination was assigned to the participant on-board any mode of available public transport. The trip required transfers since there is no route identical to LRT2. The objective is to reach a destination that may also be reached using LRT2. For the trip simulators coming from work and are homeward bound, the destination will be their own home/ rented space/ dwelling but taking an alternative route especially if they are regular LRT2 riders.

Thus, the basic difference is that the TTS for LRT2 uses the LRT2 stations as transfer points, while the TTS for other public transport relies on any point along the route that may be convenient to make a transfer to connect to the next route on the way to the final destination. For the TTS for

other public transport, it is inevitable for the passenger to be inconvenienced in transferring and waiting for the next ride.

3.1.9 Supplemental Data Collection Methods

The Evaluation Team utilized other methods to further strengthen the database for analyzing LRT2 project impact.

3.1.9.1 Station Observation and Profiling

The Evaluation Team conducted on May 2, 2019 an observation and profiling of all the 11 LRT2 stations. The purpose of the field work was for the team as a whole to obtain additional shared appreciation and understanding of the day-to-day operations of LRT2. Using a standard guide document (Annex 24), this activity entailed a recording of the team's observations on the conditions and attributes of the station and its surroundings – within 200 meters from the station. The station observation method counted, rated, and/or profiled the following aspects of LRT2: appearance and physical condition of the station ground level going up; means of access to go up to the platform from the concourse; and pedestrian movement from the road to and within the station concourse up to the second level.

The station observation method also looked at each station's people-friendly features; general land use around the station; road intersections around the area; traffic generators; formal and informal businesses; categories of people in the station; feeder transport ferrying people to and from the station; public transport plying the LRT2 route; traffic flow rate at the feeder transport terminal or boarding point; security personnel in/ around the station's ground and second levels; emergency and security facilities response and support units; and industries and other infrastructure, natural/ environmental conditions and geographic features within 200 meters from the station.

3.1.9.2 On-line Survey in Non-Project Area

This tool (Annex 26) seeks to gather additional information from regular commuters along the Quezon Avenue – España Boulevard corridor (Radial Road 7), which was previously adjudged as comparable to the Aurora Blvd.-Katipunan Avenue corridor (R- 6) traversed by LRT2. The on-line survey comprises 16 multiple choice questions in Filipino. The Evaluation Team received over 100 responses, but only 86 were deemed valid. The questions pertain to regular destinations and mode of transport; and comparison of perceptions between Year 2004 (coinciding with the "before LRT2" period) and current year (representing the post-LRT2 construction period).

The non-rail commuters' perceptions pertain to traffic flow, time spent queuing for transport, time required to reach desired destinations, travel comfort, occurrence of accidents, and level of air quality. These perceptions were assessed in comparison with similar perceptions obtained from commuters within the project impact area. The results are integrated into the discussions in this Impact Evaluation Report.

Data collected from various methods were triangulated to ensure consistency and quality. Triangulation results are shown in Annex 9.

3.2 Analytical Methods

As mentioned in the Inception Report, the following statistical tools were planned to be used in analyzing the impact of the LRT2 Project: (a) single difference, (b) double difference or DID analysis, (c) PSM, (d) post-stratification, and (e) regression discontinuity design (RDD). Considering the conditions that should be satisfied for these tools to be effectively applied, the Evaluation Team actually used three of the tools: single difference, DID, and PSM. Post-stratification and RDD were found not necessary and/or not applicable to the study. The statistical tools, including post-stratification and RDD, are described below.

3.2.1 Single Difference Analysis

This compares before and after conditions in the project (treatment) areas in order to discern changes that may be attributable to the project. "Contribution analysis" – which is a simpler version of attribution analysis – was then used to explore and investigate project contribution to tangible changes in the impact indicators being evaluated. This method of analysis is applicable to and used for all the evaluation indicators.

3.2.2 Difference-in-Difference Analysis

DID, a counterfactual impact evaluation method, was used to estimate the net impact of the LRT2 project. This was done by comparing the changes or differences in outcomes in the project area (such as reduction in travel time and costs) before and after LRT2; and similar outcomes in the non-project area. DID is illustrated in Figure 9 and Figure 10 below.

DID analysis: with versus without and before and after project scenarios

Project (treatment) areas vs. non-project (control) areas	Beginning (baseline value)	End (current value)
Before vs. after (control areas which LRT2 does not serve)	A	B
With vs. without (project areas which LRT2 serves)	C	D

"Net impact" of LRT2 = (D – C) – (B – A)

Figure 9. Simplified DID Analysis

Source: Evaluation Team

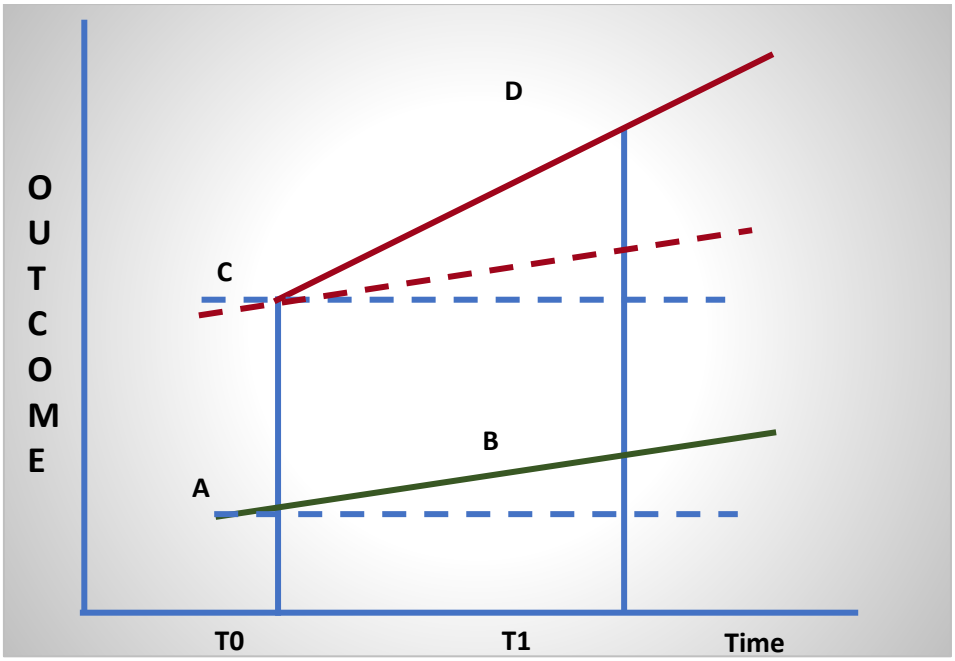


Figure 10. DID Estimation of Impact

Note: Impact (DID) Estimate:
B – A = Differences in outcomes of controls between T0 and T1
D – C = Differences in outcomes of treatment between T0 and T1
DID = (D – C) – (B – A)

Source: Evaluation Team

Here, attribution analysis rather than contribution analysis was applied to determine the project's net benefits. DID was used in analyzing the project's impact on travel time reduction.

3.2.3 Propensity Score Matching (PSM)

From the beginning of the study, project areas and non-project areas were selected to be comparable based on population, road dimensions, and other parameters. PSM was applied to further enhance the comparability of the sample respondents in the project area (treatment group), with those in the non-project area (control group). This was done by matching these two (2) groups based on "propensity scores". The propensity score is the estimated probability of "receiving treatment" or likelihood of using the LRT2 – given some observable characteristic (such as distance from the LRT2 station, age, sex, and occupation of respondent) from a regression model of participation. Project area respondents are matched to non-project area respondents with a similar propensity score before making comparisons. PSM was used in combination with DID to analyze travel time savings. The comparability between the project and non-project areas was comprehensively discussed in Sec. 1.4.3 of this Part I of this Evaluation Report.

3.2.4 Post-Stratification

The Evaluation Team planned to apply post-stratification on the data collected in case there is a need to adjust sampling weights to account for under-represented groups, based on known characteristics of the population (e.g., from census data). In the rail rider survey, which employed quota sampling, the team targeted respondents to represent the following groups: (a) male, (b) female, (c) riders needing priority assistance (children, PWDs, senior citizens), (d) peak hour riders, and (e) off-peak hour riders. Among these groups, the male-female distribution is known from the 2010 Census (PSA, 2012): that the population is comprised of 50.4% male and 49.6% female. After

the interview of LRT2 riders, survey data showed that the sample riders are 52% male and 48% female, which is considered to be an adequate representation of both sexes. Thus, the team did not apply any post-stratification adjustment on the collected data.

3.2.5 Regression Discontinuity Design (RDD)

RDD was planned to be used to confirm the validity of the counterfactual, and to sharpen the cause-and-effect analysis – which is also the purpose of PSM. In a review of evidences and methodologies on the impact evaluation of transport interventions, Raitzer *et. al.* (2019) noted that RDD can be used when there: is a threshold rule for program eligibility such as a poverty line; a group of villages located on either side of an administrative boundary; or a score used to rank potential subprojects according to an assignment variable with a cut-off value. [24]

The Team studied the applicability of RDD by using an income threshold (cut-off income) based on the average monthly income of families in the National Capital Region (NCR).[25] Adjusted for inflation, the income cut-off amounts to roughly PhP 37,000 per month. The scatter plot of travel time reduction against income of the sample households showed "no discontinuity", which implies non-applicability of the RDD. Hence, RDD was not used, and PSM is deemed sufficient to enhance cause-and-effect analysis.

3.2.6 Case Studies

The Evaluation Team conducted a series of on-site interviews to deepen our understanding of our emerging findings. The case studies are intended to bestow a human face to our statistical analysis. Case interviews were conducted for three (3) groups of project-affected people: (i) those who needed to be resettled; (ii) vendors making a living in the vicinity of LRT2 stations; and (iii) jeepney drivers plying the LRT2 route.

3.3 Unintended Consequences Analysis

This might be considered as "special analysis" as it is meant to unearth unplanned benefits and unplanned costs in line with Evaluation Major Question No. 4 in the TOR: Were there any unintended economic/ financial benefits realized and costs incurred due to the project. Inspired by a recent study of the Philippine Institute for Development Studies (PIDS) which shows how well-intentioned public policies or investments may disadvantage the intended beneficiaries themselves[26], this evaluation study had identified unintended benefits such as:

- More manageable traffic conditions for PUJs plying the R-6 route;
- LRT2 making it easier for thousands of students to go to school (building up human resources); and
- Boosting the growth of the tricycle industry, which is found by this study to be one of two (2) major feeder transport modes linked to light rail services (the other is the jeepney).

[24] Raitzer, D. A., N. Blondal, and J. Sibal. Impact Evaluation of Transport Interventions: A Review of the Evidence, Asian Development Bank, 2019.
[25] Family Income and Expenditure Survey (FIES), 2015.
[26] Vicente B Paqueo, Aniceto C. Orbeta Jr., and Gilberto M. Llanto (eds.), Unintended Consequences: The Folly of Uncritical Thinking, PIDS, 2017.

Also, this study noted unintended costs, particularly the LRT2 Project causing:

- Increase (rather than a reduction) in the volume of cars and other vehicles in the impact area;
- As a consequence of the above, slower traffic flow particularly around stations; and
- Worsening of crowding in/ of small shops and pedestrians around the LRT2 stations.

The above unintended consequences are apart from the benefits and costs that were not quantified during the project design stage and which the Evaluation Team considered measuring for inclusion in the updated cost-benefit analysis (CBA). These include the following benefits: (a) transport expense savings; (b) addition and expansion of formal and informal business ventures including employment generation (assumed at FS stage to be 2% of project cost[27]); (c) value of enhanced road safety; and (d) increase in real property values (1% assumed to be attributable to the project[28]).

3.4 Limitations, Risks and How These were Addressed

These were discussed in the Inception Report and Interim Report to include:

- **Lack of baseline data:** this had been addressed as explained in the above presentation of the Evaluation Team's "Baseline-Constrained Evaluation Approach" (Section 2.3). Lack of baseline data somewhat constrained use of more sophisticated statistical techniques. In the final analysis, however, the baseline figures provided in the LRT2 FS Executive Summary were adequate to conduct a meaningful impact assessment.[29] *This limitation underscores the need for a policy requiring that a baseline study be conducted for all major projects such as LRT2.*

- **Difficulty in finding sample households:** this was a recurring HH survey challenge in selected barangays/ areas that are largely comprised of business/ commercial establishments rather than residences and/ or gated communities and subdivisions. The Evaluation Team adjusted its sampling protocol for the evaluation interviewers to move to the most adjacent barangay in case business/ commercial condominiums are found to be predominant in the original survey area.

- **Non-availability of target respondents**: in many of the sample households, only the *kasambahay* was found available during the time of the first visit by the interviewers. *The lesson learned is that the higher the degree of urbanization of the target survey area, the more respondents are sensitive to the day and time – and duration – of interview.* This is a phenomenon that should be recognized in future surveys.

  A related consequence of high urbanization is that the respondents perceive their time to be quite precious, resulting to a higher than expected rate of refusal to be interviewed, or for those who agree to be interviewed, a high rate of "No Answer" (NA). The Evaluation Team addressed this limitation by modifying its interview schedule: from regular hours on

[27] ICC Secretariat, Proposed Extension of Closing Date of JBIC Loan No. PH-P185, page 12.
[28] ICC Secretariat, Proposed Extension of Closing Date of JBIC Loan No. PH-P185, page 12.
[29] FS for LRT Line 1 Capacity Expansion Project and LRT Line 2 Project Executive Summary, May 1991, pages 20 and 22.

weekdays, to after-hours on weekdays, plus weekends. This adjustment resulted to significant survey cost increases.

- Difficult access to documents: some key references including the project FS took time to locate, or were no longer available. As noted earlier in Section 2.1.3 above, nearly 30 years have passed since some important project documents were submitted to LRTA and other concerned agencies, and institutional memory has been weakened over the years. The Team addressed this constraint through follow ups with the concerned agencies that responded with patience. *A better document filing/ archiving system can help improve the access of future evaluation teams to major references.* Such a system, which can consist of physical and/ or electronic files, will also serve to support greater institutional learning.

- Agency personnel turnover: key Informants in selected implementing agencies had changed over time, and were no longer available for KII. This was one of the constraints to using the recall strategy (Section 2.1.3 above) as a means to reconstruct baseline data. On the upside, some of the few remaining knowledgeable old-timers in the concerned agencies proved willing to repeatedly meet with and/ or support the members of the Evaluation Team who continued to follow up, as noted above.

Part II:
Formative (Process) Evaluation Report

The second part of the Report addresses the first two (2) major (process-oriented) questions given in the evaluation Impact Evaluation Terms of Reference.

1. Was the LRT 2 Project Implemented According to how it was Originally Planned?

This first question asks that planned vs. actual design and implementation be comparatively assessed, particularly in terms of the LRT2 system's current capacity to deliver the targeted magnitude and quality of rail transport services.

1.1 Findings: Planned vs. Actual Implementation

LRT2 Project implementation was significantly delayed (Table 14). Originally, Line 2 was scheduled to be operational in the first quarter of Year 2001. The Santolan to Cubao services became available in the third quarter of 2003 and the Cubao to Recto, in the first quarter of 2004.

Table 14. LRT2 Project Implementation Delays

Milestone	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Est'd. Delay
Start construction: Planned – First Qtr 1990															
Actual: First Qtr 1996															6 years
Finish construction: Planned – Fourth Qtr 2000															
Actual: Second Qtr 2003															2.5 years
Start operation: Planned – First Qtr 2001															
Actual: Third Qtr 2003															2.5 years

Source: Evaluation Team [basic data from "Extension of Loan Validity Period of JBIC-Assisted Metro Manila Strategic Mass Rail Transit Development (Line 2) Project" (JBIC L/A no. PH-P171. May 15, 2001]

KII and project reports both highlighted that implementation delays are attributable to two (2) major causes: (1) acquiring RROW, which in turn required design changes; and (2) procurement. The same reasons are highlighted in the previous (2008/ 2009) Ex-Post Evaluation Study, which counted a total delay of three (3) years and five (5) months. The delays have proportionately

significant implications. In terms of project cost, these are price escalation and interest charges, exacerbated by foreign exchange rate fluctuations. From the viewpoint of cost-benefit analysis, delayed benefits will result in reduced cost-benefit ratios. Specific aspects of project design and implementation are discussed below.

1.1.1 Chronology of Implementation Delays

The project was implemented in four contract packages:

P1 – Depot
P2 – Substructure, Columns, and Katipunan Underground Station
P3 – Superstructure and Stations
P4 – System, Vehicle, and Track works

The original completion date in January 2001 was extended to April 2004 (Table 15). The delay was due to: (a) difficulty in securing ROW; (b) insufficient GOP counterpart fund; (c) extra-ordinary delay in procurement for P4; and (d) project design/ redesign issues relating to ROW and construction support functions. As of March 2001, the aggregate loan disbursement from Loan PH-P171 was only 35% of the loan amount.[30]

Table 15. Original vs. Revised Timetable
(as of May 2001)

Contract Package	Original Schedule (per contract)	Revised Schedule	Physical Status (%)
P1 – Depot	2 Sept. 1999	30 Oct. 2002	58
P2 – Substructure	30 June 1999	30 June 2002	71.8
P3 – Superstructure	14 March 2000	30 Sept. 2003	37.6
P4 – Systems, Vehicles and Track works	23 Jan. 2001	16 Apr. 2004	

Source: NEDA-Project Monitoring Staff, 15 May 2001

By September 2003, P1 (depot) and P2 (substructure) were 100% complete. However, P3 was being delayed by ROW issues. Thus, project completion was again moved from April 2004 to Sept. 2004. The revised target dates for completion of the four (4) packages, including their physical status, is shown below. In view of implementation delays, LRTA requested NEDA to extend the project duration.

Table 16. Original vs. Revised Timetable
(as of Sept. 2003)

Contract Package	ICC-approved Completion Schedule (in 2001)	Revised Schedule	Physical Status (%)
P1 – Depot	30 Oct.2002	15 Oct. 2002	100
P2 – Substructure	30 June 2002	25 Feb. 2003	100
P3 – Superstructure	30 Sept. 2003	31 Oct. 2004	90.71
P4 – Systems, Vehicles and Track works	16 April 2004	30 Sept. 2004	94.53

Source: ICC Secretariat, Project Evaluation Report, 17 Nov. 2003

According to the Project Evaluation Report (Nov. 2003), the nine-month delay in P2 completion was caused by ROW problems at Sampaloc Market and Recto, which were resolved only in September 2002. These problems likewise affected the scheduling of P3 whose completion was

[30] NEDA Project Monitoring Staff, Memo to ICC Technical Board dated 15 May 2001.

revised from Sept. 2003 to Oct. 2004. And the same for P4, extended from April 2004 to Sept. 2004 due to delayed resolution of the ROW problem resulting in delayed construction of viaducts and laying of track works.

1.1.2 Train Capacity

Actual daily ridership, based on LRTA records, is less than one-half of the level projected during the design stage (i.e., 200,000 versus 450,000 passengers). The Evaluation Team estimates average full capacity per car train to be 1,650 passengers with 235 seated and 1,415 standing – based on a passenger density of seven (7) average persons per square meter. With the current LRTA rolling stocks of eight (8) car trains (or 32 coaches), the average total number of daily trips is 281. Based on full capacity, this translates to 463,650 passenger-trips per day. Since 44% of LRT2 riders are students, passenger trips will go down on weekends and holidays. With the current eight (8) rolling stocks in operation, ridership ranges from 175,156 to 202,333 based on LRTA reports for 2012-2017.

The projections from 1999 were very aggressive and optimistically dependent on other transport infrastructure projects taken altogether. Other factors affecting ridership, as discussed in this Evaluation Report, include: (a) no-school days, as majority of riders are students; (b) the K-to-12 program which delayed college entry by two years; (c) the decision to exclude Tutuban in the original alignment; and (d) low population density at midpoint of the LRT2 route with Gilmore Station at the center. Annexes 11 and 12 provide further discussion on how ridership projections were made at the time the LRT2 Project was being developed.

The LRT2 system uses rolling stocks (vehicles or train sets) that are composed of four-car trains in a Motor Cab 1 – Motor 1 – Motor 2 – Motor Cab 2 (MC-M-M-MC) formation, as shown on Figure 11. Basic car train characteristics are shown on Table 17. The initial number of rolling stocks was 18. Currently, only eight are operational due to several reasons presented in Table 18 below.

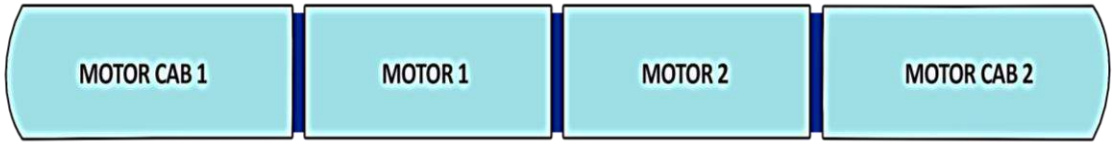


Figure 11. Standard LRT2 4-Car Train Formation

Source: Evaluation Team

Table 17. LRT2 Car Train Characteristics

Load Type	Weight (Ton)				
	Motor Cab 1	Motor 1	Motor 2	Motor Cab 2	Total
Tare Weight[31]	41.00	39.05	39.05	41.00	160.10
Full / Dynamic Load	83.10	83.10	83.10	83.10	332.40
Characteristic	**Measure**				
Operating Speed	60 - 80 kilometers / hour				
Maximum Acceleration	1.3 m/s^2 (4.68 km / hr /s)				
Maximum Deceleration	1.3 m/s^2 (4.68 km / hr /s)				
Emergency Deceleration	1.5 m/s^2 (5.40 km / hr /s)				

Source: LRTA

[31] Tare Weight – is the weight of a vehicle, container or vessel without load or passengers.

Significant delays in the procurement process translate into lower operating capacity of the LRT2. The engineering and maintenance group of LRTA can only resort to utilization of good or usable parts from other non-operating trains as replacements. The rolling stocks across all the current urban rails in the Philippines vary in specifications, and so there is no chance of parts or components interchangeability especially when LRT1 is now being operated by a private group. A comparison of train capacities and basic specification is shown in Annex 12.

Table 18. LRT2 Rolling Stocks Status
(as of 2019)

	Body Manufacturer	Electric Motor	No. of Units	Status	Remarks
1	Hyundai-Rotem	Rotem- Toshiba Megatren Model 2003	10*	Operational	Good running condition
2			4	Non-operational	For repair and restoration
3			4	Non-operational	Proposed for replacement (heavily 'cannibalized')
		Total	**18**		

*"Two of the 10 are reserved units. Only eight trains are regularly deployed

Source: LRTA

The first trip of LRT2 is at 4:30 A.M. and the last trip is 11:00 P.M. During weekends and holidays, start of operations is the same, but the last trip is 30 minutes earlier at 10:30 P.M. Majority of LRT2 passengers are students (44%) and employees/ workers (31%), while the rest are mixed class (25%). This translates into lower ridership during weekends, school breaks, holidays, and no-school days due to weather-related events. LRTA ensures that special schedules are announced in the stations through the public address (PA) system, on-line platform, and through print media that can be found within each station's premises. Weekday rush hours in LRT2 are still manageable given current ridership (Figure 12), as compared to LRT1 and MRT3. This is supported by the actual train rides, station observation, and other on-site activities completed by the Evaluation Team.

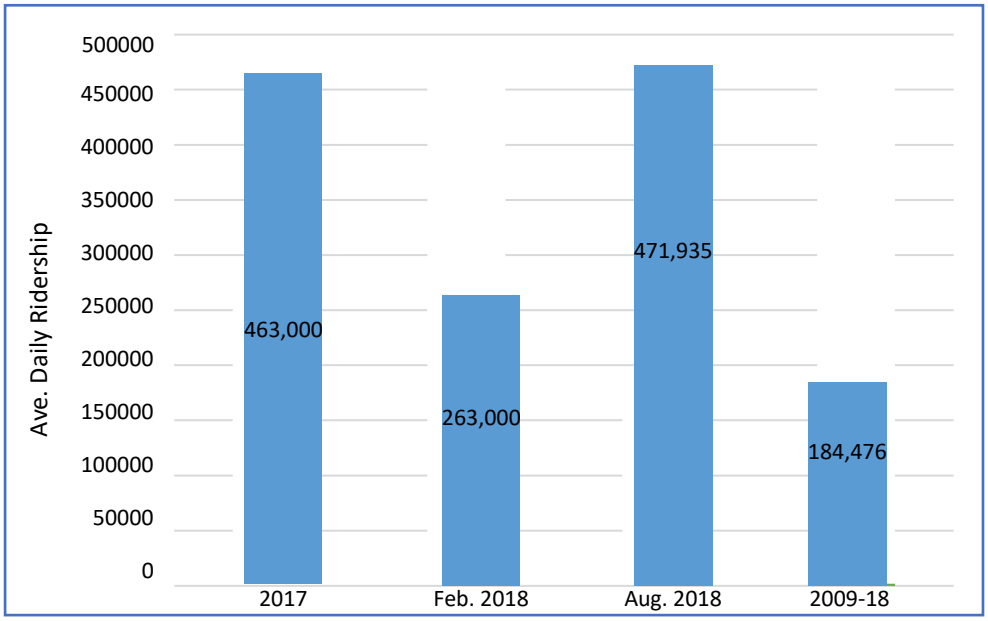


Figure 12. Average Daily Ridership: Comparison over Time

Source: Evaluation Team

Figure 13. An eastbound train on the viaduct near Marikina River towards Santolan Station

Source: Lightningfast/Wikimedia Commons

1.1.3 Station Capacity

LRT Line 2 has eleven (11) stations from Santolan (east end) up to Recto (west end). All stations are elevated except for the Katipunan Station which is underground. There is no at-grade (surface level) station for LRT2. Construction of all the stations adhered to technical building standards, but none of the stations are exactly the same due to differences in configuration of the location and the surrounding built-up environment. The Santolan Station is a stand-alone structure and directly attached to the east-end terminal, and straight to the depot and repair yard. The Recto Station on the other hand is connected to commercial buildings that lead to LRT Line 1 in Rizal Avenue.

The Araneta Center - Cubao Station is linked to a mall but has no direct connection to the MRT Line 3 station serving the EDSA route. Currently, the transfer from LRT2 Cubao Station to MRT3 EDSA Station takes about ten to twelve minutes by foot through the mall during business hours. If the connecting commercial buildings [32]are closed, a rail rider will have to use the inner roads of the Araneta Center by foot, or avail of the free shuttle service during the same business hours. The station dimensions are tabulated below.

Table 19. Station Lot Areas and Dimension

Station		Lot Area (m^2)	Station Dimensions (m)		
			Height	Length	Width
1	Santolan	2,962.50	15.66	100.00	29.63
2	Katipunan	13,132.00	16.16	296.00	67.00
3	Anonas	2,800.00	20.00	100.00	28.00
4	Araneta Center - Cubao	5,572.50	23.39	104.00	30.00
	Shuttle Area			*150.00*	*16.35*
5	Betty Go-Belmonte	2,800.00	20.00	100.00	28.00
6	Gilmore	2,800.00	20.00	100.00	28.00

[32] Gateway Mall, Araneta Coliseum, bridgeway (now being constructed as Gateway II) and Farmers Market (Mall).

	Station	Lot Area (m^2)	Station Dimensions (m)		
			Height	Length	Width
7	J. Ruiz	2,500.00	20.00	100.00	25.00
8	V. Mapa	2,800.00	20.00	100.00	28.00
9	Pureza	2,800.00	20.00	100.00	28.00
10	Legarda	2,800.00	30.00	100.00	28.00
11	Recto	7,500.00	26.06	172.56	43.50

Source: LRTA

In proportion to total, the only underground station, Katipunan in Quezon City, has the biggest lot size. The station with the smallest lot size is J. Ruiz in San Juan City – about five times smaller in lot size than Katipunan. Six (6) stations have the same total lot size of 2,800 sq. m. Figure 14 below shows the comparative lot sizes for each station, but does not necessarily reflect the precise shape of the lots.

Figure 14. Station Lot Sizes by Proportion

Source: Evaluation Team

The underground Katipunan Station naturally requires a large lot size to enable construction, space for equipment deployment, service maintenance procedures, structural integrity, and ample ventilation. All the elevated stations follow a three-storey design format regardless if stand-alone structure or connected to a commercial establishment. Most passengers stay at the platform area, but a considerable number of riders briefly stop at the sub-levels when there are commercial stalls that offer consumer items that contribute to the non-rail revenue of LRTA.

The typical LRT2 platform area is almost equal to the size of the station's lot, except for the Katipunan, Cubao, and Recto stations. On a public space allocation of five (5) square meters per person[33], the number of individuals who can be comfortably accommodated on the LRT2 platform is approximately 476, except for the Katipunan, Cubao and Recto stations which can accommodate approximately 3,400, 504, and 1,276 riders, respectively. In most cases, these numbers may increase depending on the amount and layout of facilities on the station's platform, and on the level of service (LOS)[34]. The standard features of an LRT2 platform are provided in Annex 13.

[33] Based on proxemics reference for personal space, social space, and public space. Proxemics is a modern approach to space allocation which may be more elaborate that architectural standards. Reference: E. Hall, Hidden Dimension.

[34] Level of servise (LOS) is a qualitative measure to relate the quality of motor vehicle traffic service in roads and intersections based on several factors including line speed, density, proximity, and carriageway. Later, the application was expanded to urban planning for accessibility to public transport, waiting time, queuing time, and ingress and egress to public facilities. Standards were proposed and adopted, which vary across countries. LOS rating for pedestrians ranges from 1-5 where "1" refers to 3m^2 or greater per person, while "5" refers to 0.5m^2 or less per person

1.1.4 Length of Tracks

The declared length of LRT2 is generally 13.8 kilometers, but the actual length is almost double since the track works is 12.7 kilometers per direction, and the connecting track is 1.1 kilometers. The whole track works accounted for about 4% of total project cost. The popular public perception of a railway track is simply the path where the train runs. The tracks are contained inside the viaducts which connect the columns and the stations to form the line for an elevated railway system. The long, horizontal massive concrete structures visible from the ground level are the girders which support the viaducts. Altogether, these major elements plus other reinforcing components form the whole assembly like an exclusive 'road' commonly called viaduct. The typical cross-section of a railway viaduct constructed in the middle of a four-lane, two-way road is shown on Figure 15. The actual LRT2 viaduct[35], however, is wide enough to include service and emergency walkways on both sides.

In the LRT2 Project, the substructure mentioned is the basic infrastructure for the elevated rail. The substructure for LRT2 includes the foundation of the columns, the structures for the elevated stations, and the structure for the underground stations. These were all covered under the second package contract in the LRT2 Project. Similarly, the superstructure includes the pre-cast fabrication of the viaducts with all related elements, the fabrication and erection of viaduct girders, and construction of all the stations.

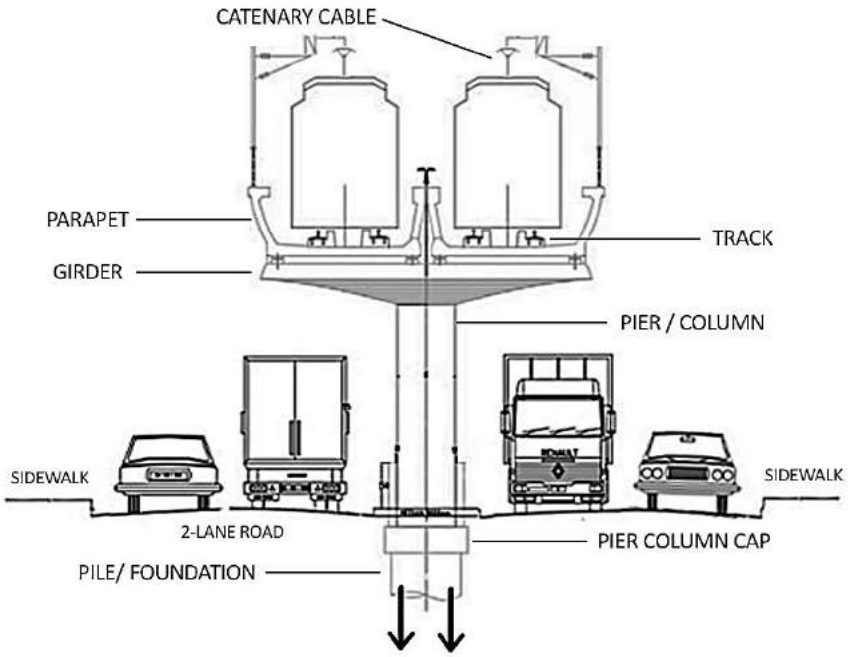


Figure 15. Typical Cross-Section of a Railway Viaduct Assembly on 4-lane Road

Source: Evaluation Team

1.1.5 Service/ Impact Area

Various "master plans" existed at the time the LRT2 alignment was being developed. The Study on Integrated Railway Network in Metro Manila (SIRNMM, 2001) was intended to connect Bulacan and Laguna via coastal lines through Metro Manila. The Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas (Dream Plan) aimed to improve the

[35] Viaduct – the rigid bridge-like 'canal' that holds the railway tracks and horizontally connects the stations. Since LRT2 is generally elevated, the series of viaducts acts as the 'road' except for the underground Katipunan station.

transport system in Metro Manila by addressing interlinked problems in the areas of transportation, land use, and environment. The MMETROPLAN (1977) addressed future transport scenarios with three main strategies to respond to traffic congestion and public transport requirements: 1) Cordon pricing, 2) Bus lanes, and 3) LRT. MMETROPLAN also contained short-term recommendations on regulations, premium buses, and reassigning jeepneys to low-demand areas. It appears that these master plans were not fully considered in the process of LRT2 route planning. Much of the good foresight in the plans was overshadowed by different administrations having their own concept of transportation plans. The lack of a transportation 'guru' with a realistic vision of a foreseeable future complicated the simple Burnham Plan for Manila, leading to road congestion problems.

Route Planning

Prior to the finalization of the LRT2 route, two (2) other routes were considered namely the Modified Aurora Route, and the Rodriguez Route – both of which emanate from Katipunan Avenue before the Santolan Station. All the three (3) routes will terminate at Tutuban in Divisoria being the original west endpoint. Figure 16 shows the route considerations from the 1991 FS.[36]

While it is ideal to build the Tutuban, Divisoria LRT2 Station instead of the current one in Recto, the perennial issue of ROW became the major hindrance since the real estate business was booming, allowing well-funded developers to secure prime lots. It was noted that during that period, modern malls were built in the Divisoria area like 168, Lucky Chinatown Mall, 1188 Mall and a few distant ones in Manila's Chinatown.

The ideal route for a mass rail transit is to be as linear and straight as possible to attain optimum travel time, avoid additional cost, preclude complicated technicalities and civil works, and not impede circulation. Tutuban, Divisoria is just one of the west end points anticipated to increase ridership. Connecting Port Area at Manila Bay could further improve ridership since the traffic congestion from Rizal Avenue to the Port Area via Divisoria has become worse over time.

The current LRT2 route (Aurora Route) is the most logical choice since it traverses a high-volume corridor with numerous traffic generators on both sides. This is one major requirement for mass transit planning in order to be sustainable. The Modified Aurora Route may not attract as many riders from Recto Avenue, because the land use in the diverted section is a mix of residential, commercial, and occasional leisure (San Lazaro Race Track).

The Rodriguez Route partly duplicates the diverted section of the Modified Aurora Route but a huge part of the route traverses a wider transport corridor compared to the Aurora-Magsaysay-Recto corridor, which in effect may face competition from many road vehicles simply because of the corridor's bigger carrying capacity.

All three (3) alternative routes have both advantages and disadvantages. The Aurora Route has a perennial source of assured riders since there are many schools at both east- and west-ends, and even in-between endpoints. The other two (2) routes will have to await commercial development on the diverted section to realize higher ridership. The Rodriguez Route passing through España might also encounter flooding during heavy rains. Despite the Aurora route weakness at midpoint, it is still regarded as the best option.

[36] FS for LRT Line 1 Capacity Expansion Project and LRT Line 2 Project Executive Summary, May 1991.

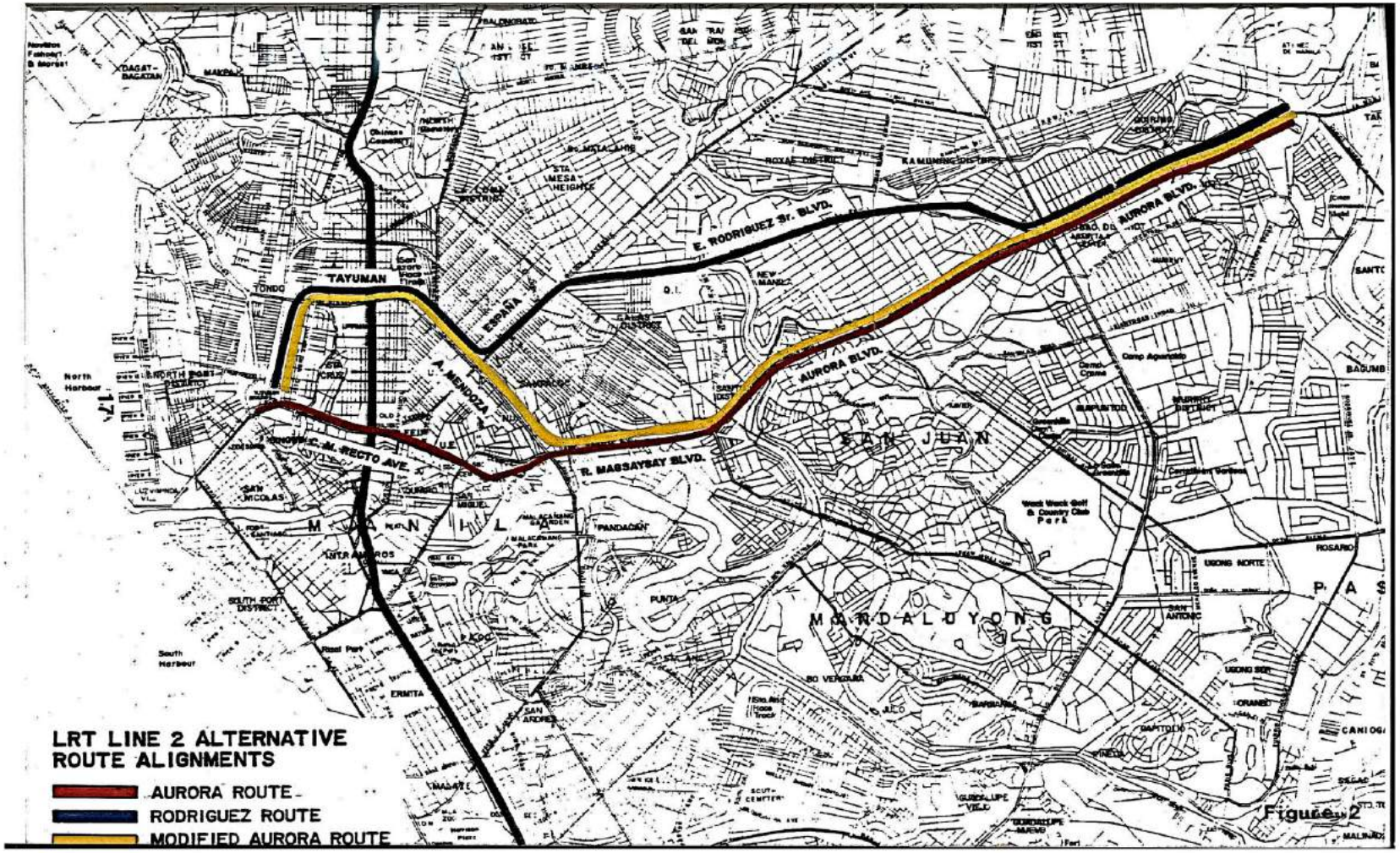


Figure 16. LRT Line 2 Alternative Route Alignments, May 1991

Source: LRTA

The change in station location in Tutuban, Divisoria is just among the many instances where ROW was the major reason. It is worthwhile to note that some technicalities emerged during the implementation period that greatly affected the master plan as well as the budget along with other related developments. Similar cases, as listed below, were observed relating to the ROW issue:

1. Failed acquisition of an 18-hectare lot in Foremost Farms in Santolan intended for depot and inter-modal transfer area or transport hub;
2. Alignment originally included Old Bilibid Prison as terminal site changed due to squatter relocation;
3. Quezon Institute as depot changed after failure of talks between LRTA and Philippine. Tuberculosis Society; and
4. Katipunan station changed from two levels to underground due to DPWH Circumferential Road 5 project which resulted to an additional 1.0 km elevated viaduct from Katipunan station to the depot.

Prior Final Route

The selection of the final LRT Line 2 alignment (Aurora Route) falling under R-6 [37]aims to capture a blend of communities of varying socio-economic profiles passing a four-lane, two-way road from Katipunan Avenue to Recto Avenue. The west endpoint, Recto station, terminates at Rizal Avenue and is adjacent to Divisoria, which is part of "old Manila" where trade and commerce flourished during the industrial era, but became congested with not enough room to grow except for retail industry. Developments thus shifted to the east, north, and south. Other parts of Metro Manila, including the eastern end, progressed over the past 30 years especially when the realty business (including malls, housing, high-rise and medium-rise condominiums, fast food restaurants, convenience stores, and fuel stations) began to grow in the new millennium, and property prices started to rise. Migration from the provinces to Metro Manila rose, and the need for settlements continued to go up as purchasing power started to rise.

At the midpoint of the final LRT2 route are located propertied affluent communities[38], some of which might be regarded as 'old rich' families who have access to destinations without the need for public transport. These communities are of considerable number, but the more critical factor is their strategic location. Succeeding sections of this Evaluation Report clearly point out that the lowest ridership occurs consistently within the LRT2 midpoint at Betty Go-Belmonte, Gilmore and J. Ruiz stations. Please refer to Figure 17. This is the New Manila area in Quezon City with wealthy residents who own high-value properties. These communities extend even to some parts of San Juan City.

Naturally, there will be no substantial rail passengers when the target population can afford other means of transport, and can avoid clambering up the LRT2 stations to get a ride. In Figure 17, urban density is noticeably low around the three stations mentioned, compared to parts indicated by the gray areas (high population density) and the dark green areas (low to medium population density). Most rails riders favor LRT2 due to lower cost (for longer trips) and greater distance covered compared to other modes, which means that passengers benefit from longer end-to-end trips.

[37] Radial Road No. 6 (R-6) – is one the radial roads from the Manila Plan *(Plans for the Development of Manila)* prepared by the American architect and urban planner Daniel Burnham in 1905.

[38] Parts of Aurora Boulevard, New Manila, San Juan, Sta. Mesa up to the Quezon City boundary.

Taking the LRT2 at midpoint stations will have lesser cost significance vis-a-vis other transport modes, except when traffic congestion is at its worst.

Gilmore Station has seen slightly increased ridership because the area developed into a hotspot for computers and electronic items like gadgets, phones, gears and toys – which continues to expand. Along the way, the area generates employment and people come to this location to do business. The impact areas identified in this study, spanning six cities and 25 barangays, are a mix of potential mass transit beneficiaries who reside in high-density areas, and potential market that may or may not actually patronize the rail system and give up personal comfort derived from using their own vehicles. A bigger snapshot of the urban density satellite photo of Metro Manila and the LRT2 route superimposed is shown in Figure 18.

In a 2009 study [39]on the Metro Manila rail system which focused on spatial analysis using a geographic information system, among the conclusions by the author, Shohei Nakamura, is that:

> *While transportation and social services are mostly available anywhere in the center of Metro Manila, their service areas do not cover the poverty area.*

The author presented these findings showing the urban densities surrounding the LRT2 (see Annex 15), which tallies with the findings shown in Figure 17.

[39] Spatial Analysis of Urban Poverty in Manila, Philippines. May 2009 by Shohei Nakamura, Cornell University

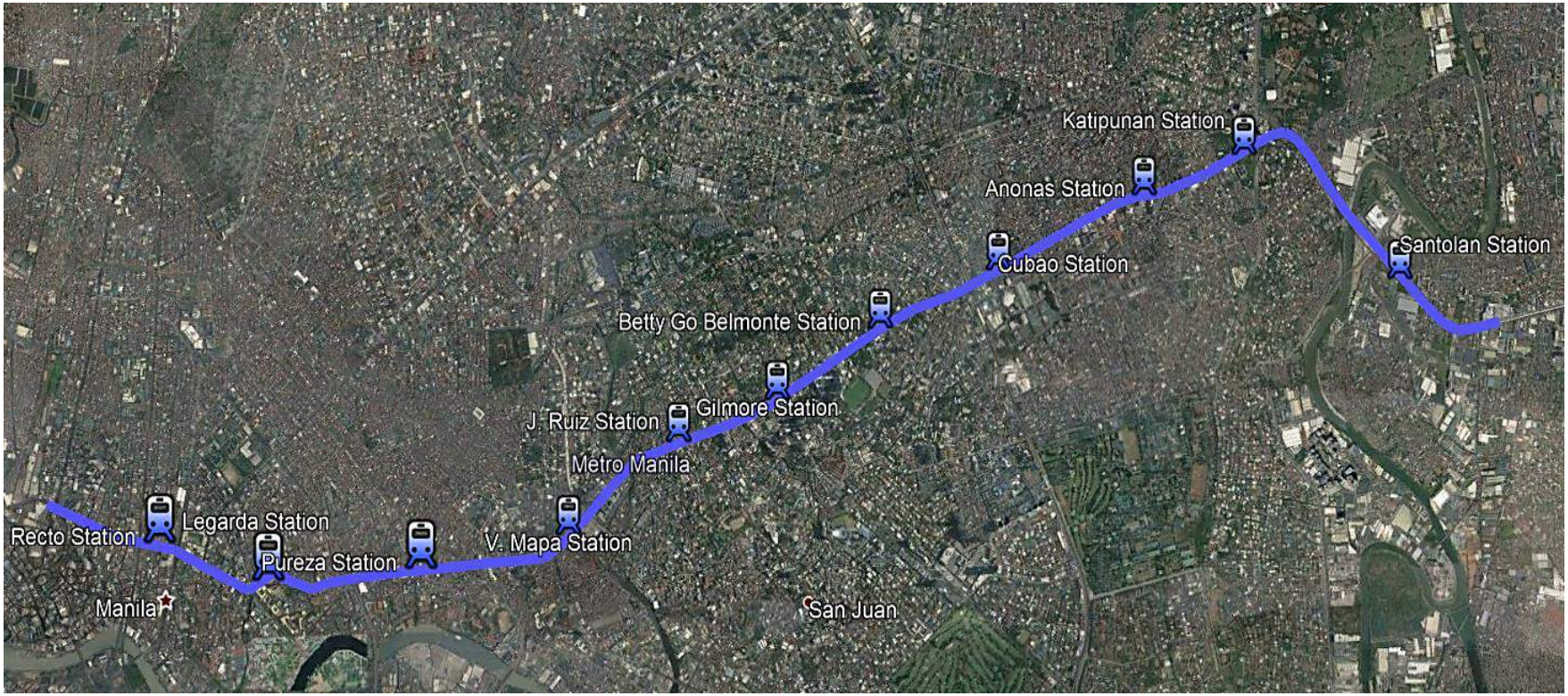


Figure 17. LRT Line 2 Route

Source: Satellite Map – Google Earth // Image Evaluation Team

In a similar but more recent study on mass transportation in Metro Manila focusing on people's accessibility improvement and coverage of rapid transit conducted by the Institute for Transportation and Development Policy (ITDP)[40], the authors conclude that mass transport will have difficulty in areas with low population density. Please refer to ITDP's GIS simulation for the study (Annex 16). This again dovetails with the findings presented in Figure 17 for the case of Betty Go, Gilmore, and J. Ruiz Stations. In addition to the findings, ITDP developed a rating system to assess how many of the residents are near any mass transit for both Manila and Quezon City. The results further help to explain the low patronage of LRT2 at certain stations, as shown below in Table 20.

Table 20. People near Transit Rating for Manila and Quezon City

Urban Area	Country	Total Population	Rapid Transit	Population Within 1 km of Transit Station	Percent of Population Near Rapid Transit (Pct.)	Population Density (Residents/Km^2)	Weighted Density
Manila City	Philippines	1,636,786	Metro	694,830	43%	44,634	114,642
Quezon City	Philippines	2,720,991	Metro	524,431	19%	18,395	34,061
Metro Manila	Philippines	10,447,343	Metro	2,396,036	23%	18, 738	83,794

Source: ITDP / People Near Transit (https://www.itdp.org/publication/people-near-transit/)

It is worthwhile to cite the actual notes from the ITDP authors whose conclusions are identical to the Evaluation Team's findings for LRT2:

> *The City of Manila has a per cent of people near transit (PNT[41]) that is relatively high for a developing-world city, in large part due to the city's relatively small land area and high population concentration. What makes the Manila area an interesting case is that the City of Manila is no longer even the most populous city in the metropolitan area. The neighboring city of Quezon City eclipsed Manila in population in 1995, and now has over a million more residents than Manila.*
>
> *Since 1960, Manila has only grown by about 60%, whereas Quezon City has absolutely boomed, growing by 630% during the same time. While Quezon City is still quite dense by most standards, it is notably much less dense than the City of Manila. While Quezon City is served by Manila's transit system, its larger municipal area and lower density make it more difficult to serve with transit compared to Manila.*
>
> *Quezon City illustrates some of the challenges that rapid urban expansion can pose for ensuring access to rapid transit for urban residents. It is important to note that Manila's high density is mainly due to the large number of informal settlements and slums within its*

[40] Institute for Transportation and Development Policy published a research in October 2016 entitled 'People Near Transit: Improving Accessibility and Rapid Transit Coverage in Large Cities', with Manila and Quezon City being the first case study having mass transportation system, with authors Michael Marks, Jacob Mason and Gabriel Oliviera.

[41] PNT is a rating developed by ITDP for percentage of people near transit.

boundaries, which suffer from overcrowding. No city should aim to be as dense as Manila. The main point is that lower-density development of any form is generally harder to serve with transit. High PNT isn't caused by high population density, but lower density makes it harder to reach a high PNT.

To reprise the main purpose of having a costly mass transport infrastructure that does not normally guarantee return of investment, it is paramount to remember that the very essence of mass transit is to serve the needs of a high-density corridor in order to survive, because a low-density corridor will naturally be at risk of not being sustainable.

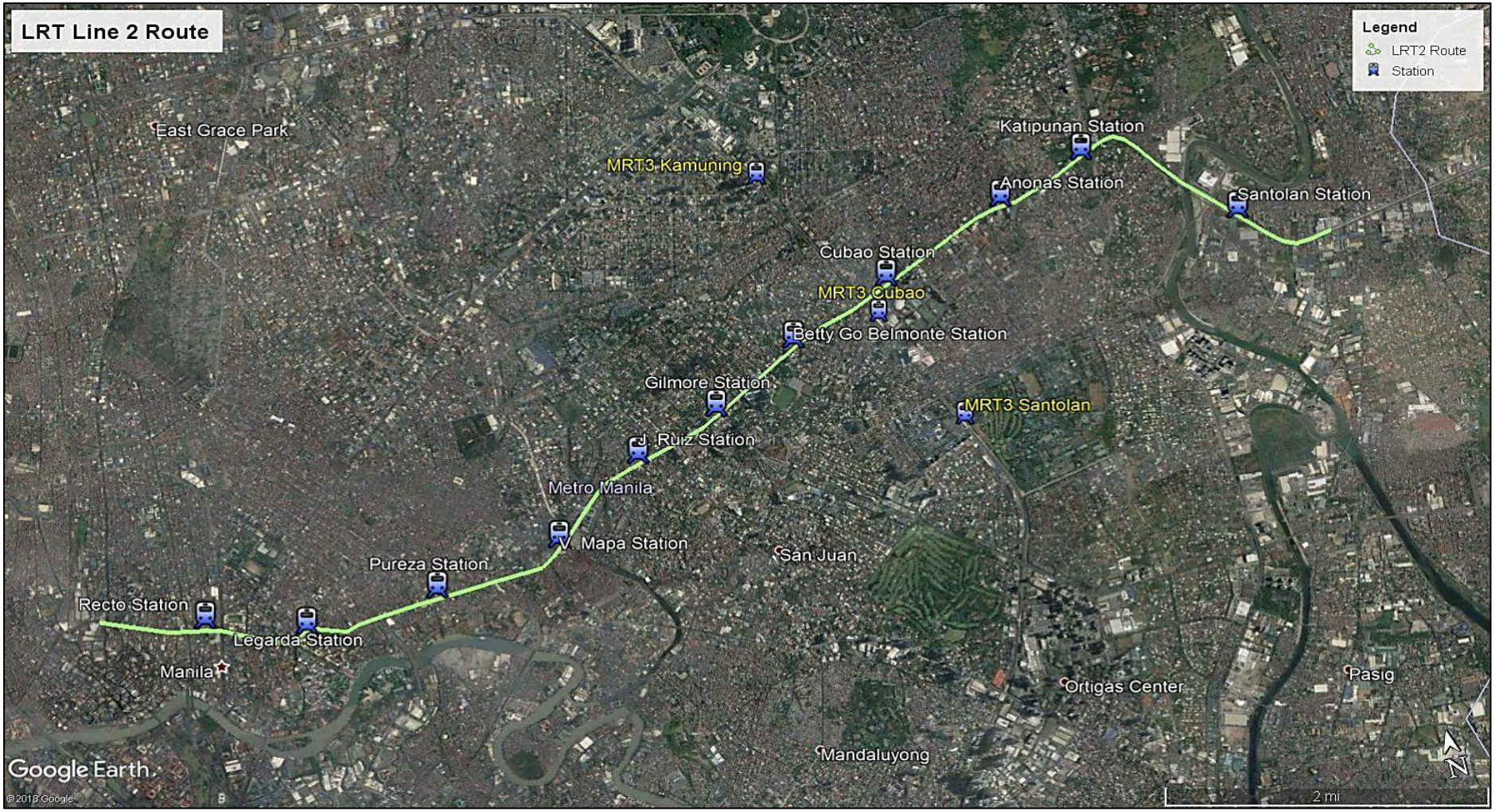


Figure 18. The Urban Density Map of Metro Manila showing Relative Effects on Low Ridership on the Light Rail Transit Line 2

Sources: Satellite Map – Google Earth // Image - Evaluation Team

1.1.6 Transport Hub and Parking Facilities

One indication that transport master plans were not fully considered during LRT2 design is the observed lack of transport hubs to support more and better organized feeder transport. Equally important, park and ride facilities within the transport hubs could have attracted more private motorists to shift to rail rather than fight their way through traffic to reach their destinations. Park and ride facilities existing in many countries are simply paid parking areas having public transport connections that allow motorists going to the city center to leave their vehicles in the parking area and transfer to rail service.

1.1.7 Interface with Feeder Transport

A feeder transport is any form of motorized or non-motorized vehicle that brings passengers (rail riders) to a terminal (station) from a connecting route. Across all stations, the identified feeder transport modes are based only on the conventional vehicle classification familiar to the public. Aside from PUJs, the emergence of TNVS using cars, vans, Asian Utility Vehicles (AUVs), Sport Utility Vehicles (SUVs), and even motorcycle taxis forms part of feeder transport that can serve the needs of LRT2 riders. However, it is difficult to distinguish which among private vehicles are TNVS due to the absence of an identifying mark on said vehicles.

From the Station Observation conducted by the Team (see Part I, Section 3.1.9 above), an inventory of feeder transport was made per station as shown in Figure 19. With each mode corresponding to a specific color, it can be easily noted that PUJs comprise the majority of feeder transport wherein the service route is shown per box. For all other boxes with no visible route especially taxis, tricycles, UV Express and motorcycle taxis, the classification was used for easy recognition.

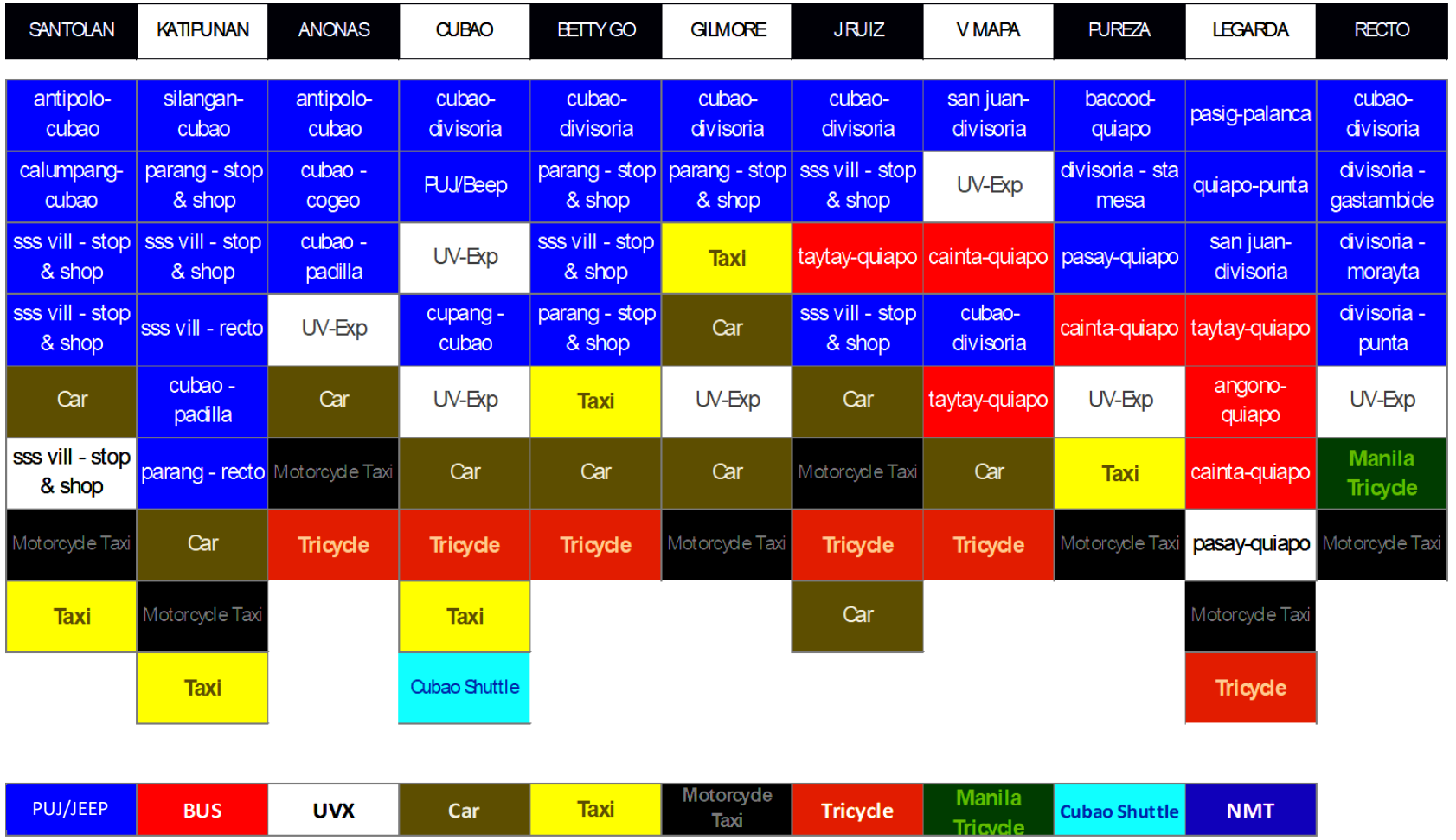


Figure 19. Feeder Transport Interface with LRT Stations

Source: Evaluation Team's Station Observation/ Field Work

Around 46% of respondents from the Impact Evaluation Perception Survey noted that the volume of feeder transport increased after LRT2 commenced operations (see Part II, Sec. 1.1.7), while 44% noted that feeder transport terminals became visible when LRT2 came along. Based on the Station Observation, not all stations have a corresponding feeder transport terminal. Even the Santolan Station has no support facility for a public transport terminal or transport hub to facilitate convenient transfer. A description of individual interface between a station and feeder transport is tabulated in Annex 16.

At any rate, LRT2 stations are supported by an active and sustainable feeder transport system that can facilitate commuter mobility from east to west. Despite being treated as informal and cheap, PUJs can be classified as sustainable in the sense that PUJs have withstood the test of time, since 1945 after World War II (WWII), when the American forces left behind the military vehicle known as "jeep". With just enough financial assistance and institutional support, PUJs have answered the transport needs of the commuting public, even up to the time of the jeepney modernization program over the past three (3) years.

As observed by the Evaluation Team, bus operations cannot compete nor thrive along the whole extent of the LRT2 route due to the prevalence of PUJs plying a road length more fitted for smaller vehicles. Bus operations, however, noticeably serve the Taytay/Cainta – Quiapo route, and converge at the midpoint of the LRT2 route leading to Manila. These are old bus routes that have managed to survive competition from smaller, faster, and more convenient public transport modes.

Quite notable in the feeder transport system are motorcycle taxis which are replicated from other Asian cities like Bangkok. Regardless if legally operated by a transport company, commuters choose the two-wheeler transport service as the practical mode despite numerous accidents related to motorcycles. Motorcycle taxis have a mobile application to handle passenger calls and fare computation. Each passenger is provided a helmet for the whole length of the ride.

In a separate observation and trip simulation, the Evaluation Team noted that the closest competition of LRT2 is the Cubao – Divisoria PUJ route (Figure 20). Taxis and TNVS vehicles are excluded since they are not limited to a specific route, and the fare is significantly higher especially during rush periods. Although not fully comparable with LRT2, the Cubao-Divisoria jeepneys provide the closest comparator mode (Table 21).

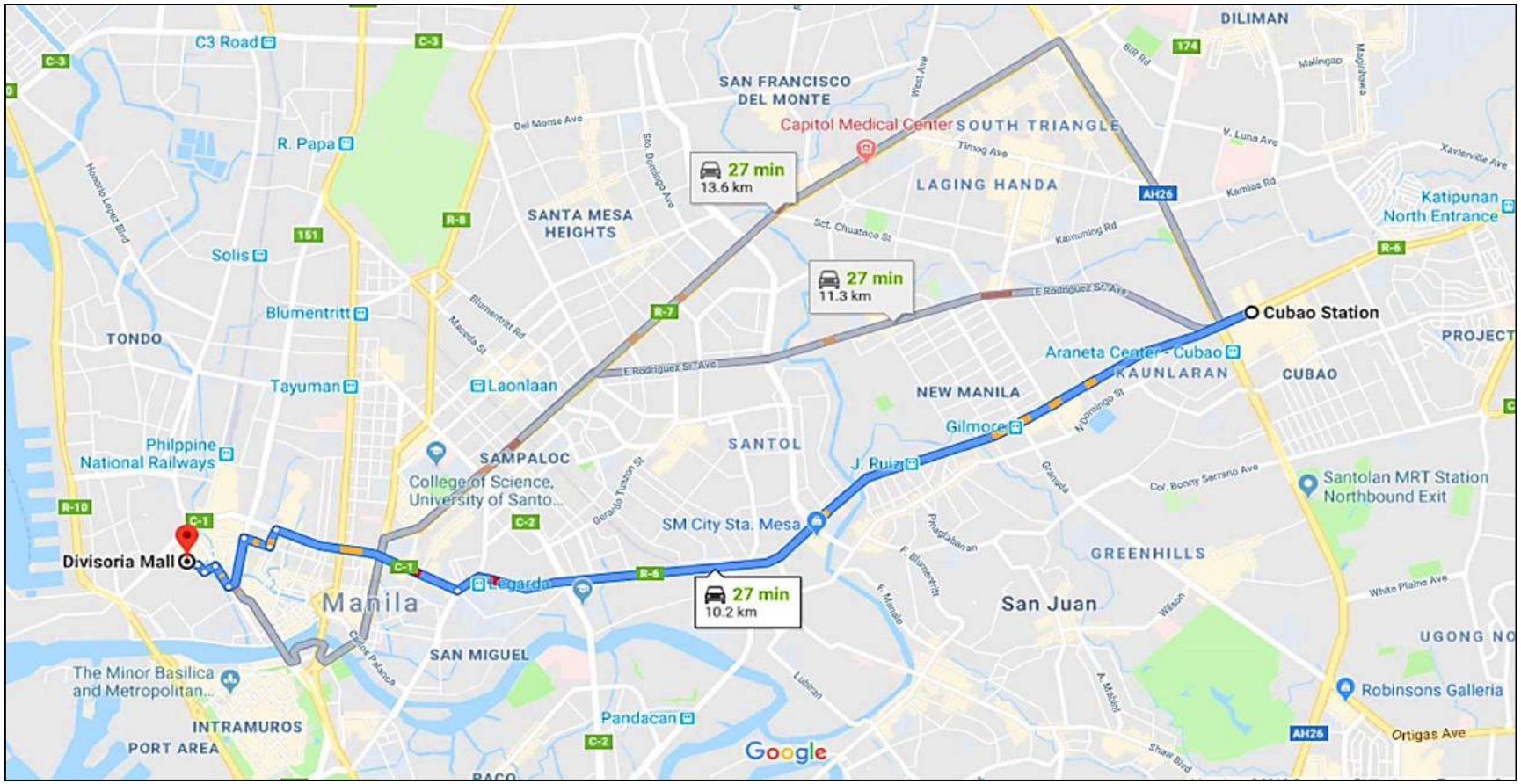


Figure 20. Cubao – Divisoria PUJ Route

Source: Evaluation Team's Station Observation/ Field Work

The aforementioned route is more than one kilometer shorter on the east end and about one kilometer longer on the west end. The route also follows the R-6 Road that is identical to the LRT2 route. Table 21 below illustrates some points of comparison between LRT2 and PUJ services.

Table 21. Comparison between LRT2 and PUJs

Comparators	LRT Line 2	Cubao-Divisoria PUJ
East Endpoint	Santolan	Yale, Cubao
West Endpoint	Recto, Rizal Ave.	Tutuban, Divisoria
End-to-End Fare (PhP)	25	19
Total Travel Time, (Min.)	25 - 27	60 - 90
Boarding / Alighting Level	Ten 3-storey elevated stations, 1 underground station	At grade /ground level (at jeepney stops)
Boarding / Alighting Points	11 stations only	Anywhere along the 12.7km route
Congestion (On A Typical Day)	None	Normal to worst
Legality of Operation	Government operated	Prone to *colorum*, militant protests
Features	Fastest mode, air conditioned, passenger trip information, direct access to some malls, built-in retail shops, unaffected by flood, skyline view	Iconic, colorful, diesel-fed surplus engine, ambient air, street scene/view, no operations during flood

Source: Evaluation Team's Station Observation/ Field Work

The Cubao – Divisoria route is believed by most of the PUJ drivers interviewed to be more than five (5) decades in existence. The PUJ in its early years began commercially operations only after WWII, while Divisoria (or *dividing line* between the Spanish communities and the non-Christian Chinese communities) can be traced back to the Spanish colonial era. Divisoria flourished commercially with the establishment of Chinese communities, and until the present day, the area continues to be a hotspot for business and retail supply. This is a good baseline to explore potential innovations for LRT2, if the west extension project will start soon. This will be discussed in brief in the recommendation at the end of this section, and will be discussed in more detail in Section 2 of this Report.

1.1.8 Budget

Actual total project cost was PhP 29.501 billion (Table 22). The breakdown of project cost items, in Figure 21, shows that the depot had the biggest share at more than half of total expenditures. This is because it also includes part of the cost in all the Contract Packages 1-4 – including supplies, equipment, materials and structures. The rolling stocks account for only 8.13%. The rest of the detailed costs is shown on Table 22, including the cost of each station.

The actual cost of the project became higher due to several factors. The project experienced some impediments especially in RROW acquisition that translated among others to additional interest on loans.

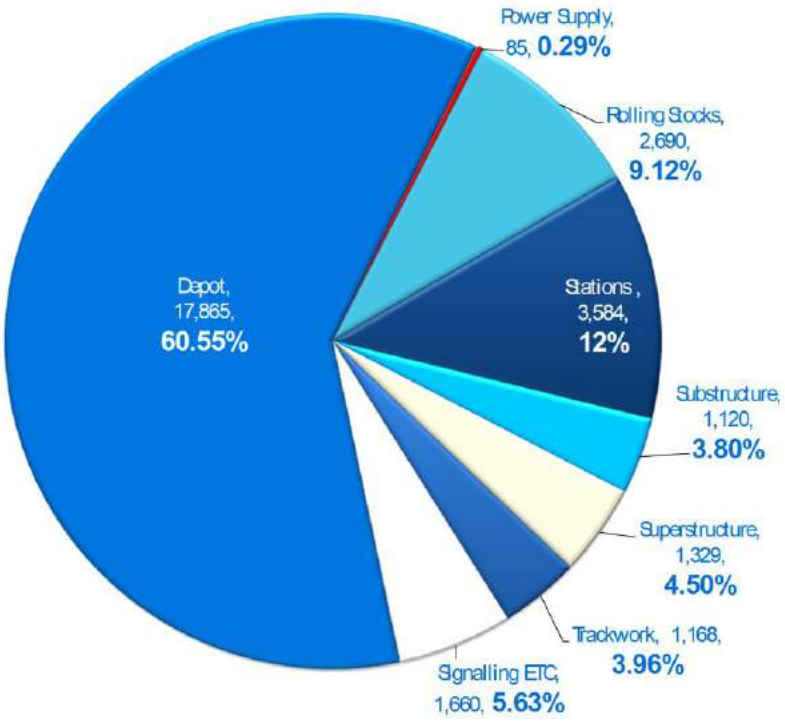


Figure 21. Breakdown of Cost Items for LRT2 Project (Billion, PhP)

Source: LRTA / Evaluation Team

Table 22. Summary of Actual Project Cost

No.	Cost Item	Unit	Qty	Overall Cost	Percent of Total	Cost / Unit
1	Stations					
	Katipunan	sq.m.	13,596.00	785,427,876.18	2.37%	57,769.04
	Santolan	sq.m.	3,708.00	193,183,716.71	0.58%	52,099.17
	Anonas	sq.m.	3,517.00	229,397,352.51	0.69%	65,225.29
	Araneta Center-Cubao	sq.m.	7,516.00	417,394,981.19	1.26%	55,534.19
	Betty Go-Belmonte	sq.m.	3,378.00	232,549,129.44	0.70%	68,842.25
	Gilmore	sq.m.	3,412.00	238,075,839.96	0.72%	69,776.04
	J. Ruiz	sq.m.	3,123.00	231,076,438.58	0.70%	73,991.82
	V. Mapa	sq.m.	3,490.00	232,557,722.19	0.70%	66,635.45
	Pureza	sq.m.	3,330.00	237,962,972.88	0.72%	71,460.35
	Legarda	sq.m.	3,122.00	242,690,895.30	0.73%	77,735.71
	Recto	sq.m.	14,666.00	544,151,125.74	1.64%	37,102.90
	TOTAL		62,858.00	3,584,468,050.68	10.83%	
2	Viaduct (Substructure)	pc	535.00	1,120,302,092.51	3.39%	2,094,022.60
3	Viaduct (Superstructure)	km	22.99	1,328,515,185.88	4.02%	57,774,089.41
4	Trackwork	km	34.96	1,167,748,264.67	3.53%	33,404,474.21
5	Signaling, OCS, Walkway and Power Cables	km	34.96	1,660,211,430.13	5.02%	47,488,885.30
6	Depot, Inclusive of all P1, P2, P3 and P4 Supplies, Equipment,	l.s.	1.00	17,864,585,396.04	53.99%	

No.	Cost Item	Unit	Qty	Overall Cost	Percent of Total	Cost / Unit
	Materials and Structures					
7	Power Supply Equipment	l.s.	1.00	85,476,724.95	0.26%	
8	Rolling Stocks	nr	18.00	2,690,445,835.97	8.13%	149,469,213.11
9	Consultancy Services	-	-			
10	Taxes	-	-			
GRAND TOTAL				29,501,752,980.83	100%	

NOTES:

a. Table was based on LRTA Final Report.

b. Some unit measures and data entry from LRTA records have minor errors and were corrected in this list.

c. Consultancy Services and Taxes were listed but no assigned value was given.

Source: LRTA

1.2 Conclusions and Recommendations

Based on the foregoing findings, conclusions and recommendations regarding the planned vs. actual LRT2 Project design and implementation capacity to deliver planned services will be provided below. Conclusions and recommendations pertaining to the project budget are consolidated in Sec. 6.2 and 6.3 on financial performance.

1.2.1 Conclusions

Planned implementation capacity

As earlier noted, the route considerations of LRT Line 2 were based on R-6 which connects Manila to Rizal through Quezon City, San Juan, Pasig, Marikina, Cainta and Antipolo. In the 1991 FS, Divisoria was initially considered as the west endpoint and Katipunan Avenue as the east endpoint. Although Burnham did not assign R-6 as a "student transport corridor" when he conceived the Manila Plan in 1905, both east and west endpoints of R-6 developed into institutional zones for higher academic pursuit after WWII, including some really old schools.

Given this reality, the LRT Line 2 was planned and built to cater to the need to travel from east to west via R-6 Road in a fast, safe and convenient manner to complement and not compete with public and private transport.

During the planning for LRT2, with close to half of the riding public being students, it was already a foreseen reality that ridership will wane during school breaks, holidays, weather-related postponement of classes and similar events. On the other hand, the "K-to-12 Program" that was implemented gradually starting 2013 across the country, might have affected LRT2 ridership when schools adapted the new system. This effect is rather temporary until all the academic institutions completely adhere to the program. Upon full implementation (targeted in 2019), schools would have two more years in their secondary education program. The long-term benefit for LRT2 would be perennially more school attendance-related trips.

The plan for full compatibility in the FS of LRT Line 1 with LRT Line 2 was a practical solution to simplify maintenance, repair, and procurement of parts and components. There are two (2) angles of good judgment to consider in this scenario. Since LRT Line 1 was the "pilot mass transit" project in the Philippines, it would be inevitable to see some unexpected impractical decisions from the past. Full compatibility would not be beneficial if the standard reference (being Line 1) was discovered to be faulty.

Actual implementation capacity

Despite having the lowest ridership among the three elevated urban rail systems, LRT2 was not built to compete with either the LRT Line 1 or MRT Line 3. Rather, it was built to complete the urban rail system plan to ensure seamless connectivity in the most efficient means. This principle applies even to future mass transit systems.

The R-6 Road being the LRT2 route has a weakness at midpoint, as explained earlier in this Part II, Section 1.1.5 (Service and Impact Area). The midpoint of the LRT2 route has low density communities spanning an area of more than three kilometers in diameter. The low density means larger lot sizes and affluent communities with less requirement for public transport including mass transit.

When LRT2 is considered, the fare and travel convenience in comparison with other modes like UV Express or PUJ is almost equal. For low wage earners with budgeted transportation allowance, the cheapest alternative plying the same route would be the Cubao-Divisoria PUJ route which costs 25% less.

The failure to build the rail line up to Tutuban in Divisoria reduced the ridership by an estimated fourteen percent (14%)[42]. Building up to Tutuban might have paved the way to include a commercial section in the trainset; possibly, one that can multiply socio-economic impact including business growth opportunities. If it was built, Divisoria and Recto Stations would be getting the highest ridership all year-round, which might offset the ridership impact of academic vacations and holidays.

The lack of comprehensive planning affected the ridership. For motorists to favor rail over road, a transport hub should have been provided in both east and west endpoints. The connecting trips were left to the private transport service providers whose plans are generally fragmented and limited to their own subsector, instead of viewing the entirety of the transport system. A transport hub can attract connecting routes (not exactly vehicles) to facilitate access to LRT2. This initiative can be a good reason for car owners to shift from road to rail.

A transport hub is not limited to public transport alone. A 'Park & Ride' feature can increase rail riders who do not want to drive all the way through the traffic when there is a faster and more convenient alternative.

The significant delay in LRT2 implementation exposed the project to higher real estate prices, as well as higher interest payments. During the period of this delay, however, developments in train and transport technologies also took place, giving the government better choices. The rolling stocks of LRT2 are bigger and better than previous versions. Along with this choice came incompatibility in equipment, track, operations, and operating system. A common platform would be the best solution to achieve connectivity across mass transits.

Currently, LRT2 has an advantage over LRT Line 1 and MRT Line 3 in terms of trains and capacity, operations, ticketing system, equipment maintenance, passenger information features, and even convenience features in the stations. This conclusion is based on the following observations:

[42] Divisoria is equated to Araneta Center - Cubao Station being a commercial hub which has a good share of 14% in the overall ridership. For a highly commercialized retail supply hub like Divisoria, the 14% estimate is actually low.

a. Trains and Capacity. In almost 15 years since it started operations, the LRT2 trains seldom experienced breakdown problems, malfunction, or maintenance-related issues. This is attributable to the thorough daily maintenance routine performed by LRTA. Please refer to Table 38 (preventive maintenance routine) of this Final Report. On the other hand, low ridership is also a key factor as it allows more maintenance time and spare train sets in the early years of operations that resulted to 'good housekeeping' of the rolling stocks.

b. Ticketing System, passenger information and convenience features. LRT2 being the 'youngest' among the urban rails in Metro Manila, has gone through the process of ticketing evolution from the usual plastic cards sold at counters, to interactive ticket vending machines in single journey or stored value tickets. It has also adopted the BEEP system that can be used to pay not only LRT2 fares. Moreover, LRTA was first to implement the technology-driven passenger assistance railway display system in 2017 and re-branded it two (2) years after as "TUBE" (a real-time passenger information system) to fit the majority of its passengers who are students. A similar version was also observed in MRT3 and LRT1 but does not compare with the quality level of the LRT2 version of TUBE. It is also planned that ticket sales can be made on-line using mobile devices which can potentially reduce plastic consumption by LRT2. Future plans will cover additional non-rail revenues, public information, and periodic on-line surveys or feedback system.

A comparison of the actual situation of three (3) Metro Manila rail services in terms of average annual ridership, average train speed, average travel time per km, passenger per square meter, average number of operation interruption/ train breakdown per year, is shown below.

Table 23. Basic Comparison of Elevated Mass Rail Transits

	LRT1	LRT2	MRT3
Start of Operations	1984	2004	2001
Daily Average Ridership	400,000 [1]	184,476 [2]	389,590 [3]
Track Length, km	19.65	13.8	16.9
Operating Coaches	45-51[4] (or 14 train sets)	32 (or 8 train sets)	44 (or 15 train sets)
Train speed	Max 80	Max 80	Max 80
Breakdowns	see below [5]	3 [6]	see below [7]
Passenger density inside the train, person/sqm.	8	7	7
Note: The number of operating cars or coaches for LRT1 and MRT3 can vary widely since the coaches can be detached from the train sets to be re-attached to a different train set. LRT2 coaches on the other hand are fixed, so the whole train set will go to the depot even if only one of the 4 coaches has a problem. For a more detailed technical comparison, please refer to Annex 12 - Comparison of Basic Specifications of LRT1, LRT2 and MRT3			

Sources/Notes:

1 LRTA website /Wikipedia
2 10-year ridership average, 2009-2018
3 LRTA website /Wikipedia
4 LRTA website – please refer to note above
5 Due to its length of operation, numerous maintenance and rehabilitation efforts have been made including additional investment on new trains
6 As recently noted in this study

7 MRT3 had various maintenance services providers (of lesser capabilities) in the past 12 years that resulted to numerous malfunctions and breakdowns. The current service maintenance was awarded back to Sumitomo being the original partner.

1.2.2 Recommendations

1. LRTA should expedite the completion of the Masinag extension line, if possible, within the year (2019). As discussed in related studies, said extension will open up a new frontier in terms of the LRT2 market: the dynamic and growing settlements located in the eastern portion of Metro Manila. The backward and forward socio-economic linkages that the Masinag extension can engender are substantial. The extension will support not only education-related trips but also local commerce and trade, as indicated below.

2. LRTA should expedite the construction of the Tutuban extension line in the next three (3) years not only to boost ridership but also to capitalize on the "business rail line concept" identified initially in this Impact Evaluation Interim Report. LRT2 has a potentially enormous and inclusive/ broad-based commercial impact anchored on Divisoria as major trade hub in Metro Manila, following the small business entrepreneurs' concept to be discussed in Section 9.1 below.

3. LRTA should consider building the extension to Port Area as part of the development pipeline for the next six (6) years. This recommendation is closely linked to the previous one above. LRT2 has the potential to transform the entire R-6 corridor to become a well-integrated trade zone, where goods coming from the ports can be efficiently transported as far as eastern Metro Manila. Conversely, markets for products from the eastern portion can proportionately expand.

4. LRTA should build a major transport hub (next one (1) to two (2) years) in both east and west endpoints to attract motorists to avail of "Park & Ride" facilities, or even to totally shift away from driving to commuting, with rail as major mode ("road-to-rail" shift). Financing for a transport hub need not always come from the government. Income potentials from transport hub operations are significant enough to attract private investors.

5. Beyond building just rail extension lines, LRTA should consider investments based on a more comprehensive, multi-year rail master plan that can be used as a general development reference/ forecast to incorporate environmental, commercial, social, economic and developmental considerations (next two years). *Stakeholder consultations suggest that such plans should be legislated.* The general concept of the master plan is to forecast future private development initiatives that will affect government infrastructure projects (not just mass transport) and maybe hamper planned projects along the way. A very costly lesson learned from LRT2 is the significant delay that resulted to a disproportionate budget augmentation to cope with rising prices.

6. LGUs should impose and implement more stringent regulations on land use and zoning (starting 2019). Real estate development did not flourish because of huge funding requirements alone. The other contributing factor was the absence of zoning as regulatory instrument. The absence of zoning allowed pristine properties to become supermarkets or malls without proper transport and traffic studies, and causing environmental degradation along the way. Various landmarks and people's historical/ cultural treasures had been sacrificed in exchange for benefits to a few business groups.

7. The concerned government agencies must invest on knowledgeable, incorruptible, and technically trained leaders to manage city or metropolitan planning (next two years). One of the major causes of congestion and chaos across cities is incompetence. Cities will perish if incompetence is allowed in the leadership; it will always result to disarray and conflict as

implementation of plans will become very costly. Along the LRT2 route alone, countless condominiums, schools, malls and other traffic generators stand side-by-side – slowing down general mobility when these developments should have been regulated by existing laws. Many of the provisions in the local building code no longer apply, and cities absorb negative impacts.

8. LRTA should conduct an in-depth fact-finding activity (within 2019) at the midpoint of the LRT2 route within the three-kilometer diameter with Gilmore Station at the center. There are still little-understood factors resulting to low ridership other than low population density.

9. LRTA should develop a dynamic information and education campaign (IEC) portfolio including passenger interaction system to promote the use of rail via on-line facility (within 2019). Although the mobile information infrastructure is already in place, LRTA still needs to exercise creativity to innovate and maximize resources on hand. There are various means to reach passengers since there is an on-line service across all stations. Promotions may be effective if these are viewed on-board the train. But these can be doubly effective if passengers will be able to pass on information to their respective social circles, through the convenience of mobile devices. Consider to incentivize passengers for corresponding effort/s like promotion, patronage, suggestions, and volunteerism.

10. LRTA should consider a comprehensive rebranding (next year) of the LRT2: ranging from aesthetics, to visuals, graphics including standards, sanitation, quality of service, maintenance, station upkeep, and passenger care – to create a different atmosphere and make the riding experience considerably more enjoyable.

2. Right-of-Way (ROW) Acquisition

To follow through the findings in Part II Section 1.1 on planned versus actual project implementation, an impact study must identify and analyze major factors found to have constrained project implementation, because any significant increment to the project implementation period will inevitably set back impact generation, and at the same time raise project costs through inflation, interest charges, and/or foreign exchange fluctuation over time. Section 1 above highlighted that ROW issues served as one of two (2) major causes of delays in project implementation. In fact, one of the key assumptions in the Updated Project Logical Framework is: *ROW acquisition completed by 2003*, on the same year that the closing date for the loan was officially recommended [43]. The consequences of implementation delays will be manifested in the updated/ end-of-project/ ex-post Project Cost-Benefit Analysis, in terms of dampened rates of return.

Since the time LRT2 was implemented, key steps have been taken by both Government and international funding agencies to more effectively address ROW policy and procedural issues. Republic Act (RA) 10752 (2015) repealed RA 8974 (2000) to facilitate ROW acquisition for infrastructure projects [44]. This section of the evaluation report seeks to contribute to the growing body of knowledge, by synthesizing relevant findings from Key Informant Interviews (KII), grounded by a review of project and legal/ policy documents. This way, lessons can be drawn to help eventually reduce if not avoid implementation delays in future projects. The following "rough sketch" on ROW is far from being an exhaustive treatise, as the Evaluation Team does not include a specialist on ROW.

2.1. Findings

2.1.1. Challenges in LRT2 ROW Process

According to the implementers of LRT2 as gathered from KIIs, one of the major causes of project implementation delays was ROW acquisition. This issue is also reflected in project reports.

The main challenge in LRT2 implementation was Road Right of Way especially involving the stations and depot (KII MMDA). Preparatory work for LRT2 ROW required a tedious process. Some property owners were difficult to negotiate with (KII DOTr): raising selling price; specifying requirements as to relocation sites; or even not wanting to move away ("territorial instinct").

Although a consultant was hired, right-of-way acquisition remained to be a cause of delay. It took too long to document and negotiate with land owners. Some family members did not want to sell; while others changed their mind (KII LRTA).

[43] ICC Secretariat, Project Evaluation Report on the Proposed Extension of Closing Date of JBIC Loan No. PH-185 by 18 Months and Increase in Project Cost by P3.6 Billion for the Metro Manila Strategic Mass Rail Transit Development (Line 2) Project (Attachment 1), 17 November 2003.

[44] Republic Act (RA) 10752: An Act Facilitating the Acquisition of Right-of-Way Site or Location for National Government Infrastructure Projects, 27 July 2015. It repealed RA 8974 (7 Nov. 2000) of the same title.

The ICC recommendation in Nov. 2003 to extend by 18 months the closing date of JBIC Loan No. PH-P185 cited the acquisition of ROW as a major cause of delay affecting Packages 1, 2 and 3 (LRT2 depot; substructure; and superstructure, respectively).[45] Cost increased by 54.3% (or PhP 1.82 billion), owing to changes in the method of property valuation.

2.1.2. LRT2 Design linked to ROW

Not only was the ROW acquisition process in itself tedious; it also entailed modification in the LRT2's original station alignment and length, thereby necessitating that more time be added to the project implementation period.

The configuration and location of stations were basically determined based on the availability of right-of-way (KII MMDA). Alignment was finalized after the planned station in Quezon Institute (QI) on E. Rodriguez Ave. was dropped, because the agreement between QI and the land donor did not allow such use (KII LRTA).

The preceding statement should be appreciated in light of the three alternative routes considered during project design, as discussed in this Report.

At the east-end of LRT2, LRTA was unable to consummate an agreement with the family owning farmland located beyond the present terminal in Santolan going to Antipolo (KII DOTr). Thus, the east-end terminal now lies along Marcos Highway. At the west-end, the Divisoria area has a large number of small businesses which required cautious treatment as to ROW (KII JICA).

According to the ICC Project Evaluation Report (2003), design changes also resulted from ROW issues such as: re-design of the Katipunan Station to conform with available space; and relocation of the Santolan Station from Marcos Highway to the Depot Area. Attachment 2 of the ICC recommendation quantified the magnitude of delays as follows:

- Delay in giving site for the whole depot area to the contractors resulted to time extension of 336 days; and
- Delay in giving site/ work area to the contractors especially at Recto, Legarda and Katipunan areas resulted in five-time extensions.

2.1.3. Enabling Legislation

RA 10752 (2015) specifies the modes of acquiring land based on ownership or how the land was acquired by the owner, i.e., (i) land granted through Commonwealth Act 141 (Public Land Act); (ii) land owned by government or government-owned corporation; or (iii) privately-owned land. The Implementing Rules and Regulations (IRR) were approved in May 2016. The modes include donation; replacement of structures, crops and trees; negotiated sale; or expropriation.

The Act spells out the procedure for deciding on a mode of acquisition given certain conditions such as legal ownership of the land, or the landowner's refusal of a negotiated sale. The Act also includes payment schemes for each mode, covering taxes and other fees as well. Figure 22 below, entitled RA 10752 ROW Acquisition at a Glance, diagrams the process of land acquisition depending on ownership.

[45] ICC Secretariat, Project Evaluation Report, Nov. 2003.

2.1.4. Institutional Framework

RA 10752 identifies the range of stakeholders that serve as "key links" in the chain required to make the ROW process work effectively. The core stakeholders are the project implementing agency and the project-affected persons. The assortment of other equally important institutions includes civil courts/ courts of law, LGUs, the Bureau of Internal Revenue (BIR), Housing and Urban Development Coordinating Council (HUDCC), and National Housing Authority (NHA). These stakeholders need to share a common vision and understanding of the project and the attendant ROW essentials. The effectiveness and timeliness of the ROW process will be decided by the "weakest link" in the chain of stakeholders. For instance, according to Key Informant Interviews:

Civil courts can facilitate project implementation by expediting ROW legal cases (KII LRTA).

Box 1. Persistence of ROW Issues

Back in the 1990s, the foremost problem causing delays in the implementation of our infrastructure projects was right of way (along with illegal occupants) in project sites. One would think that, more than two decades later, we would have already found a way to deal with the issue and keep it from causing wasteful delays in public infrastructure projects.

No such luck. To date, right of way problems remain high on, if not at the top of, the list of obstacles to prompt implementation of projects under the government's ambitious "Build, build, build" program. I'm told, for example, that the hugely important NLEx-SLEx connector road—the project that would directly link the North Luzon and South Luzon Expressways and thereby permit travelers between the north and south of Metro Manila to avoid the notoriously congested Edsa and C-5 roads—has hit a snag, because private property owners along the way have been holding out and are refusing to give way.

Source: Cielito F. Habito, "Right of Way in the Way" in Phil. Daily Inquirer, Oct. 26, 2018

2.2. Conclusions and Recommendations

A number of conclusions and recommendations are proposed for consideration below.

2.2.1. Conclusions

2.2.1.1 Project Readiness

RA 10752 in principle and in practice institutes measures and imposes deadlines to facilitate the ROW acquisition process, including Sec. 10 entitled: Appropriations for Acquisition of Right-of-Way Site or Location for National Government Infrastructure Projects in Advance of Project Implementation (underscoring supplied). It prescribes deadlines (performance standards) for specific steps in the ROW process to be completed. For instance, Sec. 6 (3): *If within 7 working days after deposit to the court of the amount equivalent to the sum under subparagraphs (a) (1) to (a) (3), the court has not issued to the implementing agency a writ of possession for the affected property, the counsel of the implementing agency shall immediately seek from the court the issuance of the writ of possession…* Here, the vital role of courts is highlighted.

The legislative framework governing ROW acquisition is complemented by Executive issuances. In line with the State policy of promoting optimum utilization of public resources consistent with priorities, the Policy Guidelines and Procedures for the Formulation of the Three-Year Rolling Infrastructure Program (TRIP) requires implementing agencies to identify in advance preparatory activities including ROW acquisition that will require a budget appropriation.[46]

[46] DBM-NEDA, Policy Guidelines and Procedures for the Formulation of the Three-Year Rolling Infrastructure Program (TRIP), Joint Circular No. 2016-01, 29 January 2016.

Notwithstanding time-bound legal and executive provisions, delays in land acquisition still occur. ROW acquisition usually eats up more time than planned. Being a nagging issue not only in LRT2 but in many other infrastructure projects, ROW acquisition should be addressed as early as possible in the life of a project (Box 1). The impact evaluation key informants noted with certainty that ROW acquisition issues will be avoided or mitigated if more effectively dealt with right at the feasibility study preparation stage.

One way to address the issue of RROW is that it must be settled before any project is implemented (MMDA). Secure ROW is now a requirement of the Investments Coordination Committee for approving project proposals. Multilateral development banks (MDBs) will not support infrastructure projects if ROW is not yet secure (DOTr).

At this point, we can draw two (2) conclusions: (1) the lead time (around 12 months) currently provided in policy and operational frameworks for ROW acquisition remains inadequate; and (2) a longer lead time is a necessary but insufficient condition for effective and timely ROW acquisition: all ROW stakeholders must perform their assigned roles more effectively to ensure that the entire ROW process is workable.

The aforementioned Policy Guidelines and Procedures for the Formulation of the TRIP require implementing agencies to distinguish projects based among others on project support requirements including ROW acquisition. Project readiness requires that where applicable, projects must have a Resettlement Action Plan (RAP) with no issues related to ROW acquisition. The Policy Guidelines allow implementing agencies about 12 months to settle right-of-way issues/ acquisition. Agencies are asked to indicate preparatory activities such as ROW acquisition that will require budgetary support.[47] From the foregoing, the following conclusions might be made: (1) *A major cause of project implementation delay can be avoided when projects are queued for funding strictly based on fully resolved ROW and related issues (as applicable to a particular project).* (2) *To fully resolve ROW issues, more lead time than currently allotted is needed.*

2.2.1.2 Institutional Framework

Courts play an important role under Republic Act (RA) 10752. Apart from the above example in Sec. 6 (3), the Law assigns to courts other responsibilities as key player in the entire land acquisition process. The same section in the RA provides that: *Upon compliance with the guidelines…, the court shall immediately issue to the implementing agency an order to take possession of the property and start implementation of the project.* And that: *In the event that the owner of the property contests the implementing agency's proffered value, the court shall determine just compensation to be paid to the owner within 60 days from the date of filing of the expropriation case.*

Similarly, LGUs are key stakeholders in land acquisition. The same Sec. 6 (3) provides that: *In provinces, cities, municipalities and other areas where there is no land classification, the city or municipal assessor is mandated, within the period of 60 days from the date of filing of the expropriation case, to come up with the required land classification and the corresponding declaration of real property and improvement for the area.*

Sec. 6 (3) further provides that: *In provinces, cities, municipalities, and other areas where there is no zonal valuation, or where the current zonal valuation has been in force for more than 3 years, the Bureau of Internal Revenue is mandated, within the period of 60 days from the date of filing of the expropriation case, to conduct a zonal valuation of the area.*

[47] DBM-NEDA Joint Circular No. 2016-01 dated 29 January 2016.

Where there is relocation of informal settlers, RA 10752 says that: *the Housing and Urban Development Coordinating Council (HUDCC) and National Housing Authority (NHA), in coordination with LGUs and implementing agencies concerned, shall establish and develop resettlement sites for informal settlers, including provision of adequate basic services and community facilities, in anticipation of informal settlers that have to be removed from the right-of-way sites or location of future infrastructure projects*.

2.2.2. Recommendations

Impact evaluation findings and conclusions suggest the following four broad recommendations, which can be considered individually or in combination with each other. These recommendations are proposed for consideration by DOTr, NEDA and LRTA for future rail projects.

2.2.2.1 Land Banking: Towards Plan-Based Land Acquisition

Some key informants suggested land banking as an option to help reduce ROW-related project implementation delays. Generally, land banking is the practice of buying land as an investment, holding it for future use, and making no specific plans for its development. In the context of this evaluation study, however, land banking can be re-defined as acquiring land in anticipation of specifically planned rail projects, as discussed with some key informants.

Land banking based on a multi-year transport master plan will help future similar projects avoid the same ROW delays (LRTA).

It should be noted, however, that other informants were opposed to the idea of land banking as stated below:

Land banking (excess condemnation or "taking more land than is actually used to meet public purpose") is not practical because: (a) there are no funds to spare; and (b) once property is acquired without a ready project, it becomes vacant public land and attracts squatting by informal settlers. ROW acquisition cannot be granted/ funded if there is no "real project". It is not possible to acquire land without a project (DOTr).

In other countries, acquiring land in advance of project implementation is practiced but necessitates a comprehensive transport master plan, as mentioned by impact evaluation informants. Stakeholders consulted suggested that transport master plan/s be legislated. The master plan will identify future locations where rail projects will be implemented, paving the way for the earlier start of the process of land acquisition. In the Philippines, a policy shift will be required.

Examples of long-term studies and master plans that could be used at least as initial basis for a land banking policy, i.e., to acquire land way in advance of project implementation, will include the SIRNMM[48], Dream Plan for Metro Manila, and the MMETROPLAN – which identify, among other infrastructure, rail projects proposed for the longer-term planning horizon.[49] Another recent

[48] JICA and DOTr, Study on the Standardization for Integrated Railway Network of Metro Manila (SIRNMM), March 2001.
[49] Freeman Fox and Associates, MMETROPLAN Final Report, 1977 and JICA, Dream Plan for Metro Manila, June 2014.

framework for possible land banking will be the Preparatory Study for LRT Line 2 Extension Project which discusses planned rail projects illustrated in Figure 51 below.[50]

Table 24 provides a rough comparison between the existing project-based land acquisition, and plan-based land acquisition being proposed to be explored by NEDA, DOTr and LRTA.

Table 24. Land Acquisition Modalities

Modalities and Comparators	Project-Based Land Acquisition (current)	Plan-Based Land Acquisition (alternative)
1. **Timing of budget allocation**	Time of approval of specific rail project	Time of approval of plan defining upcoming/ future rail projects
2. **Major advantages of modality**	Certainty of purpose and scope of land acquisition	More lead time for land acquisition
3. **Major risks of modality**	Delays in project implementation in context of available time to complete the process Resulting delays impact on cost escalation due to inflation, higher amounts payable for interest charges; and foreign currency exchange risk.	Change in Government priorities over time could mean that some or all of land acquired might not, after all, be required for construction Illegal, opportunistic occupancy of acquired land (public land) Lack of budgetary resources for early land acquisition

Source: Evaluation Team (basic information from Republic Act 10752)

The above-mentioned unintended consequence of acquired land attracting informal settlers can be pre-empted by the implementing agency following the same principle behind Sec. 11 of RA 10752. The implementing agency can proactively prevent the construction or issuance of any building, construction, development or building permit contrary to the approved master plan/ transport plan in which the anticipated rail project is identified.

2.2.2.2 ROW-Focused Technical Assistance

In furtherance of the key informants' view that ROW should be more effectively resolved at the feasibility study preparation stage, the implementing agency should ensure that the following specialists will be included in its team of project consultants:

(i) **ROW Acquisition Specialist/s** whose main responsibilities will be to identify and locate the landowners whose land and/ or other assets will be affected by construction; negotiate towards a mutually acceptable acquisition mode (donation, negotiated sale, or expropriation – see diagram in Figure 22 below); and prepare the necessary documentation; and

(ii) **Accredited Appraiser/s** who will compute the costs to be involved in land acquisition, replacement of structures, crops or trees, as well as resettlement of informal settlers, if any. At times, the above tasks of the ROW specialist are lodged with the Social Impact Assessment (SIA) Specialist. However, documentation related to ROW acquisition requires someone knowledgeable on laws, policies, and/ or other legalities beyond the SIA's scope of work. Documentation may be handled by the legal department of the Implementing Agency.

[50] JICA, Preparatory Study for LRT Line 2 Extension Project Final Report, October 2011.

Once the strip map or layout of the project site is completed, the ROW Specialist will locate the affected assets and their respective owners, and secure other pertinent information from the Register of Deeds. He/she will then classify the assets according to the manner by which these were acquired as specified in RA 10752. This information will be superimposed on the strip map to ensure that all properties have been accounted for. At the same time, the ROW Specialist will identify the mode of acquisition to be applied based on RA 10752. The ROW Specialist will schedule meetings with land/ property owners either in groups or individually to negotiate compensation. Meanwhile, the Appraiser will compute the costs to be involved in the acquisition process which should form part of the FS financial aspect for which a budget will be appropriated. This information should be available before the scheduled meeting with the land/ property owners.

2.2.2.3 Enhancing Participative Support of All Stakeholders

One of the reasons for the ROW process to be perceived as "tedious" by the impact evaluation key informants might be linked to RA 10752 specifying a wide range of participating institutions/ agencies, and project managers in the implementing agency having no control over how the institutions/ groups perform their mandated functions. The list of ROW participants encompasses the civil courts/ courts of law, LGUs, BIR, HUDCC, and NHA. Roles and responsibilities are clearly defined by Law. It will seem, however, that performance with respect to stakeholder-specific tasks and timelines – and overall compliance with RA 10752 and related other provisions – can be further harmonized and facilitated.

2.2.2.4 Creation of ROW council or committee

Perhaps the most practical way to enhance stakeholder participation is through the project management committee (PMC) structure, in which all relevant stakeholders should be represented. Aside from the listed institutions/ agencies, the PMC organization can include relevant non-government organizations (NGOs). The PMC can meet more frequently early in the ROW acquisition process, and less often as more and more ROW-related issues are resolved.

Stakeholders consulted during the impact evaluation noted, however, that ROW issues persist and invariably affect major projects across agencies/ sectors. The causes and remedies are similar across projects. In this regard, the stakeholders suggested the creation of an inter-agency council or committee that will address common ROW problems that delay project implementation.

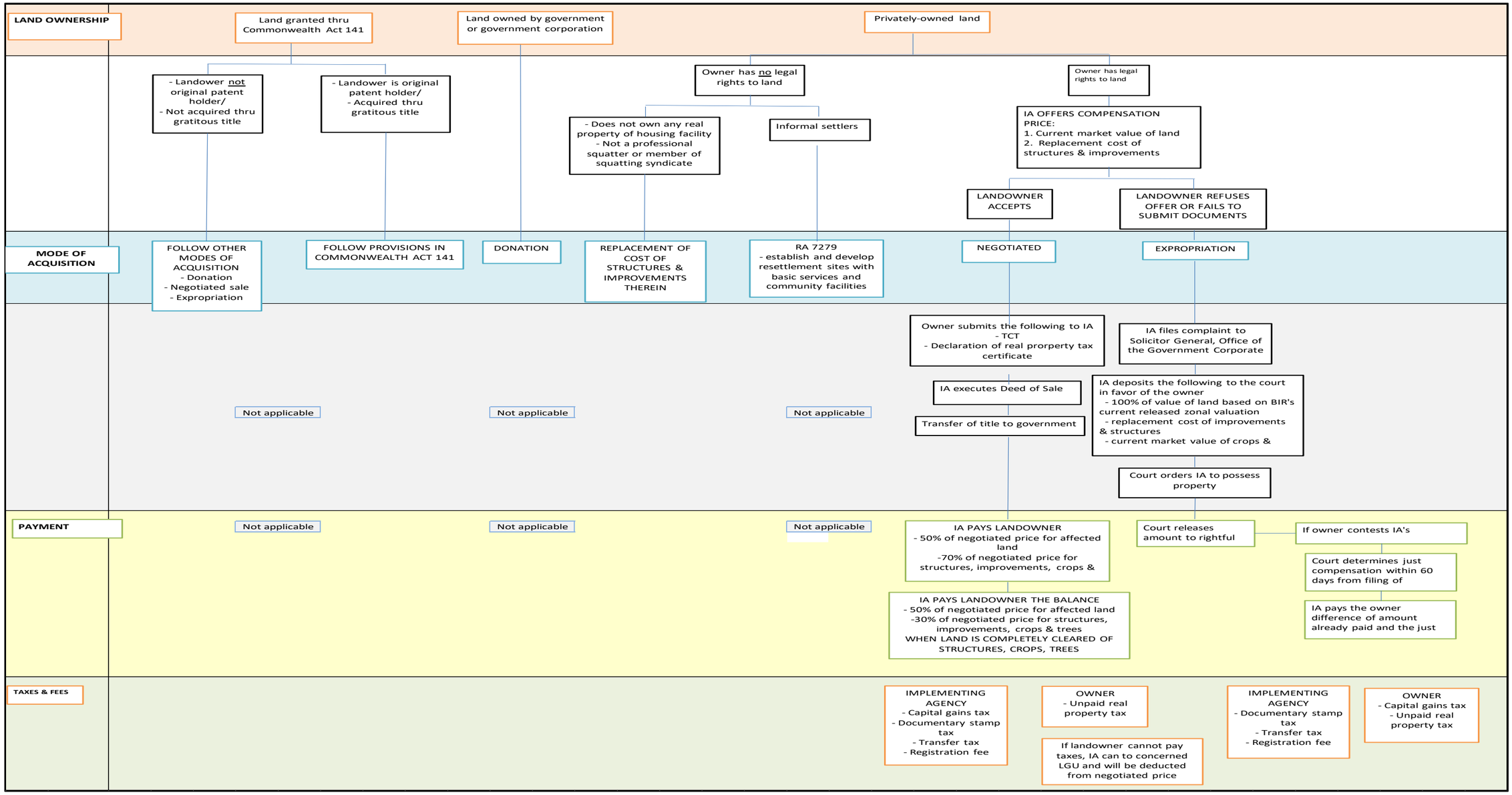


Figure 22. RA 10752 Right-of-Way Acquisition at a Glance

Source: Evaluation Team (based on Republic Act 10752)

Mini Case Study 1: Resettlement can be Pleasant

I am Primo, 51 years old, single and a resident of Sampaloc, Manila. I was one of those evicted in the area where the LRT2 Legarda station is now located.

This area used to be divided into four sections – a market, a row of apartments and two clusters of informal settlers. The informal settlers numbered about 1,000 households. I used to live in one of the apartments. People's economic activities then revolved around the market while some were pedicab drivers. In 1998, the barangay officials together with LRT2 personnel informed us that our area will be affected by the LRT2 project and that we need to relocate or resettle. Though how dismayed we were, we knew that any form of resistance could not be effective since the LRT2 is a priority project of the government.

The relocation was implemented in phases and in various modes. The first to be relocated were the informal settlers in year 2000. Each family was paid P17,000. They were relocated to Barangay Bitungol, Norzagaray, Bulacan. The LRT2 provided trucks for displaced families to load their belongings and whatever housing materials they saved from the demolition.

The relocation site was bare – housing was not included in the package, so the relocates built their own houses from the materials they saved and the cash they were paid. Initially, there were no electricity and water services at the site, but the Barangay of Bitungol helped them out by delivering water. Gradually, these amenities were provided that made life more comfortable for the settlers. Some displaced settlers still go back to Legarda for work. There are about six tricycle drivers who go home to Norzagaray on weekends.

We who live in apartments were asked to move out in 2001 when demolition ensued. Each family was paid P40,000 which we used as advanced payment to our new lessors. Some, like me, invested on tricycles. I do not know how much the apartment owner was paid, but this lot where the apartments used to be, was already sold.

Meanwhile, those who had stalls in the market were moved to the "Pamilihang Bayan ng Sampaloc" just across the street. The LRT2 management did not pay them anything but the stalls were given for free.

Overall, I rate the whole process of resettlement very satisfactory. Though there were police officers present during the demolition, there was no commotion like stone-throwing that sometimes happen in demolition operations. Besides, the LRT personnel talked to us sincerely and cordially. One benefit that this LRT2 project brought us is that it provided jobs for the residents, specifically tricycle driving. In addition, it pacified what used to be a disorderly and notorious community.

Source: Evaluation Team Case Interviews

3. Review of Project Log frame Assumptions

As part of the study to address the first key evaluation question regarding planned versus actual project implementation, the Evaluation Team reviewed the assumptions contained in the project's logical framework. As may be recalled from Part I Section 2.2, assumptions are conditions important for project success, but which lie beyond the full control of project managers. Assumptions are important because they were identified during project preparation as key to the achievement of project outputs, outcomes and impacts. The review of assumptions is in response to the first objective of the impact evaluation (Part I Section 1.3.1).

The review shows that all project assumptions remain relevant and valid. The table below summarizes the review results.

Original assumptions. All original and additional assumptions remain relevant and valid. The original Log frame (2003) had one assumption at the outcome level (People will patronize Line 2); one at the output level (GOP provided O&M funds); and three (3) at the activity level (available and timely release of GOP counterpart; ROW acquisition completed by Year 2003; and project acceptance by the affected people). Evaluation results show that people are patronizing Line 2 but at a level below target; ROW acquisition was a major cause of delay; and that there is a shortage in annual O&M funds.

Additional assumptions. The updated Log frame contained two (2) additional assumptions at the impact level (increases in population will not outpace additional transport capacity from LRT2; and there will be no major economic shocks that will dampen project impacts). At the outcome level, the additional assumption is that there will be no major economic shocks relevant to outcomes. Evaluation results show that rapidly increasing population density is affecting project impact; and that ridership is still low to affect VOC savings and road maintenance cost. In terms of consumer preferences, LRT2 riders are prioritizing travel time over transport expenses. These review results serve as basis for some of the major recommendations contained in this Impact Evaluation Report.

Table 25. Review of Project Log frame Assumptions

Impact Level	Validity	Relevance	Remarks
1) People will patronize LRT Line 2	√	√	Breakdown of MRT3 in mind of LRT2 riders.
2) Increases in population and vehicles will not significantly outpace additional transport capacity generated by LRT2.	√	√	High population density affecting LRT2 impact.
3) There are no major economic shocks particularly substantial increases in: (a) fuel prices; (b) vehicle O&M costs; and (c) road maintenance costs – that will dampen potential project impacts.	√	√	LRT2 ridership still low to achieve projected impact on VOC and road maintenance cost.

Outcome Level	Validity	Relevance	Remarks
1) There are no major economic shocks particularly substantial fuel, power price increase or inflation rates.	√	√	Increase in transport expenses linked to normal price trends.
2) There are no drastic changes in the macro/ broader business environment, such as: Policy framework; Taxes; Natural calamities; and Consumer preferences	√	√	Commuters prioritizing travel time savings over transport expense. Some stations known to be “flood-proof”.

Output Level	Validity	Relevance	Remarks
1) Project inputs provided as planned in terms of: Amounts; Budget categories; and Timeliness	√	√	Project budget increased due to implementation delays.
2) Social and environmental safeguards complied as planned.	√	√	ROW acquisition constrained implementation.
3) There are no major economic shocks particularly substantial increases in the prices of any of the planned project inputs.	√	√	Delay in implementation resulted to higher costs.
4) Annual O&M budget provided as planned (amount and timeliness).	√	√	Released O&M budget lower than amount requested. Non-rail revenue should be increased.
5) O&M procurement process implemented as planned.	√	√	Spare parts procurement major constraint to keep trains operating.

Input Level	Validity	Relevance	Remarks
6) Project budget released as planned in terms of: Amount; Fund categories; and Timeliness	√	√	Released O&M budget lower than amount requested.

4. Is the project being operated according to how it was intended?

This section will now turn to the second of two (2) process-oriented major questions being addressed by the impact evaluation.

4.1. Findings re Planned vs. Actual Operations

While Section 1 above sought to compare planned versus actual project design and implementation this next section will focus on planned versus actual LRT2 system operations.

4.1.1. Train and Station Conditions

The condition of the trains, stations and everything the goes into the whole LRT2 facilities affect the perception of riders. About 1,400 respondents were interviewed under the RRS (Part I Sections 3.1.1 and 3.1.2 of this Report), which included a component on perceptions. The purpose was to determine how the respondents view the urban rail system in the context of safe, comfortable, efficient, and affordable transport. Aside from the factors mentioned in the Conclusions earlier in this Part II, Section 1.2 of this Report, passenger perceptions provide valuable information to answer the second KEQ. Perceptions also play a critical role in determining rail ridership.

4.1.1.1 Travel time

Without the Evaluation Team providing any cue to the respondents, they most frequently verbalized that shorter travel time (or faster transport speed) is the key reason why they take LRT2. Majority of the respondents ranked comfort, accessibility, affordability, and safety after speed with a very wide margin. (See Figure 23). This concludes that fare is not the primary concern among rail riders. In contrast, in other public transport like PUJs or ordinary bus, the prime consideration is transport fare rather than shorter travel time, comfort, or safety.

This conclusion is backed by both statistics and perceptions. Figure 23 below, for instance, shows 70% of perception survey respondents saying that they take the LRT because it is fast. In contrast, only one percent of the respondents replied that they take the LRT because it is affordable. Quite similar results came out from the household survey: 81% of the respondents regarded their main benefit from LRT as: “faster travel, avoiding traffic, less travel time, reaching their destination more quickly. In contrast, only 0.6% of the respondents consider “affordability” as their benefit from LRT.

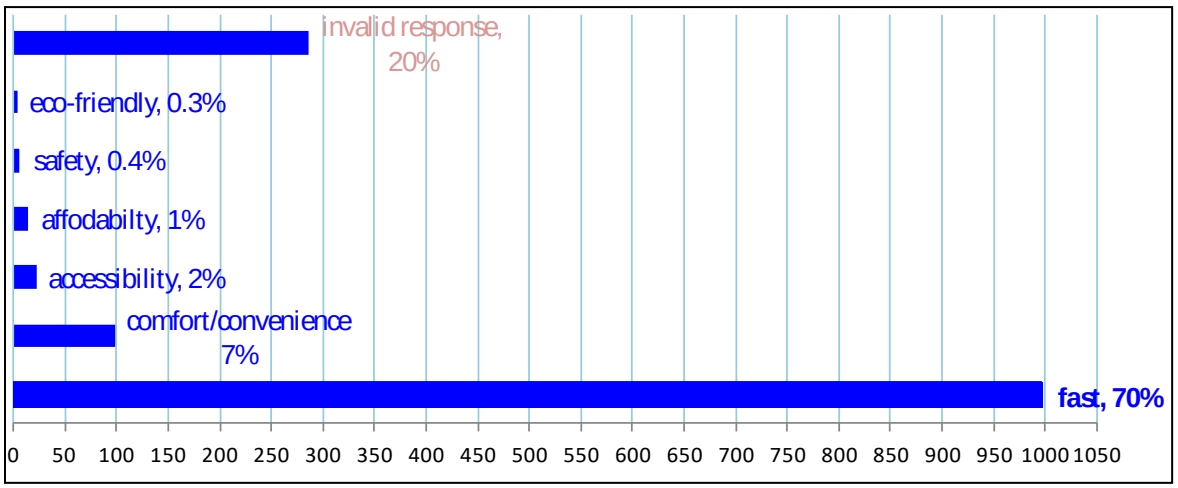


Figure 23. Reasons for Taking LRT2

Source: Evaluation Team Perception Survey

The above-cited key message that reliably shorter travel time (or reliably faster transport speed) serves as "tipping point" for patronizing LRT2 is corroborated by the results of the household (HH) survey. As noted above, majority of HH respondents (80.9%) informed us that for them, the top-ranked benefit they receive from LRT2 is faster travel (Table 26).

Table 26. Top-Ranked Household Benefits from LRT2

Benefits/ Advantages Cited as Rank 1	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Faster travel; avoid traffic; less travel time; reach destination more quickly	144	79.6	135	82.3	279	80.9
Comfortable; cool/ not hot; not tired; spacious during off peak hours; convenient; pleasant trip	23	12.7	23	14.0	46	13.3
Free from air pollution	7	3.9	2	1.2	9	2.6
Safe, well-lighted	3	1.7	2	1.2	5	1.4
Accessible; easy to take	2	1.1	1	0.6	3	0.9
Less transport expense	1	0.6	1	0.6	2	0.6
Can accommodate many passengers	1	0.6		0.0	1	0.3
Total	181	100	164	100	345	100

Source: Evaluation Team HH Survey

The household survey respondents' expectations from LRT2 match the benefits cited regarding faster travel. The concern about faster travel holds true for respondents in both project impact area and non-project area (Table 27).

Table 27. LRT2 Riders' Expectations

Expectations	Project Area						Non-project area		All areas	
	Influence area		Outside influence area		Total project area					
	No.	%	No.	%	No.	%	No.	%	No.	%
Fast	76	42.5	94	47.2	170	45.0	5	41.7	175	44.9
Avoid traffic	67	37.4	70	35.2	137	36.2	5	41.7	142	36.4
Avoid being late/ save time	3	1.7	6	3.0	9	2.4	1	8.3	10	2.6
Comfortable / convenient	19	10.6	23	11.6	42	11.1	1	8.3	43	11.0
Others	14	7.9	6	3.0	20	5.3	0	0.0	20	5.2
Total	179	100	199	100	378	100	12	100	390	100

Source: Evaluation Team HH Survey

The first three expectations in the table above all pertain to faster travel. Together, these top three (3) expectations make up 84% of total responses in the project area, and 91.7% in the non-project area. Residents in the non-project area, which is more than one kilometer away from any LRT2 station, would brave the usual traffic to be able take the LRT which they know will take them faster to their destination.

4.1.1.2 Accessibility

The general perception of the respondents considers overall accessibility to the LRT2 rail system as good. This includes access and path leading to the stations, stairs, escalators and lifts, queuing at ticket booth / vending machines and turnstiles – having in mind even the elderly, persons with disability, pregnant riders, and young children as well. Table 28 presents the summary of these findings.

Table 28. Passengers' Perception on Accessibility

	Entry / Exit Paths	Access leading to station / terminal	Access w/in station - stairs, lifts, escalators	Access w/in train	Queue - Ticket Booth / Vendo	Queue Entry / Exit - Turnstiles
SO GOOD	5%	5%	1%	1%	5%	5%
GOOD	72%	79%	43%	46%	79%	81%
NEITHER	14%	3%	24%	24%	3%	2%
BAD	2%	2%	18%	16%	1%	1%
SO BAD	0%	0%	2%	1%	0%	0%
No Reply	7%	11%	12%	12%	12%	12%
Total	100%	100%	100%	100%	100%	100%

Source: Evaluation Team Perception Survey

Figure 24. Ticket vending machine greatly improved access and reduced queue time that blocks overall circulation around turnstiles.

Figure 26. Introduction of Passenger Assist Railway Display System (PARDS) enables useful information and guidance to passengers. Mobile application is soon to be launched for wider use of the riding public.

Figure 25. Floor marker facilitates accessibility of passengers having poor eyesight with enhanced 'feel' of the path on the floor (due to the embossed portions) leading to elevator at platform level.

Source: Evaluation Team

In addition to the above results, the other scope of accessibility deals with proximity. The attractiveness of a public facility like mass transit is relative to accessibility. The concept of mass transport planning is to locate and align the system to a high-volume corridor with heavy concentration of businesses, settlements, transport hubs, and other human activities. Should a public facility be distant, a connecting medium comes into play.

Since the R-6 Road is generally a narrow corridor from east to west with various businesses operating along the whole stretch, the existence of feeder transport is inevitable because most of the street front is usually occupied or acquired mostly by business owners. Settlements and communities normally locate farther away from the main thoroughfare due to high property values and thus, a market for ferrying people to the transport hub/ terminal/ station is created. This is the role of feeder transport.

Figure 19 (Part II, Section 1.1.7) showed a random sample of feeder transport interfacing with LRT2. The feeder transport varies in size and format starting from two- and three-wheelers to four wheelers, and up to more than four wheels in certain parts of the road approaching Manila. In most cases, feeder transport is noted to ply secondary or even tertiary roads (which are generally classified as "feeder roads"). In this impact evaluation study, feeder roads are understood as roads along which feeder transport vehicles pass as they 'feed' a non-road/ elevated transport system much bigger in capacity than any road-based mode.

In view of their mobility and circulation, feeder transport dispels the issue of proximity, and bridges the gap to facilitate accessibility. Feeder transport caters to both near-distant and far-distant trips[51].

FGD participants confirmed that LRT2 is accessible to residents from the project impact area (influence area plus outside project influence area) by tricycle, pedicab, walking, or jeepney as in the case of Barangay Jesus dela Peña in Marikina. People from Jesus dela Peña take the Katipunan station. Tricycles in particular play a key role as important link in the alternative transport mode being offered by LRT2.

Tricycle terminals became available near LRT2 stations to convey riders back and forth their homes/ place of travel origin. LRT2 passengers perceive a "freedom from crime" when taking the tricycle. They usually have a personal relationship with tricycle drivers since they all come from the same barangays. In case a passenger accidentally leaves something in the tricycle, the driver is bound by social norms to return it.

4.1.1.3 Comfort

About 70% of the FGD participants feel comfortable with the train seating and leg room (Table 29). Despite the recent problem with several trains having defective air conditioning units, respondents still voiced contentment with the ventilation system. The quality of upkeep of rest rooms in the stations is not favored by LRT users. Several times during data collection, rail riders complained about rest rooms being closed, or that there are no such other facilities in the vicinity.

Table 29. Passengers' Perception on Comfort

	Type of Seat	Seating Comfort	Leg Room	Aircon	Rest Rooms
SO GOOD	5%	3%	4%	5%	1%
GOOD	77%	63%	76%	72%	49%
NEITHER	15%	27%	18%	14%	24%
BAD	2%	5%	2%	2%	12%
SO BAD	0%	0%	0%	0%	3%
No Reply	1%	1%	1%	7%	12%
Total	100%	100%	100%	100%	100%

Source: Evaluation Team Perception Survey

[51] Near-distant – a length that is still walkable. In simple terms, a distance too near to ride and a bit far to walk. The common reference is up to 500 meters. Far-distant – inconveniently walkable, or better to take a ride. Reference is more than 500 meters. This is neither a rule nor a policy.

Figure 27. Low-passenger volume during mid-afternoon on westbound trip at Cubao Station

Source: Evaluation Team

Figure 28. Early evening rush yet still enough room on eastbound trip at V. Mapa Station

Source: Evaluation Team

The goal of the LRT2 Project is: "Sustained public transport development that is safe, comfortable, efficient and affordable". The FGD results related to trains and stations show that *LRT2 is perceived to be comfortable by commuters from barangays located near end-stations like Santolan, but not as much by those who ride in middle stations like Cubao and Anonas*. People who take off from end-stations are usually the first passengers and can therefore sit comfortably. By the time the train reaches other stations, the train has become crowded such that the air conditioning becomes hardly sufficient for the comfort of all.

The completed FGDs with local communities further revealed that among the sectors represented in group discussions, people with special needs (senior citizens, PWDs, pregnant women) had the most complaints. They claim that the number of seats allocated for people with special needs is not adequate. Sometimes, children's guardians who are strong enough to stand still compete for seats. In some stations, particularly the Claro M. Recto station, the escalators or elevators were not functioning, so that senior citizens are forced to climb a flight of stairs.

PWD, the elderly, pregnant women and all others with obvious vulnerability including children were classified under 'disadvantaged' because the ascent to the station requires some effort, where the provision of elevators and escalators was noted. This also includes segregated seats on the platform area, railings, signboards, exemption from queues, discounts and at times, personnel assistance. The FGDs elicited perceptions concerning provisions for riders with special needs. Responses are consolidated in a simple chart (Table 30).

Table 30. Provisions for Riders with Special Needs

	SO GOOD	GOOD	NEITHER	BAD	SO BAD	NR	Total
FGD ratings	3%	70%	10%	4%	1%	12%	100%

Source: Evaluation Team Focus Group Discussions

Comfort can be assessed by comparing the daily full-capacity of the currently operating eight car trains (463,650 passengers, see Sec. 1.1.2), and current ridership. The comparison shows that the average current daily ridership of 164,718 passengers is still way below the full capacity of the current rolling stocks – suggesting that generally, riders are comfortable. *Passenger comfort inside the trains has a time dimension.* During the morning and afternoon peak hours, LRT2 trains are crowded as reflected in the perception survey results shown on Table 31.

4.1.2. System Operations

The average total number of daily trips is 281 based on current available rolling stocks of eight (8) train sets equivalent to 32 coaches.[52] The current operating hours of LRT2 is 4:30 AM – 11:00 PM daily, except for certain holidays. The first five (5) years of operation by LRT2 registered low ridership, which started to gradually pick up in 2009. A good reference point could be the last 10 years (2009 – 2018) of operation. Ridership reached a high of 202,354 in 2014 for the first time, and this became the LRT2 ridership reference by the public. The original forecasted daily ridership for LRT2 was 450,000 but given the factors considered during the feasibility study stage, this is difficult to achieve unless bold interventions will be made. Figure 29 shows the LRT2 historical ridership and the target ridership.

[52] The actual number of operational rolling stock / train sets is 10, where 2 are reserved units in case of an unexpected breakdown in any of the eight train sets being regularly deployed.

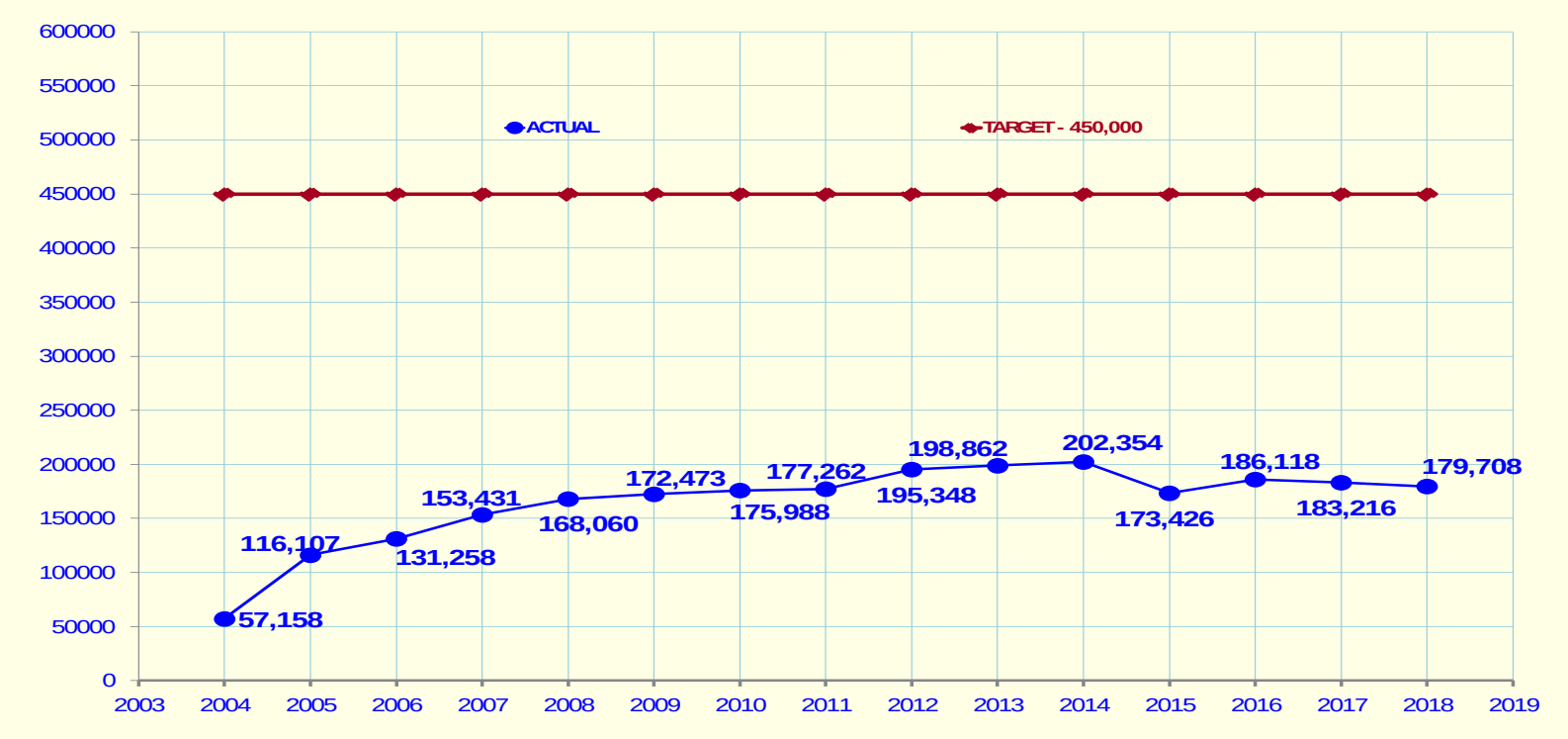


Figure 29. LRT Line 2 Average Daily Ridership, 2004-2018

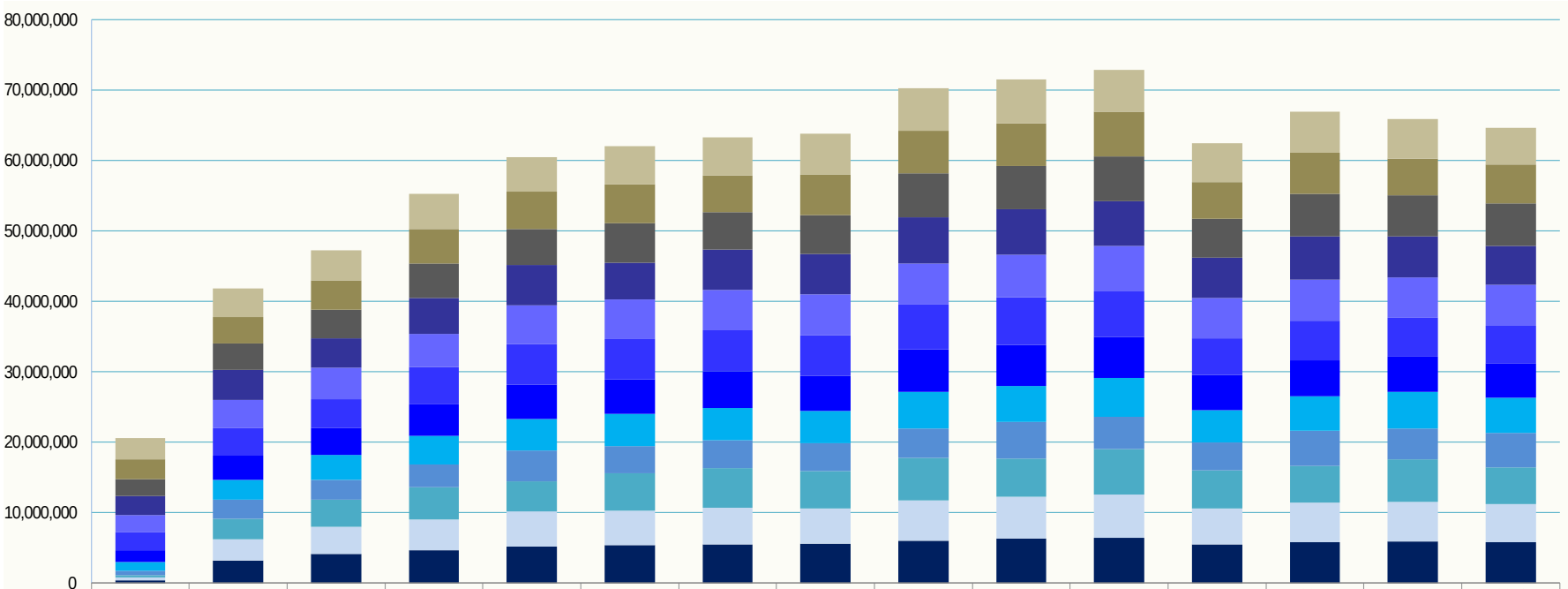
Source: Evaluation Team (basic data from LRTA)

In Figure 30, the ridership numbers may look impressive if presented on a cumulative monthly basis projecting the whole span since the start of LRT2 operations. However, daily ridership as presented in the figure still does not meet the real target. It can be noticed that ridership follows a decreasing pattern during the summer months, which may be attributed to the ongoing/ partial compliance with the K- to-12 Program among schools. This pattern will soon shift to June, July and August when the newly imposed full implementation of the program across all schools nationwide takes effect in School Year 2019-2020.

With the current LRTA rolling stocks and with a total of average of 281 daily trips, the daily ridership could reach 463,650, thereby exceeding the projected value. The average ridership over the past 10 years was only 184,476, or 41% lower than the planned ridership capacity. Figure 31 further below provides the full panoramic view of annual ridership by month.

Figure 30. LRT Line 2 Annual Cumulative Ridership by Month, 2004-2018

Source: Evaluation Team (basic data from LRTA)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
DEC	2,968,146	4,038,523	4,275,846	4,909,554	4,876,798	5,495,354	5,414,144	5,820,247	6,036,216	6,261,652	5,858,679	5,458,297	5,866,260	5,696,344	5,286,129
NOV	2,808,197	3,772,998	4,168,598	4,968,869	5,289,040	5,525,581	5,306,291	5,701,262	6,134,292	6,106,300	6,337,713	5,250,930	5,875,481	5,195,519	5,466,261
OCT	2,405,900	3,755,306	4,060,696	4,820,438	5,161,133	5,530,247	5,229,845	5,506,501	6,216,960	6,118,592	6,358,742	5,455,318	6,062,572	5,832,386	6,010,050
SEPT	2,706,394	4,188,323	4,103,665	5,150,498	5,738,717	5,265,542	5,746,636	5,787,473	6,516,116	6,484,874	6,412,823	5,818,848	6,066,697	5,836,266	5,566,990
AUG	2,485,262	3,983,309	4,492,664	4,733,001	5,525,984	5,566,098	5,747,650	5,821,245	5,826,800	5,979,216	6,468,343	5,681,928	5,846,969	5,729,986	5,822,727
JULY	2,508,405	3,991,757	4,067,991	5,255,243	5,747,918	5,829,234	5,876,060	5,744,011	6,431,346	6,842,717	6,456,420	5,264,854	5,600,213	5,515,175	5,351,887
JUNE	1,760,650	3,420,919	3,892,905	4,535,809	4,827,398	4,820,056	5,133,566	5,030,198	5,984,594	5,766,084	5,816,668	4,999,112	5,177,705	5,030,154	4,872,561
MAY	1,159,265	2,829,749	3,507,392	4,002,755	4,527,249	4,629,168	4,577,954	4,583,854	5,258,739	5,195,139	5,562,645	4,575,694	4,898,407	5,195,670	4,974,614
APR	701,773	2,731,917	2,806,471	3,270,309	4,332,136	3,841,641	4,053,921	3,868,385	4,109,105	5,164,319	4,594,214	3,922,372	4,951,097	4,306,273	4,895,529
MAR	300,137	2,834,425	3,933,862	4,607,495	4,329,574	5,281,959	5,545,579	5,364,991	6,029,351	5,438,753	6,443,635	5,445,210	5,212,390	6,145,246	5,214,809
FEB	372,958	3,039,568	3,768,098	4,363,970	4,956,656	4,976,517	5,193,329	5,038,046	5,762,530	5,900,076	6,125,131	5,113,794	5,670,901	5,569,411	5,443,559
JAN	399,698	3,211,797	4,174,739	4,617,321	5,188,912	5,328,990	5,530,622	5,548,201	6,019,102	6,332,723	6,412,491	5,446,999	5,773,982	5,905,227	5,789,960

Figure 31. LRT Line 2 Historical Monthly Ridership, 2004 - 2018

Source: Evaluation Team (basic data from LRTA)

At present, the ridership profile across the eleven (11) stations forms an inverted arc with midpoint stations registering the lowest patronage levels (Figure 32). This trend had been analyzed in the Impact Evaluation Interim Report. Below is the plot of ridership profile by station. Related to ridership per station, Annex 28 from the Rail Rider Survey generated an indication ("boarding index") as to the proportion of passengers coming from each of the cities being served by LRT2.

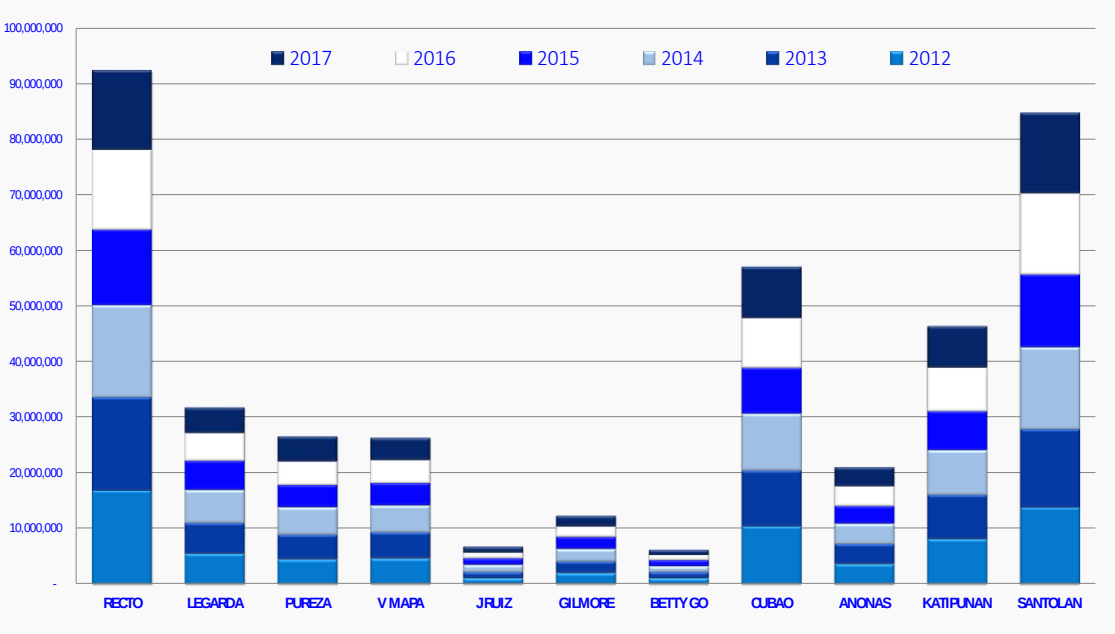


Figure 32. LRT2 Average Ridership by Station, 2012-2107

Source: Evaluation Team (basic data from LRTA)

Some of the causes of low ridership in LRT2 were identified as incident- and management-related. To better gauge public discontent affecting the financial sustainability of LRT2, suggestions for improvement were requested from the public through the Evaluation Team's Perception Survey. The suggestions emanate from different perspectives relating to comfort, efficiency, security, safety, sanitation, line expansion, and public awareness. Table 31 shows the breakdown of suggestions.

Table 31. Suggestions from the Public to Improve LRT2 Services

Rank	Suggestions
1	Improve A/C
2	Add / Improve Trains
3	Fix / Improve escalator, elevator
4	Facilities improvement
5	Crowd control
6	Clean / improve restrooms
7	Speed up -Headway
8	Overall security improvement
9	Prioritize the disadvantaged
10	Management Improvement
11	Maintenance improvement
12	Facility design and safety
13	East-West Line Extension
14	No train delays
15	Increase frequency of trips

Rank	Suggestions
16	Extend operating hours
17	New policy refinement
18	Service improvement
19	Information / education campaign
20	Male and female area / access

Source: Evaluation Team Perception Survey

Comfort and convenience issues characterize majority of the complaints. In 2018, there were several train sets with problematic air conditioning and despite rectification and repairs already made, the public still clamored for cooler trains. Likewise, due to the elevation of the platform, passengers would opt for an easier way to ascend but sometimes, both elevators and escalators are out of order. An uncomfortable riding experience can trigger negative ripple effects if the service is not quickly improved. This holds true for all public utilities.

Referring back to Table 31 above, adding more trains (No. 2 ranked suggestion) and speeding-up headway (No. 7 rank) are related directly to total travel time. Majority of the riders understand that a train system operates like any other road vehicle that can run nose-to-tail. All rail systems especially the urban commuter trains observe the standard headway where trains should always be apart at any given time. Addressing all these suggestions can be made religiously although with the current situation of the LRTA, those suggestions with higher priority should be addressed first, subject to the availability of budget.

At any given period in LRT2 operations, except during peak volumes, the average queue time is 2.1 minutes, on the premise that a passenger will go straight from the station's entrance, inspection, ticket vending machine through the turnstiles, stairs and finally, to the platform (Table 32). This does not hold true during emergencies, unexpected incidents, or ticket machine malfunction. The average waiting time (for the train to arrive) at a station is 3.0 minutes. This is consistent with the current standard headway for LRT2 at 2 minutes and 9 seconds. (Minimum headway was assumed at 2.5 minutes during project design.) There is negligible difference of 1.0 minute between eastbound and westbound travel time; thus, they can be assumed as equal.

Table 32. Trip Simulation for LRT2

	Train Travel*	Queue Time**	Waiting Time	Total Travel Time
Total Eastbound Trip, min.	22.45	2.1	3.0	27.55
Total Westbound Trip, min.	21.45	2.1	3.0	26.55

* Pertains to end-to-end travel.
** Pertains to entering station inspection, ticketing, going through turnstile.

Source: Evaluation Team Trip Simulation

Using the standard queue time, waiting time and train travel time between stations, the travel time from any station to another may be now projected as shown below:

Table 33. Ideal Total Travel Time in LRT2 Depending on the Target Station

Number of Stations	1	2	3	4	5	6	7	8	9	10
Total Travel Time, min.	7.35	9.59	11.84	14.08	16.33	18.57	20.82	23.06	25.31	27.55

Source: Evaluation Team Trip Simulation

For comparison, the Evaluation Team collected data on queueing time being experienced by non-LRT2 riders in R-7 along Quezon Ave.-España Boulevard. Three (3) out of every five (5) respondents informed that the time it takes to wait for a ride is now longer compared to Year 2004. One out of every five said waiting time has not changed since 2004.

As noted earlier, the Evaluation Team conducted the Station Observation to check the actual situation on-the-ground, and to witness the minutiae of details on the day-to-day operations of LRT2. The influx of people differs by station depending on land use, urban layout, accessibility, and location of the station. People flow into the station through various means and modes of transport. The passenger flow rate is shown below. Feeder transport ranges in size and configuration including the basic means of transport – walking. Random sampling of people's arrival at the station was conducted to determine the actual rate of flow. The results may differ at certain times of the day.

Table 34. Random Sample of Passenger Flow Rate per Station (person/minute)

Santolan	Katipunan	Anonas	Cubao	Betty Go	Gilmore	J Ruiz	V Mapa	Pureza	Legarda	Recto
44	29	6	40	2	2	2	31	23	27	16

Source: Evaluation Team Station Observation

There is public trust that the trains and the whole system are in good condition, that schedules are met, and stations are accessible (see table below). The riding experience was improved when LRTA adopted a public information system conveyed through a digital screen installed inside the trains.

Table 35. Train and System Operations

	Trains' Condition	Overall condition	Actual no. of trips reported	Schedules Posted and accessible
SO GOOD	5%	5%	2%	2%
GOOD	85%	92%	71%	78%
NEITHER	7%	2%	11%	7%
BAD	2%	1%	4%	1%
SO BAD	0%	0%	0%	0%
NR	1%	1%	12%	12%
Total	**100%**	**100%**	**100%**	**100%**

Source: Evaluation Team Perception Survey

There is standard security support from the national police, including at the Santolan station and the LRTA compound. Police personnel are deployed in pairs across all stations, and actively take part in random inspection and patrolling. For stations connected to commercial centers like Cubao and Recto, there are additional security personnel especially if the access points are within the premises of private business establishments.

Despite the presence of security personnel, various incidents have been recorded by LRTA which usually involve personal belongings carried by passengers. The 2018 summary of incidents is provided in Annex 18. Passengers' perceptions on safety and security within the trains and stations are notably good, as summarized in Table 36. The next table then shows perceptions regarding emergency response.

Table 36. Passengers' Perception on Safety and Security

	Pickpockets* Train/Stations	Presence of security personnel	Roving Patrol	With surveillance system	Passenger Safety Program	Lighting inside train	Lighting within station
SO GOOD	16.3%	20%	20%	19%	6%	19%	19%
GOOD	68.2%	64%	64%	67%	90%	66%	67%
NEITHER	2.4%	3%	3%	2%	2%	2%	2%
BAD	0.8%	1%	1%	0%	0%	0%	0%
SO BAD	0.5%	0%	0%	0%	0%	0%	0%
No Reply	11.9%	12%	12%	12%	1%	12%	12%
Total	100.0%	100%	100%	100%	100%	100%	100%

* The 1,402 respondents were asked to rate security from pickpockets. The respondents gave predominantly and similar high ratings on security inside trains and inside train stations. Thus, the resulting figures for trains and stations are combined on the table.

LRT2 operations include emergency preparedness programs to address natural or man-made situations. The scope of concerns of the program involves natural disasters, assault or terrorism, crime fighting, firefighting, and other emergency situations. The overall in-charge of the whole emergency response program is the LRTA Administrator.

The response operations unit has two teams to handle situations. The Site Main Controller acts as overall authority at the strategic level composed of the senior members of the LRTA tasked to manage the situation, and to set the strategy, guide/ advise, and monitor and support responses. The team is linked to government agencies, institutions, and non-government organizations. The other team is the Site Incident Controller who acts as field authority at the tactical level with a team composed of second tier leaders to act as first responders to manage, plan, coordinate, and mobilize resources.

Table 37. Passengers' Perceptions on Emergency Response

	Emergency Facility and Equipment	Program Protocol and Equipment	Disaster Risk & Crisis Management	Crowd Control
SO GOOD	3%	4%	4%	3%
GOOD	71%	78%	69%	80%
NEITHER	10%	4%	10%	3%
BAD	3%	2%	5%	1%
SO BAD	1%	0%	0%	0%
No Reply	12%	12%	11%	12%
Total	100%	100%	100%	100%

Source: Evaluation Team Perception Survey

Non-Rail Operations

Non-rail operations are activities within the LRT2 stations or trains that are not directly required to operate the train system. LRTA is maximizing its facilities by incorporating commercial operations as added attraction and convenience to the riding public, and thereby generating additional income. Unforeseen opportunities and benefits emerged when the business sector started to connect the mass transit operation through station development. Non-rail commercial operations are bound to be part of the undertaking if the station's location is a commercial area like Cubao or Recto. In the recent past, consumer and retail business entities have actively taken part in LRT2 non-rail activities.

Majority of non-rail business undertakings are lease transactions for structures, floorspaces, areas or facilities for advertising, commercial stalls or kiosks, real property, right-of-way facilities, fiber optic cable, internet connection, and non-exclusive ramping privileges. In addition, there are special short-term lease arrangements like filming or photo shoots, promo booth, sampling of products or services, production of leaflets or flyers, and media postings (video commercial, banners, tarpaulins, and posters). At the platform level, only "passive non-rail commercial activities" are allowed by LRTA, and these mainly involve display of posters and video clips of a product or service (Figure 33). "Active non-rail business activities" are allowed only on the lower levels beneath the platform, as shown in Figure 34.

Figure 33. Passive Commercial – Display / Advertising

Figure 34. Active Commercial –Vending / Retailing

Source: Evaluation Team

Non-rail operations are not limited to commercial activities. Being a government entity, LRTA also accommodates social marketing campaigns or passive activities that seek to promote people's welfare ranging from public health, to moral values, education, and well-being. These materials also bear the logo of LRTA being the partner agency.

Figure 35. Advocacy and Awareness-Raising Materials includes Health, Gender

Source: Evaluation Team

1.2.3 Operation and Maintenance

LRT2 is being operated and maintained as planned. Even though LRT2 is a government-owned and operated urban rail, aside from the PNR trans-boundary train to the Bicol Region, LRT2 performance has been better than Line 1 and Line 3 in terms of disruption in operations. In 2018, LRT2 experienced some breakdown due to a signaling problem that caused LRTA to implement provisionary servicing. The problem did not escalate into a full shutdown, but trips were shortened from Santolan up to V. Mapa, which is the eighth station.

Operations. Notably, 'good housekeeping' practices, low ridership and competitiveness of the LRTA contributed to achieve its quality of operation despite the struggle with daily revenues, diminishing rolling stocks, ageing train sets, and very slow spare parts procurement process. An outsider may simply dismiss the case of the LRT2 as a failure but if the details of the operations and efforts made to attain and deliver on the public's transport need are scrutinized, LRT2 is a very good performer as far as mass transit is concerned. The only failure to conclude at this point is the overestimation of ridership and underestimation of funds, not being able to anticipate potential price escalation and delays that normally happen in infrastructure projects. Thus, serious consideration must be given to projections, considering the Pickrell Effect[53]

Maintenance. LRTA has a good track record on maintenance. Four (4) incidents were noted as follows:

1. 3rd quarter of 2018, signaling system interruption that resulted to 'trip cutting' until V. Mapa station but was shortly restored;
2. 22 April 2019, 6.1 magnitude earthquake prompted all rail lines including PNR to stop operations. LRT2 resumed at 4:30 a.m. on the next day;
3. 15 May 2019, air pressure glitch resulted to 30-minute interruption until Betty Go-Belmonte Station; and
4. 18 May 2019, the most recent LRT2 train collision is considered an isolated case. It is still being investigated and no conclusions were made at the time of this Report.

[53] In the 1990s, similarly high projections were being made in the United States until a landmark study of 19 projects conducted by a transport economist, Don H. Pickrell, created the "Pickrell effect" of improving forecasts.

LRTA observes a stringent schedule to maintain its rolling stocks. The preventive maintenance procedures listed on Table 38 are part of the regular activities that the LRTA O&M Team conducts, and which include part-by-part inspection for safety, cleanliness, and order. LRTA conducts annual system maintenance during the Holy Week.

Table 38. Regular Preventive Maintenance Routine

1. Daily track networks and facilities mainline monitoring – by train ride
2. Daily track networks and facilities mainline monitoring – by foot
3. Twice-a-month preventive maintenance of track at mainline / depot
4. Twice-a-week preventive maintenance of track at mainline / depot
5. Quarterly preventive maintenance of track geometry of turnouts at mainline
6. Semi-annual preventive maintenance of turnouts at mainline
7. Semi-annual preventive maintenance of rail expansion joints at mainline
8. Semi-annual preventive maintenance of rail checkrail at mainline / depot
9. Semi-annual preventive maintenance of insulated joints at mainline
10. Semi-annual preventive maintenance of insulated and non-insulated joints at depot
11. Semi-annual preventive maintenance of track geometry with respect to vertical and horizontal alignments at mainline / depot
12. Annual preventive maintenance of welded joints mainline / depot
13. Annual preventive maintenance of raw mainline / depot
14. Annual preventive maintenance of walkway mainline / depot

Source: LRTA

Given that the current regular passenger load that is less than one-half of the design capacity, there is ample time for preventive maintenance activities. However, this does not translate to an ideal and efficient maintenance program. One of the major bottlenecks in LRT2 operations is the procurement of parts which had been reported during Key Informant Interviews to be taking a lengthy period. Informants indicated that procurement is being done by DOTr rather than LRTA, and that the process can become faster if responsibility is to be delegated to LRTA. Procurement delay in general is a long-standing problem that even DOTr has not been able to resolve.

Figure 36. Bogie (train wheels) Undergoing Maintenance

Source: Evaluation Team

Figure 37. Motor Cab Detached from Bogies Undergoing Maintenance

Source: Evaluation Team

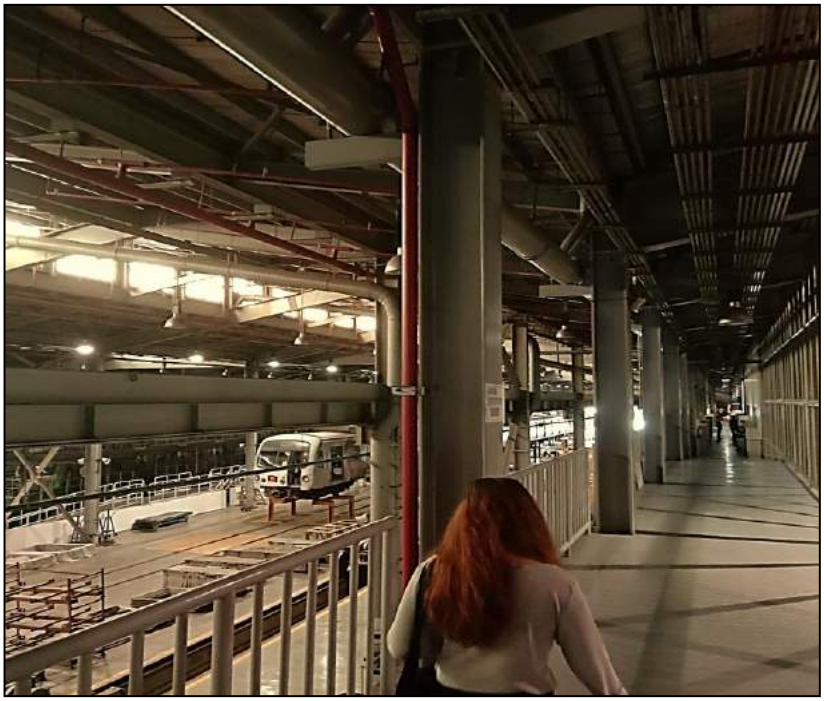


Figure 38. Repair Yard Facility behind the LRTA Offices

Source: Evaluation Team

Figure 39. Stocks of Parts and Materials

Source: Evaluation Team

With the recent earthquake on April 22, 2019, LRTA was forced to stop operations to allow a five-hour observation period, and inspection of critical components like substructures, superstructures, catenaries, systems and stations especially those connected to other buildings. The total downtime due to the 6.1 magnitude earthquake was about six (6) hours within its operating hours (4:30 AM - 11:00 PM), plus another four (4) hours spent on inspection. LRT2 resumed operations at 4:30 AM the following day, as no damage was found. All other rail lines (LRT1, MRT3 and PNR) also adapted a similar emergency response.

Until late during the period during which this impact study was being conducted, LRT2 never had any major incident since operations began in 2004. At around 9:51 p.m. on Saturday, May 18, 2019, however, a train that was parked at a pocket track between Anonas and Katipunan stations reportedly moved westward on its own, crossed onto the main track, then passed through the Anonas Station before colliding head-on with an eastbound train from Cubao station. LRT2 resumed operations at 10:47 a.m. the following day. The Evaluation Team has no access to the accident report and would not speculate on its cause. In any case, this is considered to be an isolated incident, but further reduced the number of operating trains. For further information on this particular incident, please refer to Annex 19. “Milestone events” that occurred during the period of this evaluation are documented in Annex 20. These events include the April 22 earthquake, May 15 technical problem, train collision on May 18, and partial closure of the Marcos Highway Bridge for an estimated four months starting May 25. The LRTA response to each of these events has been discussed above.

1.3 Conclusions and Recommendations:

At this point, conclusions and recommendations will be provided based on an assessment of planned vs. actual capacities to operate, manage and sustain operations.

1.3.1 Conclusions

Planned operations

There was an overestimation of the projected ridership in the mid-1990s. The historical ridership showed that LRT2 has never even achieved even half of the targeted 450,000 projection. However, it will not be fair to declare that LRT2 is underperforming based on ridership without looking into other factors that also contribute to the current level of ridership. These other factors include: (a) no-school days, as majority of riders are students; (b) the K-to-12 program which delayed college entry by two years; (c) excluding Tutuban in the alignment; and (d) low density population at the LRT2 system's midpoint.

Actual operations

Passengers assign a higher value to shorter travel time compared to transport cost/ expense in taking LRT2. It must be noted however that ridership declined in 2015 when the LRT2 fare was raised from PhP 12-P15 to PhP 11-P25.

The introduction of PARDS is a good step to increase public awareness and patronage of LRT2. Creative promotional information can significantly influence people's choice on transport mode.

1.3.2 Recommendations

1. LRTA should focus on how the east extension (within 2019) and west line extensions (next three (3) to six (6) years) can be developed as a 'convenient gateway' to increase patronage of the LRT2.

2. LRTA should test trial an extension of operating hours up to 12:00 midnight to gauge the effect on ridership (within 2019). With the increasing work shift patterns and 24/7 business operations, LRT1 and MRT3 might also explore this recommendation. It is noted that there is a pending bill in Congress to extend the operating hours of MRT3, LRT1 and LRT2 until midnight.

3. LRTA should explore, consider, and align public suggestions (Table 31), if viable to improve LRT2 operations.

4. LRTA should expand the use of PARDS (within 2019) to include regular on-line survey of riders for use as feedback system for LRTA to more regularly "engage in a conversation" with its clients. In this regard, the Evaluation Team recommends that a Rapid E-survey of Riders using LRT2 Stations Wi-Fi be institutionalized by LRTA as a practical, low-cost channel of communication with riders.

5. Institutional Analysis

The foregoing planned versus actual assessment of project implementation, and then of project operations, is underpinned by institutional roles and relationships, with LRTA at the forefront. So before proceeding to address the next evaluation question, this section will re-examine such roles and relationships – with the end-view of identifying further improvements on how operations are organized – leading to higher service standards/ ratings and eventually, greater and more sustainable – and broad-based (i.e., inclusive) socio-economic impact.

Institutional analysis is regarded as an essential part of any impact evaluation study, especially where a greater degree of institutional convergence, along with focused capacity development, is sought in order to continually improve project operations. This section of the LRT2 Impact Evaluation Report will dwell on institutional aspects that have been found to be most directly linked to the process of benefits generation, as well as to potential future intensification of the magnitude of current and longer-term benefits. This section: (i) will underscore the role of key institutions and inter-agency interfacing; (ii) will recommend follow-up actions; but (iii) will not attempt to provide a comprehensive, in-depth institutional assessment of LRT2 performance, which can be the subject of follow-on inquiry. This section will highlight institutional arrangements during the project operation stage, to complement the pre-implementation phase institutional assessment provided earlier in Section 2 in the context of the LRT2 experience on right-of-way (ROW) acquisition.

5.1. Findings

During the on-going LRT2 Project implementation, the following institutions/ agencies were mentioned by informants as key to generating – and sustaining – socio-economic benefits from LRT2 transport services.

5.1.1. LRTA Board of Directors

The inter-agency Board as policy governing body is most crucial to continually enhancing and sustaining LRT2 benefits. It is presented first in this Findings Section of institutional analysis because it provides the overarching "basic institutional platform" for creating and sustaining long- term LRT2 impacts.

Its fundamental role is to formulate policies; and to prescribe and promulgate rules and regulations for the attainment of LRTA objectives. It is tasked to issue, prescribe, and adopt policies, programs, plans, standards, guidelines, procedures, rules, and regulations for implementation and enforcement by LRTA Management. It convenes at least once a month to resolve operations-related issues and concerns and other matters requiring immediate attention.

The Board is composed of eight (8) ex-officio cabinet members: Secretary of the DOTr as Chairman; the respective Secretaries of the DPWH, Department of Budget and Management (DBM), Department of Finance (DOF) and NEDA; the Chairman of the MMDA and the LTFRB; the Administrator of LRTA; plus, one (1) representative from the private sector.

5.1.2. Department of Transportation (DOTr)

DOTr is the primary policy, planning, programming, coordinating, implementing and administrative entity of the executive branch of the government on the promotion, development and regulation of a dependable and coordinated network of transportation systems, as well as in the fast, safe, efficient and reliable transportation services. That its role is crucial from the planning up to the

operation and maintenance stage of the LRT2 Project is borne by the fact that the DOTr Secretary sits as chair of the LRTA Board of Directors. As such, DOTr plays the all-important role of policy-setting for LRTA operations. At the operations level, key informant interviews indicate that DOTr likewise performs the crucial role of procuring spare parts for the train sets. As discussed in this report, slow spare parts procurement is seen as the key factor behind the current state of operations: less than one-half of the total number of rolling stocks is in good running condition: currently eight vs. 18 train sets, compared to 14 out of 18 train sets at the time NEDA and JICA conducted the Ex-Post Evaluation of the project ten years ago.

5.1.3. Light Rail Transit Authority

LRTA is the implementing agency for the LRT2 Project and thus, its policies, operations as well as limitations impact directly on benefits generation. It is a Government-Owned and Controlled Corporation (GOCC) attached to the DOTr and responsible for the construction, operation, maintenance and/or lease of the light rail transit system in the Philippines: Line 1 (Green Line following a north-south direction from Roosevelt to Baclaran); and Line 2 (Blue Line following an east-west direction from Santolan to Claro M. Rector Ave.). Line 1 has been turned over to the Ayala Corp. and Metro Pacific Investments Corp. consortium under the government's public-private partnership (PPP) program. Line 2 is being fully operated by LRTA. Line 3 (Yellow Line along EDSA from Taft Ave. to North Ave) is owned by the Metro Rail Transit Corporation (MRTC), a private company operating in partnership with the DOTr under a Build-Lease-Transfer agreement.

The LRTA organizational structure (Figure 40) is subdivided into three (3) major "offices" (Office of the Administrator; Office of the Deputy Administrator for Administration, Finance and Automated Fare Collection System; and Office of the Deputy Administrator for Operations and Engineering. Under each office are departments, while various divisions fall under each department. LRTA is a fairly large organization comprising of close to 900 permanent/ regular, contractual, and contract of services employees.

The series of KIIs conducted by the Impact Evaluation Team shows that *LRTA personnel throughout the entire organization are highly knowledgeable and committed professionals, although relatively few of them were around when the LRT2 Project was being planned, constructed, and then initially operated during the period 1996 through 2003* – as noted earlier in Part I Section 3.4 (Limitations and Risks) of this Report. This was one limitation encountered by the Evaluation Team during KIIs at LRTA as well as in other agencies. In any case, the LRTA Planning Department served as one efficient point of contact for the Evaluation Team, organizing a number of KII sessions with different LRTA departments and divisions, and facilitating Team access to relevant reports.

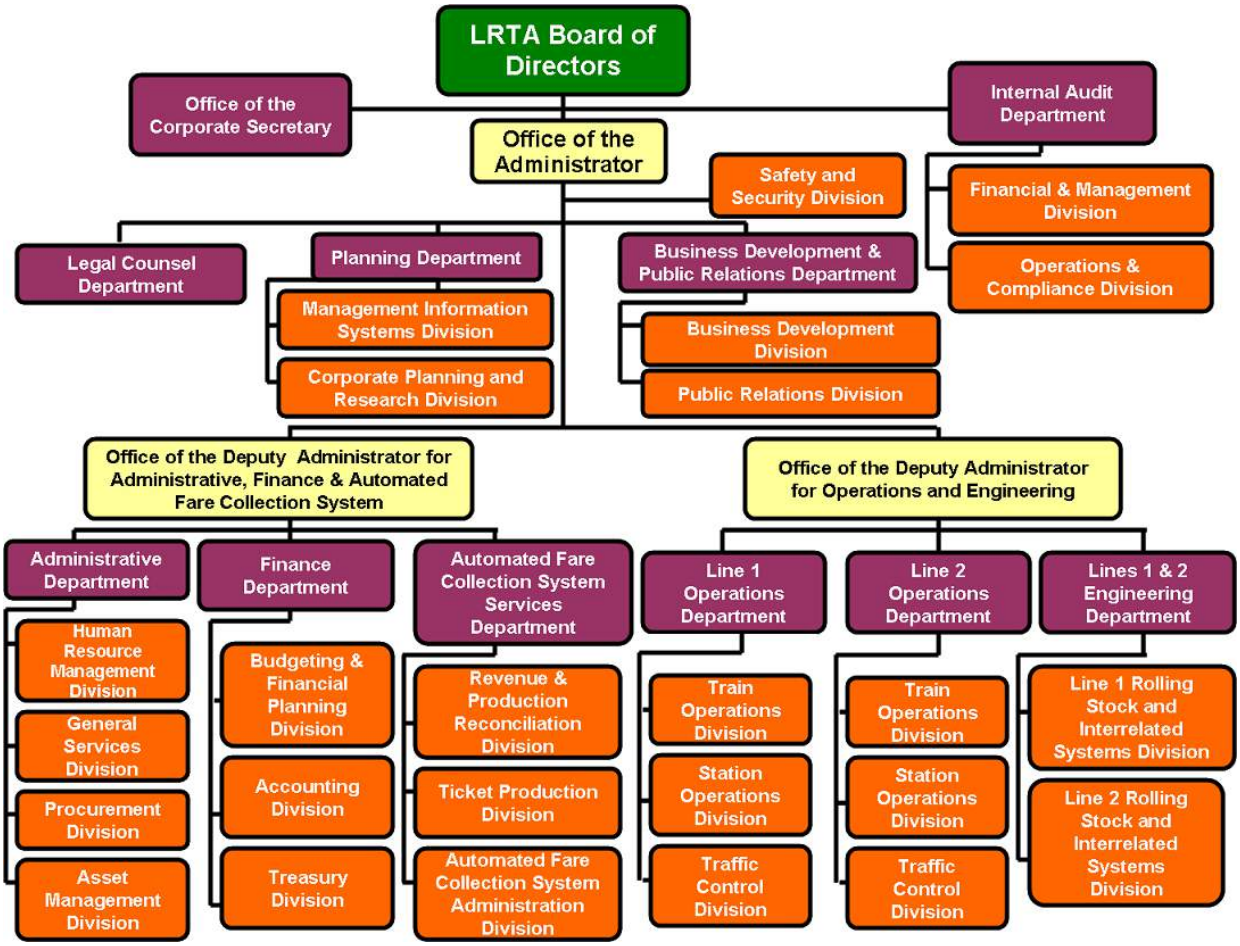


Figure 40. LRTA Organogram

Source: LRTA

The rest of the findings below focus on selected other institutions whose role the Evaluation Team wishes to highlight based on the results of our research. Concentrating on key institutions serves to focus our study. Such focus, however, should not be misinterpreted as downplaying the critical role of other major institutions, e.g., NEDA and DOTr, whose respective roles are known and appreciated far and wide.

5.1.4. Local Government Units

The more active role of LGUs was identified by impact evaluation informants as one key to generating enhanced, more inclusive, and more sustainable benefits from the LRT2 Project: *LGUs should have a sense of ownership/ complementary roles in traffic operations and management (KII MMDA).*

Pursuant to the Local Government Code of 1991, DOTr has been collaborating with LGUs in transport planning and management, recognizing the LGUs' mastery of mobility and accessibility needs within their areas of jurisdiction, as well as of local policies and ordinances to address local transportation problems. In this regard, LGUs prepare the Local Public Transport Route Plan (LPTRP) detailing the route network, mode, and required number of units per mode for delivering public land transport services. The LPTRP serves as basis for a comprehensive local transport plan.[54]

[54] DOTr, DILG and LTFRB, Local Public Transport Route Plan Manual, Oct. 2017.

Part II Sec. 2.1 of this evaluation report highlights the significant role of tricycles as one mode of feeder transport linked closely to LRT2 services, within the context of an integrated transport network system. The regulation of tricycle operations and the granting of franchises are carried out by the LGUs through the local legislature, subject to DOTr guidelines. In this regard, there is headroom to improve tricycle operations linked to rail operations, particularly in the vicinity of LRT2 stations.

Last year (2018), the Bill of the Magna Carta for Tricycle Drivers and Operators was filed in both houses of Congress. This piece of legislation seeks to prescribe a uniform set of requirements and reasonable fees that shall apply to all local government units in relation to their duties and tasks as regards their supervision and regulation of the operation of tricycles. The Bill is expected to be passed when the Seventeenth Congress resumes after the May 2019 elections.

Apart from managing tricycle transport, LGUs also: (a) field traffic enforcers; (b) regulate street parking and collect street parking fees; and (c) put up traffic signs – all of which can significantly improve the traffic situation around LRT2 stations. Thus, we see the need for enhancing the collaboration between LGUs and the MMDA. MMDA is responsible among many other duties for the administration and implementation of all traffic enforcement operations, traffic engineering services, and traffic education programs.

5.1.5. Metropolitan Manila Development Authority

MMDA performs a wide range of functions spanning the entirety of the LRT2 project cycle (planning, through construction/ implementation, and then operation). It sets policies concerning traffic management in Metro Manila, and also coordinates and regulates the implementation of all programs and projects concerning traffic management specifically pertaining to enforcement, engineering, and education. Our MMDA key informants said that:

MMDA was responsible for traffic management especially during LRT2 construction. MMDA prepared the scheme for traffic rerouting, scheduling of road closure, and providing traffic personnel.

MMDA took part in identifying the location of stations although basically, the determination of stations and depot locations was recommended in feasibility studies. However, some final adjustments had to be made.

Beyond traffic management matters, MMDA also performs urban planning functions: acting as Regional Development Council (RDC) for Metro Manila, it endorses proposed projects, including the LRT2 East and West Extension Projects, to the Investment Coordination Committee (ICC).

5.1.6. Land Transportation Franchising and Regulatory Board

LTFRB is responsible for promulgating, administering, enforcing, and monitoring compliance with policies, laws, and regulations of public land transport services. It is in charge of granting franchises or accreditations, and for regulating public vehicles such as Public Utility Buses (PUBs), mini-buses, PUJs (tied to LRT2 as feeder transport), UV Express Services, school services, taxies, TNVS, and Tourist Transport Services.

LTFRB is responsible for regulating public vehicle routes for the purpose of reducing traffic congestion along the LRT2 (or any railroad transport system) route.

By re-assessing and rationalizing transport franchises serving LRT2 stations impact areas, LTFRB can play a major role to enhance both LRT2 processes (transport system efficiency) and final results (impact/ benefits) (KII MMDA).

Here, we can see the convergence between LGUs and LTFRB in collaboratively improving complementary feeder transport modes to continually enhance the overall level of transport efficiency, i.e., in terms of reduced travel time and travel cost system-wide.

5.1.7. Producers/ Suppliers of Train Spare Parts

Many reports – including sections of this Impact Evaluation Study – have dwelled on constraints brought about by the lack and/ or untimely delivery of spare parts. From KII:

A major threat to the long-term sustainability of LRT2 (say, 20 year-period) is operation and maintenance (O&M) arrangements, including availability of spare parts. The idea of maintaining a "spare parts buffer" is not supported by the LRTA Board.

There should be: (a) multi-year ("continuity guaranteed") agreement with spare parts suppliers (say 10 years; could be government-to-government agreement); and (b) local fabrication of parts (60-70% of parts can be fabricated locally).

LRT2 rolling stocks from different countries vary in durability; some LRT1 spare parts are left unused because the original parts are too durable – a "management problem" from the COA point of view.

Stakeholders consulted noted that localization of spare parts has advantages especially in terms of more readily available replacement parts, as well as disadvantages particularly the anticipated research, development and investment costs. The dilemma is that local manufacturers will be producing a few set of parts for the same limited number of trains. Thus, investing a large sum of money to produce a few number of train parts will just make the localized cost of each part more expensive than its actual cost if procured abroad. This spare parts issue can be expected to further grow in proportion to the degree to which the Philippine light rail system expands its service area coverage, regular operations are intensified, and as parts of the system itself start to break down as expected due to normal wear and tear.

5.2. Conclusions and Recommendations

Based on the foregoing discussion, following are conclusions and recommendations to further enhance institutional roles and relationships.

5.2.1. Conclusions

5.2.1.1 Spare Parts Procurement

The institutional arrangement for procuring spare parts clearly has to be more effectively addressed. The objectively verifiable results indicator of improved procurement should be nothing less than additional train sets running regularly beyond the current eight sets.

5.2.1.2 Capacity of Institutions

The afore-discussed institutions: LRTA, LGUs, MMDA, LTFRB, spare parts producers/ suppliers, and LRTA Board, basically possess the requisite in-house capacities to perform effectively their roles

and tasks towards supporting the LRT2 system to generate significant, sustainable benefits/ impacts. This is in part a result of inter-institutional collaboration as in the case of DOTr and LGUs on local transport and traffic management.

DOTr initiated the Philippine Railway Institute (a component of the JICA-funded Mega Manila Subway Project), which will help further capacitate LRTA in implementing and operating existing and future rail projects. There exist, however, immediate opportunities to further enhance institutional capacities, as will be presented in the Recommendations Section below.

In the meantime, areas for possible institutional strengthening surfaced during key informant interviews. For instance:

Research and development (R&D) should support all LRT projects, with participation of the academe. Include a rolling stocks restoration lab (LRTA).

In-country and in-house Research and Development (R&D) is vital considering rapid advances in rail technology which implies among others that in just a few years after a rail system starts operating, some spare parts may no longer be available in the market – multi-year supply agreements notwithstanding. LRTA informants estimate that 60-70% of parts can be fabricated locally. This is an area where LRTA internal capacity-building will be needed, with the participation of Philippine and foreign manufacturers and engineering universities.

Another identified area of strengthening is in terms of LRTA procurement role and capabilities, so that more procurement can be decentralized to LRTA by DOTr. And related to capacities is the observation that since LRTA is classified as a "non-profitable GOCC" (because it cannot raise fares as it is supposed to provide subsidized transport services), LRTA personnel usually receive a smaller annual bonus compared to other GOCCs – with possible implications on overall staff performance.

5.2.1.3 Interface across Institutions

More than capacity strengthening, the various meetings and interviews conducted by the Evaluation Team show that the more immediate need is to further enhance institutional collaboration, as initially above indicated. Interviews for example showed that:

As LGUs can play a more active role in projects like LRT2, then DILG is another important stakeholder that should be involved in project planning, construction and operations (KII NEDA). Only DILG can influence LGUs to act.

Part II Section 2 on ROW Acquisition of this Report discusses findings and recommendations to address implementation delays linked to the ROW acquisition process and requirements. The stakeholders recommended that civil courts/ courts of law, LGUs, BIR, HUDCC, and NHA be more closely integrated into the design and implementation of future light rail projects. BIR, HUDCC and NHA involvement is pursuant to the provisions of RA 10752 on ROW acquisition. BIR is responsible for the zonal valuation of affected land. HUDCC and NHA are responsible for developing resettlement sites in coordination with LGUs and implementing agencies.

A hitherto perhaps under-discussed facet of "institutional interface" is collaboration between LRTA and riders themselves. (Note: Institutional analysis usually covers both formal and informal institutions.) This facet of collaboration can be facilitated through a feedback system using the LRT2 stations free Wi-Fi as platform, and building on the survey instrument drafted by the Evaluation Team for this purpose.

Various other areas for enhancing institutional collaboration have been identified (Table 39).

Table 39. Institutional Convergence for Greater LRT2 Impact

Possible Areas for Enhancing Collaboration	Institutions Involved	Potential Benefit Impact
Major Stakeholders		
1. **Improving traffic management in the impact area of LRT2 stations**	DOTr, MMDA, LGUs	Reduced Vehicle Operating Cost (VOC), travel time, transport expenses
2. **Rationalizing number and mix of different modes of transport in impact area of LRT2 stations**	LRTA, LTFRB, MMDA, LGUs	Faster traffic flow/ reduced travel time
3. **Rail technology research and development (R&D) focusing on spare parts production**	LRTA, academe/ engineering universities, spare parts producers/ suppliers/ patent holder; local machinery shops; possibly DOST also	More cost-effective operation and maintenance (O&M); more sustainable long-term operations
4. **Enhancing communications/ feedback flow**	LRTA, riders disaggregated by social and economic categories	Continuing improvements in LRT2 services leading to greater comfort, reliability, convenience, safety, efficiency and affordability
5. **Mobilizing/ pulling in other stakeholders who are not currently part of the LRTA Board (possible *ad hoc* invitees to Board meetings)**	LRTA Board, LGUs, DILG, riders (see recommendations section below)	Higher efficiency throughout the entirety of the transport network system
Other Stakeholders		
6. **Building on/ expanding tourism**	LRTA, tour groups, schools	Increased non-rail revenue of LRTA to enhance its fiscal position and sustainability prospects
7. **Business advertising (multi-media)**	LRTA, ad agencies	Same as above

Source: Evaluation Team

5.2.1.4 Basic Institutional Platform

The impact evaluation results suggest that there are other key stakeholders that should be represented in the LRTA Board where all-important policy decisions are made, and major operational difficulties are resolved. The current composition of the LRTA Board was provided above. Possible additional members of the LRTA Board are identified in the next section.

5.2.2. Recommendations

5.2.2.1 Spare Parts Procurement

This Report recommends an immediate solution, and a longer-term solution. In the immediate term, DOTr (within 2019) should delegate procurement responsibilities to LRTA, which is fully accountable for rolling stocks to be in good condition. The longer-term solution is presented immediately below.

5.2.2.2 Spare Parts Research and Development

In the longer term (starting next year, 2020), DOTr should allocate resources for R&D supportive of optimizing the economic life of the LRT2 system, and of other existing and future rail projects. LRTA informants specified that R&D should include a rolling stocks restoration lab. In Sections 10 and 11 of this Report, the other longer-term solutions recommended are: (i) including spare parts in a 20 to 30-year agreement with train supplier; and (ii) including parts as an obligation of the local train supplier partner. Spare parts R&D should involve DOST (technology applications), BOI (investment incentives) and academic institutions (e.g., transport studies conducted by UP National Center for Transportation Studies).

5.2.2.3 Broadening the Institutional Scope

The LRTA Board (starting 2019) should give other stakeholders, i.e., agencies and groups that are affected by or can affect LRT2 operations, the opportunity to participate in its regular meetings. These other stakeholders include DILG, LGUs, affected transport groups, and riders themselves. Representatives of these stakeholders could be invited to participate in specific meetings, depending on agenda items that directly affect them. The broader institutional scope will support a more dynamic harmonization of policy and operational guidelines such as on fare hike, operating hours and more strategically, expanding and diversifying the scope of LRT2 services under the same "brand".

As discussed in this study, the Evaluation Team recommends that a Rapid E-survey of Riders using LRT2 Stations Wi-Fi be institutionalized by LRTA as a regular channel of communication with riders. The purpose will be to: (1) develop a data collection tool for LRTA to efficiently draw feedback from riders; and (2) establish a standard, real-time, and interactive platform (system) to address concerns to improve LRT2 services. The Rapid E-survey is seen as a low-cost, high- impact in-house initiative to be "owned" by LRTA. It will form part of regular LRTA client satisfaction surveys.

5.2.2.4 Follow-up Strategic Studies

As noted at the beginning of this institutional analysis, this section does not aim to present a comprehensive, in-depth institutional assessment of LRT 2 performance, which can be the subject of future, follow-on research study/ inquiry. Topics for future studies (next one (1) to two (2) years) could include the following:

a. Feasibility Study on Local Fabrication of LRT Parts
b. Review and Assessment of LRT Procurement: Towards Decentralizing and Streamlining Roles and Responsibilities
c. Privatization of LRT2 Operation and Maintenance (possible updating)[55]
d. LRT2 Institutional Linkages Improvement: Towards Broader-Based Engagement in Mass Transport Systems
e. Multi-Stakeholder Partnerships to Improve Traffic Conditions in the Vicinity of LRT2 Stations

[55] LRTA, LRT Line 2 Operation and Maintenance Project Information Memorandum, Sept. 2014.

Part III:
Impact Evaluation Report

6. Were the intended economic benefits of the project realized? By how much? How can cost recovery be improved?

At this point, this Report will now begin to address the four remaining major evaluation questions – specifically pertaining to LRT2 impact/ results. To what extent were the planned impacts attained?

6.1. Economic Benefits: Planned vs. Actual Impacts

The first question centers on assessing the realization, quantity, and sustainability of intended economic benefits.

6.1.1. Findings Re Planned vs. Actual Economic Benefits

6.1.1.1 Ridership Volume and Composition

Ridership volume

Ridership statistics provide the context for benefits assessment. As such, ridership is again analyzed in this section, but in the context of benefits generation and incidence, rather than in terms of LRT2 operations which was the context of the previous ridership discussion in Part II, Section 1.1.2 of this Report.

From 2004 up to 2018, LRT2 ridership averaged 59.3 million per year or about 165,000 per day. On its initial year of operation, LRT2 posted daily ridership of more than 57 thousand, which doubled on the following year and somewhat stabilized in the succeeding years at around 175,000 (Table 40).

It can also be gleaned from data in Table 40 that ridership significantly went down in 2015, the year when the LRT2 fare increased from PhP 12-P15 to PhP 11-P25. This daily ridership represents less than 1% of total daily ridership (person-trips by all transport modes) in Metro Manila[56]. Moreover, it falls short by over 50% vis-à-vis the LRT2 daily ridership capacity of approximately 450,000 passengers.

[56] The estimated daily person-trips in Metro Manila in 2015 was 21,464,005. Reference: JICA and DOTC Technical Report, December 2015 (Project for Capacity Development on Transportation Planning and Database Management Transportation Demand Characteristics Based on MUCEP Person Trip Survey).

Table 40. LRT2 Volume of Ridership, 2004-2018

Year	Annual ridership	Daily ridership	% Increase (Decrease)
2004	20,576,785	57,158	
2005	41,798,591	116,107	103.1
2006	47,252,927	131,258	13.0
2007	55,235,262	153,431	16.9
2008	60,501,515	168,060	9.5
2009	62,090,387	172,473	2.6
2010	63,355,597	175,988	2.0
2011	63,814,414	177,262	0.7
2012	70,325,151	195,348	10.2
2013	71,590,445	198,862	1.8
2014	72,847,504	202,354	1.8
2015	62,433,356	173,426	-14.3
2016	67,002,674	186,119	7.3
2017	65,957,657	183,216	-1.6
2018	64,695,076	179,709	-1.9
Average	**59,298,489**	**164,718**	**10.8**

[a] Data from the Fare Revenue Operations Group - AFC System Administration Division, LRTA.
[b] Estimated by dividing annual volume of ridership by 360 days.

Source: Evaluation Team (based on LRTA data)

The household survey results inform us that a truly substantial majority of households living within the project impact area (combined influence area + outside influence area) have members who take LRT2 (Table 41). And that in the non-project area, less than 10% of respondents have members riding LRT2 – as expected, given that said area is more than one kilometer away from any LRT2 station.

Table 41. Household Survey Respondents with LRT2 Riders

With or Without LRT2 Rider	Project area						Non-project area		All areas	
	Influence area		Outside influence area		Total project area					
	No.	%	No.	%	No.	%	No.	%	No	%
With LRT2 Rider/s	185	91.1	191	95.0	376	93.1	32	7.9	408	50.6
Without LRT2 Rider	18	8.9	10	5.0	28	6.9	371	92.1	399	49.4
Total HH Respondents	**203**	**100**	**201**	**100**	**404**	**100**	**403**	**100**	**807**	**100**

Source: Evaluation Team HH Survey

The HH survey results further inform that within the project area (combined influence area + outside influence area), an average of only one (1) member per household is an LRT2 rider, although around 30% of the households have at least two (2) members who are LRT2 riders (Table 42). In the influence area, two (2) persons per household, on average, ride the LRT2, with 35% of households reporting that there are at least two (2) members of their households using LRT2 services.

Table 42. Extent of LRT2 Ridership in Households

No. of LRT2 Riders in HH	Project area						Non-project area		All areas	
	Influence area		Outside influence area		Total project area					
	No.	%	No.	%	No.	%	No.	%	No.	%
1	122	65.9	142	74.3	264	70.2	19	59.4	283	69.4
2	42	22.7	30	15.7	72	19.1	11	34.4	83	20.3
3	11	5.9	15	7.9	26	6.9	0	0.0	26	6.4
4	8	4.3	2	1.0	10	2.7	0	0.0	10	2.5
5	1	0.5	1	0.5	2	0.5	1	3.1	3	0.7
6	1	0.5	1	0.5	2	0.5	1	3.1	3	0.7
Total	185	100	191	100	376	100	32	100	408	100
Average no. of LRT2 riders in HH	2		1		1		2		1	

Source: Evaluation Team HH Survey

Indeed, while there are much fewer LRT2 users in the non-project area as shown on Table 42, the proportion of households with at least two members riding the LRT2 is higher at 40%, compared to the project area (30% of respondents).

Ridership composition

Table 43 provides a profile of LRT2 riders based on findings from the RRS and the HH Survey. There are slightly more male (52%) than female (48%) riders. LRT2 riders are on average 38 years old. About 3% are children below 12 years old, while 10% are 60 years old and above. Out of every ten (10) LRT2 riders, four (4) (44%) are studying while three (31%) are working.

The composition of LRT2 riders by sex is supported by the results of the LRT2 station observation and profiling exercise, which showed that 51% of riders are male and 49%, female. Also inferred from the LRT2 station observation results, riders are comprised of about 3% children, while 10% are senior citizens who are 60 years old and above.

Table 43. Profile of LRT2 Riders

Characteristics	LRT2 Riders	
	No.	Percent
Sex		
Male	730	51.7
Female	681	48.3
Total	1,411	100.0
Age		
12 and below	19	3.3
13-21	85	14.7
22-39	206	35.7
40-59	212	36.7
60 and above	55	9.5
Total	577	100.0
Average Age	38	
Occupation		
Student	624	44.2
Employed	433	30.7
Not employed	105	7.4
Others – not specified	249	17.6

Characteristics	LRT2 Riders	
	No.	Percent
Total	1,411	100.0
Household Income Class		
A, B (>P154,750 per month)	2	0.4
C (> P50,250 - P154,750)	47	8.9
D (> P15,917 - P50,250)	294	55.9
E (> P5,167 - P15,917)	140	26.6
F (lower than P5,167)	43	8.2
Total	526	100.0
Do you or your family own a vehicle?		
Yes	138	12.0
No	1,009	88.0
Total	1,147	100.0

*Income ranges based on PSA statistics.

Source: Evaluation Team Combined HH Survey and Rail Rider Survey

By household income category, more than half (56%) are members of households in income class D, or those in the income bracket PhP 15,917 to PhP 50,250 per month (Table 43). More than a third (35%) of riders belong to households in the E and F categories, or with monthly income not exceeding P16,000. Nine (9) percent of riders fall under class C (PhP 50,250 up to PhP 154,750). Only 0.4% belong to classes A and B (greater than PhP 155,000 monthly). In addition, the majority (88%) of the LRT2 riders do not own a vehicle.

6.1.1.2 Travel Time Reduction

One of the long-term positive impacts expected to result from the LRT2 operations is:

> *Improvement of mobility of people by cutting travel time between points along the LRT Line*[57]

Table 44 provides the average travel time spent by commuters from their residence to their usual destination and back, at two time periods, before (or, in the past when there was no LRT2 yet) and after (or, at present). It also shows the average travel time of commuters in the project area against those in the non-project area.

It can be noted that the average travel time of commuters from the project area is reduced by 62 minutes (1 hour), from an average of 154 minutes (2.5 hours) before, to 92 minutes (1.5 hours) at present. On the other hand, commuters from the non-project area had approximately 43 minutes travel time reduction. From these data, it appears that the LRT2 Project has reduced the travel time of commuters, LRT2 riders and non-LRT2 riders.

[57] LRTA. 1991. Feasibility Study on the LRT Line 1 Capacity Expansion and LRT Line 2 Construction: Executive Summary. page 25.

Table 44. Average Travel Time*: Project vs. Non-Project Areas

Comparators	Project Area	Non-Project Area	Increase (Decrease) (minutes)
AFTER/ "With LRT2"/ AT PRESENT (in minutes)	92.3	104.9	-12.6
BEFORE/" Without LRT2"/ IN THE PAST (in minutes)	154.3	148.1	6.2
Increase (Decrease), (in minutes)	-62.0	-43.2	-18.9

* Per trip in a day, from point of origin/ residence to their usual destination, usually along part of the LRT2 route (Santolan-Recto) in the case of those in the project area, and LRT2 riders in the non-project area; or along part of the Quezon Ave-España Blvd. corridor (R-7) in the case of commuters those in the non-project area.

Source: Evaluation Team HH Survey

A DID approach with PSM was used in estimating the impact of the LRT2 Project on travel time of commuters, both riders and non-riders of LRT2. DID allows estimation of the difference in the changes in the outcome between the LRT2 project area/ participants (treatment group) and the non-LRT2 project area/ participants (comparison or control group) over time. Applying the PSM method reduces or eliminates selection bias by balancing observable characteristics between the treatment and control groups. See Annex 21 for a discussion of the statistical tools used and results.

The DID was estimated using a "probabilistic" equation (1) where Y is the outcome of interest, i.e., travel time reduction; P=1 if project area and P=0 if non-project area; T= time dummy, T=1 if data "after" and T=0 data "before"; and (Xβ) = other observable factors that could have affected changes on the outcome Y = travel time saving such as the distance of the respondents' barangay from the LRT2 station and the respondent's sex. The DID estimate is the resulting α_3(2).

$$Y = \alpha_{0+} \alpha_1 P + \alpha_2 T + \alpha_3 P*T + \{X\beta\} + \varepsilon \quad (1)$$

$$DID = \alpha_3 \quad (2)$$

Propensity scores were generated which were used to match each observation in the project area to observations in the non-project area before estimating the DID. Table 45 shows the estimation results and DID = α_3 or net impact on travel time reduction is 8.8 minutes. This however is statistically not significant

Table 45. Average Travel Time: Project vs. Non-Project Areas

Model	Coefficients	Standard Error	t-value	Significance
Constant	170.202	24.923	6.832	.000
Rider/Non-rider	-44.014	26.639	-1.652	.099
Interaction variable (DID = α_3)	-8.764	17.289	-.507	.613
Distance	.010	.003	-3.149	.002

Source: Evaluation Team Rail Rider Survey

6.1.1.3 Travel Expenses Reduction

Travel expenses of LRT2 riders at the time of interview averaged about PhP 62.00, with more than half of them (59%) spending not more than PhP 60.00 in commuting in a day to and from their residence / point of origin to their destination. Students, on average, spend PhP 60.00 a day, while employees incur a little less, PhP 58.00 (Table 46).

Table 46. Travel Expenses (Fares) of Sample LRT2 Riders, By Type of Respondent

Estimated travel expenses (in Pesos)	Student		Employed		Not Employed		Others-not specified		All RRS Respondent Types	
	No.	%	No.	%	No.	%	No.	%	No.	%
P20 and below	25	4.0	29	6.8	2	2.0	13	10.6	78	5.6
P21 to P40	213	34.3	133	31.1	25	24.8	38	30.9	437	31.3
P41 to P60	120	19.3	111	25.9	27	26.7	21	17.1	309	22.1
P61 to 80	125	20.1	79	18.5	22	21.8	17	13.8	265	19.0
P81 to 100	82	13.2	41	9.6	13	12.9	17	13.8	172	12.3
Above P100	56	9.0	35	8.2	12	11.9	17	13.8	137	9.8
Total	621	100	428	100	101	100	123	100	1398	100
Average	60.14		58.23		64.82		68.87		61.78	

Source: Evaluation Team Rai Rider Survey

LRT2 riders among the household respondents spend PhP 3.00 higher on their daily trips, averaging PhP 65.00. Non-LRT2 riders, on the other hand, spend about PhP 75.00 per day, or PhP 10.00 higher, whether from within the Project area or otherwise (Table 47).

Table 47. Average Travel Expenses: Project vs Non-Project Areas and LRT2 vs Non-LRT2 Riders

Comparators	Project Area	Non-Project Area	Both Areas	Difference (Project-Non-Project), In Pesos
Average travel expenses per day[a] (in Pesos)				
LRT2 Riders	64.66	78.45	65.06	-13.79
Non-LRT2 Riders	74.56	75.02	74.58	-0.46
Total	**68.73**	**76.66**	**69.16**	**-7.93**
Difference (LRT2 -Non LRT2 Rider), in Pesos	**-9.90**	**3.43**	**-9.5**	

[a] From residence/point of origin to usual destination and back in one day.

Source: Evaluation Team HH Survey

The majority of road users among household respondents, whether a rider of LRT2 or not, felt that their travel expenses (fares) had increased or is greater at present, compared to what they spent on their usual route in the past (Table 48). A higher proportion of LRT2 riders (88%) claimed that their travel expenses are "greater after/with LRT2" than non-LRT2 riders (79%). Likewise, there are more road users in the project area (89%) than in the non-project area who think that their expenses are greater at present than in the past (56%).

Table 48. Riders' Perception of Increase / Decrease in Travel Expenses: Project vs. Non-Project Areas and Before LRT2 (Past) versus After (Present), In Percent of Total Respondents

Comparators	Project Area			Non-Project Area			All Areas	
	LRT2 Riders	Non-LRT2 Riders	Sub-total	LRT2 Riders	Non-LRT2 Riders	Sub-total	LRT2 Riders	Non-LRT2 Riders
Travel expenses composition								
Lesser "after / with LRT2"	7.7	8.6	8.1	27.3	16.7	21.7	8.3	8.9
The same	3.2	11.5	6.7	9.1	33.3	21.7	3.4	12.4
Greater "after / with LRT2"	89.1	79.9	85.2	63.6	50.0	56.5	88.4	78.7
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Evaluation Team HH Survey

Travel expense of commuters is estimated to have increased by roughly an average of PhP 20.00 in the project area, and by an average of PhP 8.00 in the non-project area, or by 41% and 12%, respectively, from before the use of LRT2/in the past to the present (Table 49). Considering the average of nine years use of the LRT2 by household respondents, this roughly translates to an annual increase of 4% in the project area, and a 1% increase in the non-project area – over the past nine (9) years.

Table 49. Average Travel Expenses: Project and Non-Project Areas

Comparators	Project Area	Non-Project Area	Difference (Project-Non-Project), In Pesos
Average travel expenses After LRT2/ At Present (in Pesos)	68.73	76.66	-7.93
In 2006 prices	49.55	55.27	-5.72
Average transport expenses Before LRT2/ In the Past (in Pesos)	48.75	68.54	-19.78
In 2006 prices	39.19	55.10	-15.91
Difference (After/Present- Before/Past), in Pesos	19.97	8.12	11.86
In 2006 prices	10.36	0.17	10.19
% Increase (decrease)	41%	12%	
In 2006 prices	26%	0.3%	

Source: Evaluation Team HH Survey

These rates of increase in travel expense are higher compared with the rates of PUJ minimum fare increases from 2008 -2017, which averaged only 0.4% (Table 50).

Table 50. PUJ Metro Manila Jeepney Fare Rates, 2008-2017

Effectivity Date	Minimum fare (1st 4 kms), In Pesos	% increase (Decrease)	Succeeding km, In Pesos	% increase (Decrease)
Nov. 7, 2008	8.00		1.50	
Dec. 4, 2008	7.50	-6.3	1.40	-6.7
Feb. 23, 2009	7.00	-6.7	1.40	0.0
Feb. 2, 2011	8.00	14.3	1.40	0.0
Mar. 21, 2012	8.50	6.3	1.40	0.0
May 15, 2012	8.00	-5.9	1.40	0.0
Jun. 14, 2014	8.50	6.3	1.50	7.1
Dec. 12, 2014	7.50	-11.8	1.50	0.0
Jan. 21, 2016	7.00	-6.7	1.50	0.0
Feb. 8, 2017	8.00	14.3	1.50	0.0
Average	**7.80**	**0.4**	**1.45**	**0.1**

Source: Philippine Daily Inquirer, 29 May 2018

Moreover, the estimated annual rate of increase in travel expenses of LRT2 riders particularly those in the project area is higher than the average inflation rate of 2.8% from 2012 to 2017 (Table 51). In 2006 prices, the estimated increase in travel expenses of commuters in the project area is PhP 10.00.

On the other hand, the travel expenses of road users in the project area were estimated to be smaller than those in the non-project area at both reference periods in current and 2006 prices. However, the travel fares of commuters in the non-project area did not increase in terms of 2006 prices (Table 51). The (nominal) net increase in travel expenses is at an average of roughly PhP 12.00 or PhP 10.00 at 2006 prices.

Table 51. Consumer Price Index and Inflation Rates, 2012-2017 (2006=100)

	CPI (2006=100), NCR	Inflation rate (2006=100)
2012	124.4	3.2
2013	126.4	3.0
2014	130.5	4.1
2015	131.8	1.4
2016	133.4	1.8
2017	138.7	3.2
Average		2.8

Source: PSA website

6.1.2. Social and Inclusivity Analysis of Economic Benefits

An overarching consideration in impact evaluations is assessing project contribution towards achieving poverty reduction and inclusive growth.[58] "Social analysis" can be defined in different ways but for this impact evaluation, it is intended mainly to examine the degree to which LRT2 contributes to equitable and sustainable development. Specifically, social analysis will examine the incidence of benefits (disaggregated impacts), stakeholder participation, and gender equity.

Data gathered for this evaluation show that over half of riders (56%) are middle income (PhP 15,917 to 50,250 monthly income) and one-third, lower income (max. PhP 15,917 monthly income vs. income threshold of PhP 10,481 in 2018). Majority (88%) of riders do not own a vehicle.

Majority of LRT2 riders fall under two (2) professions, both of which are building blocks for inclusive and sustainable development: students and employees/ workers (Table 43, above). LRT2 makes it easier for students, who comprise around 44% of riders, to commute. LRT2 thus supports the education system by enabling students to travel faster and in comfort, and spend more time and energy studying and learning, rather than wallowing in traffic. The data also manifest the LRT2's noteworthy role in conveying passengers to and from their place of work, as one-third of passengers are found to be employees/ workers. LRT2 impact on students will be discussed further in Section 7.1 on unintended benefits.

LRT2 serves men and women equally: 52% and 48% of riders, respectively, as similarly noted in the previous Ex-Post Evaluation Study. It is also a fitting mode of transport for young children and seniors. Traveling by LRT2 is faster and more comfortable compared to commuting by any other alternative mode of transport. It is more affordable than traveling by certain modes such as TNVS and taxi, but more expensive compared to taking a PUJ or ordinary bus. Hands down, travel by light rail is faster due to the usual traffic conditions.

The social inclusive orientation of LRT2 services can also be inferred from the educational attainment of its patrons, as obtained from household survey results (Table 52). The figures convey that close to six out of every 10 riders reached up to the high school level, and that less than one-fourth are college graduates.

[58] NEDA, Terms of Reference for Consulting Services for the Impact Evaluation of the Light Rail Transit (LRT) 2 Project, page 1.

Table 52. Educational Attainment of LRT2 Riders

Educational Level/ Attainment	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Kinder/Nursery	1	0.4	1	0.4	2	0.4
Elementary	10	3.6	13	5.4	23	4.5
High School	160	58.4	114	47.1	274	53.1
College level	42	15.3	49	20.2	91	17.6
College Graduate	57	20.8	62	25.6	119	23.1
Post Graduate	1	0.4	0	0.0	1	0.2
Vocational	3	1.1	3	1.2	6	1.2
Total	274	100	242	100	516	100

Source: Evaluation Team HH Survey

LRT2 has affected jeepney drivers both positively and negatively. The Evaluation Team interviewed drivers plying the Cubao to Divisoria route in order to assess the impact of LRT2 on their group, which is a close competitor of L.RT2 on the same route. The interviews showed the following highlights, among others:

- The 11 km route did not change with LRT2 since there was no re-routing even during LRT2 construction.
- Jeepney passengers consist mostly of students enroute to the university belt, and vendors with merchandise from Divisoria. Employees of malls and businesses are now among their regular clients.
- LRT2 did not change the jeepney passengers' composition, but significantly reduced volume, as jeepney riders shifted to LRT2 for faster travel speed and enhanced comfort.
- Frequency of trips is the informants' main indicator for passenger volume. The drivers could make 8-10 round trips daily along the route before LRT2 started operations. This had been reduced to one-half. Reduction of passengers equates to less income for PUJs.
- Some PUJ drivers interviewed by the Evaluation Team voiced the perception that they are benefiting from more manageable traffic conditions along R-6. LRT2 impact on jeepney drivers will be further discussed in Section 7 on unintended benefits.

The full case study on jeepney drivers is provided in Annex 22.

6.1.3. Conclusions and Recommendations

What conclusions and recommendations regarding the realization of planned benefits can be drawn from the above findings?

6.1.4. Conclusions

6.1.4.1 Ridership

That the actual volume of passengers has not yet been achieved by the project, some 15 years after the start of operations, has been discussed thoroughly in this Report. *Benefits will rise along with ridership.* In the meantime, what might be highlighted in this section on benefits, is that the "quality" of ridership, i.e., its composition, should also be taken into account in transport studies including impact evaluations. In the case of LRT2, the service being made available to women and special needs passengers is an important contribution towards achieving the Project goal of "Sustained public transport-based development".

6.1.4.2 Travel time

LRT2 has undoubtedly reduced travel time. Net time savings, i.e., using the "with versus without project analysis" is estimated to be around 8.8 minutes (to and from destination, after PSM application). In the project area, this translates to roughly 40% savings (62.0 minutes savings compared to 154.3 minutes travel time before LRT2) – compared to the target of 44% savings specified in the project logframe. A pivotal view that must be introduced in reckoning travel time savings is that transport chaos would have occurred without LRT2 serving Radial Road 6 (see for example Section 7).

The economic impact of time savings will be shown later in Section 6.2 of this Report. Calculations will show annual savings of approximately PhP 584.4 million, which is only around 42% of the target savings of "PhP 1,400 million in 2004" specified in the logframe. This is not unexpected considering that actual ridership is less than one-half of LRT2 full capacity. Total time savings is valued at PhP 8,765.6 million over the 15-year operating period (2004-2018).

6.1.4.3 Travel expenses

Going by the data gathered for this evaluation, travel expenses indisputably rose in both project area and non-project area (Table 49). Although this conclusion seems counterintuitive with respect to the affordability objective of LRT2, the increase in transport expense should have been expected because prices have been rising normally – both in nominal and real terms – over the 15-year period (2004-2018) during which LRT2 has been operating. Price movement was illustrated in the Consumer Price Index (CPI) values shown in Table 51.

In the project area, transport expenses were reported to have gone up by an average of PhP 20.00 per day. Such is predictable as prices hardly ever go down. The above CPI trend can mirror the pattern of daily expenses (including transport) through the years: expenses cannot be expected to go down. But it can be seen to go down: (i) in terms of a benchmark fare/ charged by alternative transport mode/s such as TNVS; and/ or (ii) in real terms, by deflating current expenses so that these will be comparable to a given base year.

6.1.5. Recommendations

6.1.5.1 Ridership

Recommendations in the context of LRT2 implementation are provided in Part II Section 1.2.2 of this Report. The magnitude of benefits/ impact will rise in proportion to the increase in passengers. With regard to socio-economic impact on riders, what might be recommended are as follows:

1. NEDA-MES should conduct follow-up periodic "quality of benefits" surveys/ studies (next year) to complement magnitude of benefits analysis. Data can include riders' feedback drawn cost-effectively through the recommended Rapid E-Survey using LRT2 Station Wi-Fi.
2. Related to the above and given perception survey results, LRTA should enhance enforcement of regulations and functioning of elevators and other amenities targeting passengers with special needs: PWDs, pregnant riders, children below 12 years, and senior citizens (within 2019).

6.1.5.2 Travel time

Recommendations related to train operations are provided in Part II Section 4.2.2. With benefits generation, the following might be considered:

1. LRTA should extend on trial basis (within 2019) LRT2 operating hours to accommodate the flexible work hours and class schedules of its main patrons (noting the pending bill in Congress to extend operating hours until midnight).
2. Future evaluations should further investigate the reported reduction in travel time in non-project areas, considering the generally worse current traffic conditions, as compared to 15 years ago.

6.1.5.3 Travel expense

3. Future evaluations should ensure that any analysis of travel expense should take into account inflationary effects. The fare rate in Year 2004 cannot be directly compared with the fare rate in Year 2018/19. To be comparable, annual fare rates should be deflated to one base year.
4. LRTA should balance any possible increase in LRT2 fare in terms of two considerations (within 2019): (1) financial sustainability; and (2) affordability by fixed-/ low-income earners, as well as students who comprise the majority of regular patrons. A related consideration is that many riders assign a higher priority to reduced travel time rather than transport fare.

6.2. Analysis of Financial Performance and Economic Impact of LRT2

This section of the Impact Evaluation Report will provide an assessment of the Financial Performance and Economic Impact of LRT2. It will draw insights based on the expectations of National Government when the LRT2 Project was conceptualized, through its early operation stages, and until its current state as a major Mass Transport Facility.

6.2.1. Methodology

For this study, *Financial Performance* is defined as the degree to which the implementing organization has realized financial benefits and recovered costs in the course of pursuing its mission. *Economic Impact* refers to changes in the economy and the extent to which these changes contribute to the enhancement of broader society. In the context of this impact evaluation study on LRT2, analysis of Financial Performance is carried out to determine the ability of LRTA to sustain LRT2 operations, while Economic Impact Analysis is undertaken to establish how the National Government is living up to its commitment to the broader society with respect to developing and managing LRT2.

For this project, analysis of financial performance and economic impact shall be carried out in three (3) “phases”:

6.2.1.1 Phase 1: Review of Financial and Economic Considerations Justifying LRT2 Construction

This first Phase sets the parameters of the evaluation and the indicators of financial performance and economic impact. The source document for the review is:

- *Updated Feasibility Study on the LRT 1 Capacity Expansion and LRT 2 Construction* submitted to the then Philippine Department of Transportation and Communication (DOTC) in August 1991.

6.2.1.2 Phase 2: Evaluation of Financial Performance Anticipated during Development Phase

This second Phase is important as it considers changes in evaluation assumptions and the circumstances that may affect the ability of the project to recover costs and realize benefits. The source documents for this phase are the following:

- *Metro Manila Strategic Mass Rail Transit Development (I), (II), (III)* by Kawabata, Y., & Aoki, H. The document was produced in 2009 and retrieved from Japan International Cooperation Agency (https://www2.jica.go.jp/en/evaluation/pdf/2008_PH-P171_4.pdf);

- ODA Portfolio Review – *Metro Manila Strategic Mass Rail Transit Development Project, Phases I, II and III (Line 2) (LRTA)* of the NEDA (2009) and retrieved from the said agency (http://www.neda.gov.ph/wp-content/uploads/2018/03/Annex-4-D-Results-of-Ex-Post-Evaluation-Conducted-in-CY-2009-1.pdf).

6.2.1.3 Phase 3: Evaluation of Actual Financial Performance and Economic Impacts

The primary sources of data for this phase are the following:

- *Metro Manila Strategic Mass Rail Transit Development (I), (II), (III)* by Kawabata, Y., & Aoki, H. The document was produced in 2009 and retrieved from Japan International Cooperation Agency (https://www2.jica.go.jp/en/evaluation/pdf/2008_PH-P171_4.pdf);

- ODA Portfolio Review – *Metro Manila Strategic Mass Rail Transit Development Project, Phases I, II and III (Line 2) (LRTA)* of the NEDA (2009) and retrieved from the said agency (http://www.neda.gov.ph/wp-content/uploads/2018/03/Annex-4-D-Results-of-Ex-Post-Evaluation-Conducted-in-CY-2009-1.pdf).

- The *Annual Audit Reports on the Light Rail Transit Authority* from 2009 to 2017 of the Philippine Commission on Audit (COA);

- Available and most recent *Department Orders* of the DOF that provided the Zonal Values of Real Properties in some of the areas where LRT2 stations are located; and

- Key Informant Interviews of Micro and Small Businesses operating within the vicinity of the LRT 2 stations.

For purposes of the study, Phase 1 covers the period prior to the construction of LRT2 (late 1990s to 2000). Phase 2 covers the construction period (early 2000 to 2004). Finally, Phase 3 covers operations until 2017.

6.2.2. Scope and Limitations

It must be noted that LRT2 was proposed along with the expansion of LRT Line 1 [*LRT 1*]. The proposal was made on the assumption that integrated transport development is the only effective means of maximizing the benefits of major transportation projects (DOTC, 1991, p. 13). Hence, the evaluation looks at LRT2 as one of the components of broader LRTA operations. This has been the

case until 12 September 2015 when LRTA transferred management of LRT1 to the Light Rail Manila Corporation (LRMC), a private firm, as part of the concession agreement executed on October 2014 (COA, 2015).

It must be noted that as much as the Evaluation Team endeavored to fully establish the performance and impacts of LRT2, the analysis is limited by the availability of reports and the reliability of information. Zonal values prescribed by DOF Department Orders provide independent zonal values needed to establish the impact of LRT2 on real property. However, not all DOF Department Orders are available and updated to support the methodology adopted for this study. Annual financial statements can significantly aid in the evaluation of financial performance, but the engagement was limited to only those that can be retrieved during the evaluation time provided to the consultants. Finally, there are reservations on the implications of the financial performance analysis since Commission on Audit (COA) issued a qualified opinion on the LRTA financial statements used in this study.

Nevertheless, the findings herein can provide useful insights to design monitoring and evaluation approaches for similar projects in the future. Although the conclusions are suggestive and will require further corroboration founded on a complete set of reliable data, the assessment procedures followed can aid in further probing the economic impact and financial performance of mass rail transit systems such as LRT2.

6.2.3. Phase 1: Setting Financial Performance and Economic Impact Baselines

6.2.3.1 Expected Economic Impact

At the time LRT2 was proposed, Metro Manila was characterized for its rapid urban sprawl, increasing urban development pressures, reliance on private vehicles as means of transport, and the absence of a comprehensive Metro Manila Development Plan (DOTC, 1991, pp. 10-15). Providing a mass transport system was viewed as a strategy to improve Metro Manila's urban form in the course of alleviating traffic problems (DOTC, 1991, p. 15).

In 1991, the three (3) alternative routes considered were: Aurora Route [Route 1], E. Rodriguez Route [Route 2], and Modified Aurora Route [Route 3] (DOTC, 1991, p. 27). In the updated Feasibility Study, DOTC estimated ridership figures for the coming decades (see Table 53 and Table 54). For this project impact, these data will be used as baseline figures for Rail Ridership.

Table 53. Estimated Annual LRTA Rail Ridership (LRT 1 & 2 combined) in millions (DOTC, 1991, pp. 43-44)

Ridership	2000		2010	
	Within Capacity Constraints	Expanded Capacity	Within Capacity Constraints	Expanded Capacity
Route 1	910	1,290	910	1,740
Route 2	880	1,150	900	1,550
Route 3	890	1,130	890	1,520

Source: DOTC, 1991.

Table 54. Estimated Annual LRTA Rail Ridership (LRT 2 only) in millions (DOTC, 1991, pp. 43-44)

Ridership	2000		2010	
	Within Capacity Constraints	Expanded Capacity	Within Capacity Constraints	Expanded Capacity
Route 1	210	320	210	430
Route 2	180	180	200	240
Route 3	190	200	190	270

Source: DOTC, 1991.

Based on the rationale of the Feasibility Study, LRT2 construction is seen as a strategy to direct urban development while addressing traffic issues. LRT2 impact is measured in terms of Vehicle Operating Cost (VOC) Savings and Travel Time Savings (DOTC, 1991, pp. 58-60). The estimated Economic Benefits [in terms of VOC Savings plus Travel Time Savings] of the project are as follows:

Table 55. Estimated Economic Benefits of the Project, In millions of PhP (DOTC, 1991, p. 62)

Alternative Routes and Benefits		1995	2000	2005	2010
Route 1 Aurora Route	VOC Savings	1,001	1,205	1,397	1,468
	Time Savings	1,407	1,932	2,466	2,859
	Total	2,408	3,137	3,863	4,327
Route 2 E. Rodriguez Route	VOC Savings	808	1,132	1,229	1,334
	Time Savings	1,370	2,098	2,506	2,993
	Total	2,187	3,230	3,735	4,327
Route 3 Modified Aurora Route	VOC Savings	835	1,130	1,221	1,323
	Time Savings	1,286	1,901	2,327	2,788
	Total	2,121	3,004	3,548	4,111

Source: DOTC, 1991.

The estimated impact of Route 1 shall serve as baseline economic impact of LRT2. The annual estimated annual time savings (calculated in 1995 at PhP 159.8 million – Table 56) and annual VOC savings (est. in 1995 at PhP 184.3 million – Table 57) shall be the used as benchmarks.

To assess the accuracy of this measure, the Evaluation Team compared the VOC and Time Savings at present with the estimate prescribed in Route 1. The estimated economic impact for LRT2 is reinforced when: (1) the assumptions in 1995 hold true; or (2) scenarios are better at present compared to the expected scenario when the project was conceptualized in 1995. If either scenario holds true, then the Economic Impact, in terms of Economic Internal Rate of Return, remains as valid measure. In the DOTC feasibility study, the Route 1 IRR is 18.27%

Table 56 (Variance Analysis of Time Savings) presents the data used to compute LRT2 time savings in 1995 and 2018. Annual time savings is a function of annual ridership, time savings of passengers, and value of time saved per hour. Although Average Daily Ridership was less than expected (lower by 325,524 passengers), the estimated annual time savings in 2018 is PhP 179.6 million higher than the estimate made in 1995 (but lower compared to the FS target of PhP 1,400 million in 2004). The lower level of ridership is more than compensated by the substantial increase in time savings (8.6 minutes per rider), coupled with the increase in value of time saved (PhP 11 higher). Hence, the economic impact in terms of Annual Time Savings is above the expected level.

Table 56. Variance Analysis of Time Savings

Base Year	Est. Ave. Travel Time Savings in min.	Ave. Daily Ridership	Est. Time Savings, hrs	Est. Time Value, PhP/hr	Est. Total Annual Time Savings, PhP
1995	10.3	510,000	87,550	5	159,778,750
2018	18.9	184,476	58,110	16	339,362,050
Variance	8.6	(325,524)	28,440	11	179,583,300

Source: 1995 data based on DOTC (1991), 2018 based on estimates of Evaluation Team HH Survey

The 1995 and 2018 VOC savings are also compared. Table 57 (Variance Analysis of VOC Savings) presents the data used to compute LRT2 VOC savings in 1995 and 2018. Annual VOC savings is a function of annual ridership, Average length of Trip of Passengers, and VOC savings per rider. Annual VOC savings is lower compared to the 1995 estimate due primarily due to low ridership, resulting in Annual VOC savings being about 50% less compared to the expected level.

Table 57. Variance Analysis of VOC Savings

Base Year	Ave. trip-km per rider	Average daily ridership	Total rider-km/ day	VOC savings per LRT2 rider-km	Annual VOC savings
1995	6.6	510,000	3,366,000	0.15	184,288,500
2018	8.05	184,476	1,485,032	0.15	81,305,502
2018	8.05	184,476	1,485,032	0.15	86,725,869
2018	8.05	184,476	1,485,032	0.16	86,725,869
2018	8.05	184,476	1,485,032	0.17	92,146,236

Source: 1995 data based on DOTC (1991), 2018 based on estimates of Evaluation Team VOC Key Informant Interviews

Notwithstanding low ridership, the Evaluation Team carefully looked into aggregate economic impact. We analyzed the sum of Annual Time and VOC savings to determine aggregate impact (see Table 58). The 1995 estimate is PhP 344.0 million. Under the "low" and "high" Annual time and VOC savings scenarios, annual economic impact is still substantially higher, at PhP 420.7 million for the low time and VOC savings scenario, and PhP 431.5 million for the high scenario. Since the actual scenarios are better at present compared to the expected scenario when the project was conceptualized in 1995, then the EIRR rate of 18.27% is still a valid estimate. It should be noted that the actual EIRR is likely higher. The Evaluation Team deems it appropriate to use the 18.27% as a conservative estimate of economic impact.

Table 58. Comparative Economic Impact, in terms of Time and VOC savings

Base Year	Annual Time Savings, in PhP	Annual VOC Savings, in Php	Total Annual Economic Impact
1995	159,778,750	184,288,500	344,067,250
2018 (Low scenario)	339,362,050	81,305,502	420,667,552
2018 (High scenario)	339,362,050	92,146,236	431,508,286

The EIRR is used as the main measure of Economic Impact. The EIRR is the discount rate required for the Net Present Value (NPV) of a project to be zero. In a nutshell, NPV is the difference between Economic Benefits and Costs, priced at present, using a discount rate that considers the expected risks and returns of a project. A positive NPV is an indication that the economic benefit over time of a project exceeds the economic costs over the same period. If a project's NPV is computed using the EIRR, the NPV is zero. However, if the discount rate used to compute the NPV is lower than the EIRR, the NPV is positive. Hence, if the EIRR is greater than the discount rate used to price or value a project, then the project is deemed economically viable. For this project, the SDR of 15% prescribed by the Philippine ICC prior to 2016 (ICC, 2016), was used to determine the NPV of the project.

Table 59 presents the baseline EIRR for all the routes. Notice that for all routes, the EIRR is greater than the 15%. Hence, ***the project is deemed economically viable given the 1990s circumstances when the project was proposed***.

Table 59. Baseline Economic Impact

Alternative Routes	SDR	EIRR (DOTC, 1991, p. 63)
Route 1	15%	18.27%
Route 2	15%	18.45%
Route 3	15%	18.38%

Source: DOTC, 1991.

Apart from measurable economic impacts, there are specific changes expected when LRT2 becomes operational. Some of the relevant economic impacts not covered by the EIRR, which are all identified as positive in the feasibility study, include:

- Improvement in mobility of people by cutting travel time between points along the LRT Line 2 route;
- Increased employment generation;
- Enhancement of businesses opportunities; and
- Opportunities to start urban renewal projects (DOTC, 1991, p. 70).

Travel time savings are quantified in this evaluation study using data generated from the household survey and rail ridership surveys. Employment and business impact are evaluated based on the perceptions of stakeholders, particularly insights from those who frequent LRT2 and do business in the periphery of LRT2 stations; these impacts were not quantified due to data constraints. As for opportunities for urban renewal, zonal values can be used as proxy indicators of potential of land for urban renewal.

6.2.3.2 Expected Financial Performance

As a social investment, LRT2 is expected to charge affordable fares for the riding public (DOTC, 1991, p. 20). During its conceptualization, it was also implied that the project will not be able to recoup its investments. However, LRTA has to maintain sufficient resources in order to fulfill its mission. It is therefore necessary for LRTA to recover a substantial portion, if not all, of costs necessary to run LRT2.

Financial performance is an indication of the organization's capacity to recover costs, and therefore its potential to be sustainable. To establish financial performance, one needs to compare a project's ability to generate incremental cash flows with the full cost of operation. A project is said to be financially viable if incremental cash flows are sufficient to cover cost of operation. Two measures can be used to establish financial performance – Farebox Recovery Ratio (FRR) and Financial Internal Rate of Return (FIRR).

Farebox recovery is the ratio between fare revenue and cash operating expenses. It is an indicator to determine if the investment is generating enough to cover the cost of doing business. Farebox recovery is used to analyze annual financial performance. Using projected revenues and operating expenses of LRT2 for the three (3) routes (DOTC, 1991, pp. 76-78), the baseline farebox ratio of LRT2 is presented in Table 60.

Table 60. Baseline Financial Performance – Farebox Recovery Ratio

Alternative Routes	Base Fare	Average Farebox Ratio
Route 1	P5.00 to P5.50	403%
Route 2	P5.00 to P5.50	387%
Route 3	P5.00 to P5.50	381%

Source: DOTC, 1991.

Analysis of Farebox Recovery is useful to monitor yearly financial performance. To evaluate long-term financial viability, cost of money should also be considered. To account for this, one can use the Financial Internal Rate of Return with Weighted Average Cost of Capital (WACC) of the project as indicators (ADB, 2017, p. 6). The FIRR is the discount rate required for the NPV of a project to be zero. A positive NPV is an indication that project revenues over time will exceed the cost of running the project over the same period. If a project's NPV is computed using the FIRR, the NPV is zero. However, the FIRR should be compared with the Weighted Average Cost of Capital, provided by

those who financed the project. The WACC is therefore a hurdle rate. If the FIRR is greater than the WACC, the NPV computed using the WACC is likely positive, and the project is deemed financially viable.

For LRT2, the WACC needs to be computed using the funds that financed the project. In the DOTC Feasibility Study, WACC is computed and presented as follows.

Table 61. WACC Computation

Funding Source	Percent of total of Project cost	Cost of Capital	WACC
Overseas Economic Cooperation Fund (OECF)	80%	2.7%	2.16%
Equity	20%	25%	5%
WACC			7.16%

Source: DOTC, 1991.

Table 62 presents the baseline Financial Performance, in terms of FIRR, for all the routes. Notice that for all three alternative routes, the FIRR is greater than the 7.16%. Hence, ***the project is deemed financially viable or profitable given the 1990s circumstance when the project was proposed***.

Table 62. Baseline Financial Performance – FIRR

Alternative Routes	WACC	FIRR (DOTC, 1991, p. 63)
Route 1	7.16%	8.20%
Route 2	7.16%	7.16%
Route 3	7.16%	7.42%

Source: DOTC, 1991.

6.2.4. Phase 2: Preliminary Financial and Economic Evaluation

6.2.4.1 Analysis of Potential Financial Performance – Was LRT2 viable in 2000?

Project construction started in early 2000 and ended in 2004. Analysis of Potential Financial Performance is done in order to check if the assumptions when the Feasibility Study was conducted remained true after LRT2 was actually constructed. For this Phase 2 analysis, the FIRR is deemed appropriate to establish potential financial performance

The WACC needs to be computed based on the cost of funds that actually financed the project. The package of Japanese Yen-denominated loans committed to LRT2 is presented in Table 63. Note that the loan only comprises 76% of total project cost. The remaining balance (24%) is assumed to be shouldered by the National Government or other sources as equity.

Assuming the legal rate of return of 6% (BSP, 2013) was used as the base return of the National Government, the $WACC^A$ is estimated at 3.03% (Table 63). For comparison, we may also assume that the balance could be funded by other fund sources at a reasonable borrowing rate, as suggested in empirical studies cited by the ICC (ICC, 2016). Assuming a rate of return equal to 10%, the $WACC^B$ is estimated at 4.00% (Table 63).
For purposes of estimating WACC, the Evaluation Team assumed that the risk-free rate is the same for the Yen denominated loans and sources that funded the balance of the project cost.

Table 63. Fund Sources

Loan Package	Amount, in Yen	% total	Cost of Capital to compute WACC^{A}	Cost of Capital to compute WACC^{B}
Loan I*	24.71 billion	25%	2.70%	2.70%
Loan II*	26.34 billion	27%	2.70%	2.70%
Loan III*	23.67 billion	24%	0.75%	0.75%
Others	23.94 billion	24%	6%	10%
Total*	98.66**	100%		
WACC Estimate			3.03%	4.00%

*Source: (Kawabata & Aoki, 2009)
**Excludes Interest during Construction

Table 64 presents the comparison between the FIRR and the WACC^{A} and WACC^{B}. Note that the FIRR exceeds the WACC^{A} estimate. Since WACC is the hurdle rate, we can deduce that *LRT2 is financially feasible when the National Government rate of return is 6%*. This means that the revenue expected to be generated by the project is less than the estimated cost of running it. Furthermore, we note that the WACC^{B} estimate is greater than the FIRR. By comparing the FIRR with the WACC, which is the minimum hurdle rate, we can deduce that the *LRT 2 is not financially feasible when the National Government rate is 10%*. This means that the revenue generated by the project is less than the cost of running it.

Table 64. LRT 2 FIRR

LRT 2 FIRR Sources: (Kawabata & Aoki, 2009) and (NEDA, 2009)	WACC estimates	
	WACC^{A}	WACC^{B}
At appraisal: 3.8%	3.03%	4.00%
At ex-post evaluation: 3.35%		

Source: DOTC, 1991.

It would appear that ***LRT2 will be deemed financially viable if the National Government expects a very low return from the said project.*** This may be consistent with the expectation set in 1990s that LRT2 as a social investment is not expected to recoup its investments. **A lower FIRR is an indication that the National Government may have lowered its financial performance expectations over the years.** [Note that the Feasibility Study was prepared in 1991.] This implication is evident when we compare FIRR estimates in Phase 1 with the FIRR estimates in Phase 2 (see Table 65). However, this may not be a prudent move on the part of the National Government because a portion of the funds came from external sources. In case the interest on foreign loan is substantially higher than what was agreed in the late 1990s, the LRTA might find itself in a situation where it can face difficulties for failing to meet loan obligations.

Table 65. Comparative FIRR

FIRR Particulars	FIRR Estimates
Phase 1 FIRR	7.16% to 8.20%
Phase 2 FIRR – At appraisal	3.80%
Phase 2 FIRR – At ex post evaluation	3.35%

Source: DOTC, 1991.

6.2.4.2 Variance Analysis – Was the LRT2 Budget Spent as Planned?

Analysis of FIRR is a useful tool to establish financial performance. However, this evaluation study can also benefit from analyzing the budgeted and actual expenses to realize the project. By understanding the difference between the budgeted and actual costs, one may acquire an idea about the financial performance implications of a project that did not meet standards regarding time and amount spent.

Variance analysis is an accounting technique used to investigate the difference between actual and planned costs. A *variance* is the difference between a planned activity and the actual financial outcomes. The technique allows the financial analyst to zero in on activities and probe further. A Favorable Variance is reported when Actual Cost does not exceed Planned Cost. Otherwise, an Unfavorable Variance is reported.

Table 66 and Table 67 present the Variance Analysis of the project component items, in Yen and Peso values, respectively. Two denominations were used to be able to capture the foreign exchange impact of the construction of LRT2.

During the construction phase, it must be noted that a significantly unfavorable variance was computed for the Construction of Superstructure, Procurement of Consulting Services, and Interest and Tax levies.

- Superstructure cost increased substantially in Yen (112% of planned cost) and in Philippine Peso (162% of planned cost). The increase in cost may already be expected with the inclusion of Price and Physical Contingencies in the budget. The additional increased cost in Philippine Peso was due to a higher exchange rate for the Japanese Yen, according to (Kawabata & Aoki, 2009, p. 6).
- Consulting Services cost increased substantially in Yen (65% of planned cost) and in Philippine Peso (104% of planned cost). The additional increased cost in Philippine Peso was due to the higher exchange rate for the Japanese Yen, and the extended construction period (Kawabata & Aoki, 2009, p. 6). It was noted that the planned period construction period was from 1996 to 2001, but actual construction was not completed until 2004 (Kawabata & Aoki, 2009, p. 5).
- Interest and Tax Levies also increased substantially during the Construction Phase. Tax Levies were not anticipated during the planning stage so these were not included in the budget. Interest cost increased in Yen (36% of planned cost) and in Philippine Peso (68% of planned cost), which can also be attributed to the higher exchange rate for the Japanese Yen since 76% of the loan was Yen-denominated (see Table 63).

Nevertheless, the Evaluation Team also took note of Favorable Variances that resulted to cost savings. Substantial favorable variance is reported for the Depot, Substructure, Fare Collection Systems, Vehicle, Ancillary Facilities, Tracks, and Land Acquisition.

- Depot and Land Acquisition cost decreased in Yen (39% of planned cost and 32% of planned cost, respectively) and in Philippine Peso (24% of planned cost and 15% of planned cost, respectively). According to the report of Kawabata and Aoki (Kawabata & Aoki, 2009, pp. 4-5), the area for the planned Depot did not push through because of unsuccessful negotiation between LRTA and the owners of lots. This impact evaluation report noted previously that the completed depot is 1.24 hectares, compared to the planned 9.8 hectares.

- Cost of Substructure decreased substantially in Yen (18% of planned cost) and increased slightly in Philippine Peso (1% of planned cost), while total cost of the Fare Collection Systems, Vehicle, Ancillary Facilities, and Tracks decreased in Yen and Philippine Peso (33% and 17% of planned cost, respectively) (see Table 66 and Table 67) in spite of all purchases and construction being completed as planned (Kawabata & Aoki, 2009, pp. 4-5). The cost savings can be attributed to low cost of purchases to set up these components of the project.

Based on the variance analysis, we can see that *the extended construction period and a strong Japanese Yen compared to the Philippine Peso were the main cause of Unfavorable Variances*. According to (Kawabata & Aoki, 2009), the main reasons for the extended construction period are as follows:

- Extended negotiation time for land acquisition, that included relocation, that lasted almost five (5) years;
- Extended investigation and survey of overhead and underground utilities, because there were no as-built plans available;
- Extended negotiation of Fare Collection Systems, Vehicle, Ancillary Facilities, and Tracks; and
- Design changes, particularly in the location of the Santolan Station, and location of Substructures in Pureza Station, and other structures.

Summing up all the cause of variances, the *foreign exchange impact on construction substantially contributed to the higher cost in the Philippine Peso. Cost savings could have been realized if purchases were transacted in Yen.* This is supported by a Favorable Variance in Yen (14% of planned cost, see Table 66) compared with an Unfavorable Variance in Philippine Peso (6% of planned cost, see Table 67).

Table 66. Variance Analysis, in Yen (Planned and Actual Values)

Project Components	Planned Values, in Yen		Actual Values, in Yen		Variance, in Million Yen	% difference from Planned	Remarks
	In Million Yen	% of Total Value	In Million Yen	% of Total Value			
	A	*B*	*C*	*D*	*A-B*	*(A-B)/A*	
Depot	¥5,572	5%	¥3,401	4%	¥2,171	39%	Favorable
Substructure	¥15,560	15%	¥12,761	15%	¥2,799	18%	Favorable
Superstructure	¥9,404	9%	¥19,902	23%	-¥10,498	-112%	Unfavorable
Fare collection system, vehicle, ancillary facilities, and tracks	¥35,379	34%	¥23,808	27%	¥11,571	33%	Favorable
Consulting Services	¥3,129	3%	¥5,150	6%	-¥2,021	-65%	Unfavorable
Land acquisition	¥18,536	18%	¥12,680	14%	¥5,856	32%	Favorable
Subtotal before contingencies, interest, and taxes	¥87,580	85%	¥77,702	88%	¥9,878	11%	Favorable
Price & Physical contingencies	¥11,084	11%	¥-	0%	¥11,084		
Subtotal before interest and taxes	¥98,664	96%	¥77,702	88%	¥20,962	21%	Favorable
Taxes and levies	-	0%	¥4,613	5%	-¥4,613		Unfavorable
Interest during construction	¥4,107	4%	¥5,593	6%	-¥1,486	-36%	Unfavorable
Total	102,771	100%	¥87,908	100%	¥14,863	14%	Favorable

Source: Kawabata and Aoki, 2009.

Table 67. Variance Analysis, in Philippine Peso (Planned and Actual Values)

Project Components	Planned Values, in PhP		Actual Values, in PhP		Variance, in Million PhP	% difference from Planned	Remarks
	In Million PhP	% of Total Value	In Million PhP	% of Total Value			
	A	*B*	*C*	*D*	*A-B*	*(A-B)/A*	
Depot	₱1,393	5%	₱1,052	4%	₱341	24%	Favorable
Substructure	₱3,890	15%	₱3,947	15%	-₱57	-1%	Unfavorable
Superstructure	₱2,351	9%	₱6,156	23%	-₱3,805	-162%	Unfavorable
Fare collection system, vehicle, ancillary facilities, and tracks	₱8,845	34%	₱7,364	27%	₱1,481	17%	Favorable
Consulting Services	₱782	3%	₱1,593	6%	-₱811	-104%	Unfavorable
Land acquisition	₱4,634	18%	₱3,922	14%	₱712	15%	Favorable
Subtotal before contingencies and interest	₱21,895	85%	₱24,034	88%	-₱2,139	-10%	Unfavorable
Price & Physical contingencies	₱2,771	11%	₱-	0%	₱2,771		
Subtotal before interest	₱24,666	96%	₱24,034	88%	₱632	3%	Favorable
Taxes and levies	₱-	0%	₱1,427	5%	-₱1,427		Unfavorable
Interest during construction	₱1,027	4%	₱1,730	6%	-₱703	-68%	Unfavorable
Total	₱25,693	100%	₱27,191	100%	₱1,498	-6%	Unfavorable

Source: Kawabata and Aoki, 2009.

6.2.5. Phase 3 – Assessing Financial Performance and Economic Impact

6.2.5.1 Measuring Economic Impact – Is the LRT Beneficial for the Economy?

Economic viability is established when the estimated economic benefits of the project exceeds economic costs. This can be determined by comparing the Economic IRR of the project with the Social Discount Rate (SDR) prescribed by the National Government when the project was initiated.

Table 68 presents the comparison between the EIRR and the ICC-prescribed SDR prior to 2016, and from 2016 to the present [The ICC revised the SDR in 2016.] Note that the EIRR exceeds the SDRs prescribed by the ICC. By comparing the SDR, which is the minimum hurdle rate, with the EIRRs of LRT2, we can deduce that the *LRT 2 is economically viable*. This means that the totality of the economic benefits generated by the project exceeds its economic costs.

Table 68. Comparative LRT 2 EIRR

EIRR	ICC prescribed SDR	
	1980s to 2016	2016 to present
At appraisal: 16.3%	15%	10%
At ex-post evaluation: 15.35%		

Sources: (Kawabata & Aoki, 2009) and (NEDA, 2009)

Note however that the Preliminary EIRR is higher than the EIRRs in Table 68. A higher EIRR would mean that it would take a higher rate of return for the project to yield zero NPV. Hence, it would seem that expectations of the National Government were met despite possible reductions in the estimated benefits derived from the project. Therefore, the project can be deemed beneficial to the economy as it contributes more benefits than resources and opportunities forgone for this choice of investment.

Table 69. Comparative EIRR

Phase 1 EIRR	18.27% to 18.35%
Phase 3 EIRR – At appraisal	16.3%
Phase 3 EIRR – At ex post evaluation	15.35%

Sources: (Kawabata & Aoki, 2009) and (NEDA, 2009)

6.2.5.2 Other Economic Impacts – How the LRT2 Affected Businesses

Aside from the quantifiable benefits covered in the EIRR, the LRT2 Project is expected – as mentioned previously in Sec. 6.2.3.1 – to create the following impacts on the local economy, particularly where the stations are located:

- Improvement of mobility of people by cutting travel time between points along LRT Line 2 route;
- Increased employment generation;
- Enhancement of businesses opportunities; and
- Opportunities to start urban renewal projects (DOTC, 1991, p. 70).

Financial benefits expected to accrue to businesses and vendors had not been included in the rate of return computations during project design.

To obtain an idea about the change in the business landscape, Key Informant Interviews (KIIs) were conducted among business enterprises in the impact evaluation study areas. The interviews were conducted on the following dates:

- 29 January 2019
- 31 January 2019
- 4 February 2019
- 7 February 2019
- 8 February 2019
- 4 March 2019
- 5 March 2019
- 6 March 2019

The KIIs were exploratory in approach. The KII sought to reach those enterprises that operate within the premises of the LRT stations regardless of their registration status with their respective LGUs. The *snowball technique* allowed the Evaluation Team to search for the enterprises that existed prior to the start of LRT2 construction and operation.

The main interest of the interviews was to explore changes in the business landscape by documenting general perceptions of current enterprises that started business in the area before LRT2 became operational. Of the, 209 key informants, 36 (17%) reported that they started business within the LRT station premises before the year 2000.

During the interview dates, 209 key informants shared their thoughts about LRT2. (Please see Annex 5 for the profile of KII participants.) Of the 209 respondents, almost all (92%) are engaged in micro enterprises[59] of which 34% are sole proprietors. The remaining 8% are in small enterprises. Among the informants from the micro enterprise/ informal sector, 42% are vendors and 15% fall under the food service industry. Almost all enterprises are located within a 100-meter radius from the LRT stations.

Favorable perceptions about the LRT2 can be grouped into the following thematic areas:

- Facility made their businesses more accessible to the usual and potential customers;
- LRT2 made the business open to more types of customers;
- LRT2 operations created new business opportunities;
- LRT2 made the establishment prominent, serving as a landmark for customers;
- More sales have been reported;
- Operation of the LRT2 made the surrounding area secure;
- Better transportation experience for passengers who also transact with businesses; enterprises; and
- LRT2 facilitated transactions because it connected businesses with suppliers from other parts of Metro Manila.

Some informants also reported that they did not benefit from the project. Responses can be assigned under the following thematic areas:

- LRT2 operations did not change the nature or financial performance of business enterprises;

[59] Includes those who identified their businesses as *Informal*

- LRT2 made businesses remote from their usual customers;
- LRT2 exposed their businesses to intense competition;
- Reduced business activity because of the limited preference of current customers;
- Reduced income due to design of LRT2 area; and
- Some businesses closed over time.

Coding the responses into the areas previously identified provides a glimpse of the changes in the business landscape (see Table 70).

Table 70. Changes in the Business Landscape

Stations	Favorable	Not beneficial
Santolan (Pasig City)	• New business opportunities	• Did not change nature or financial performance of business
Anonas (Quezon City)	• Businesses more accessible • Better transportation experience for passengers; connected businesses with suppliers	
Araneta-Cubao (Quezon City)	• Business open to more types of customers	• Reduced income
Betty Go Belmonte (Quezon City)	• Business open to more types of customers • Businesses more accessible	• Did not change nature or financial performance of business
Gilmore (Quezon City		• Did not change nature or financial performance of business
J. Ruiz (San Juan City)	• Businesses more accessible • Business open to more types of customers • Made the establishment prominent	• Did not change nature or financial performance of business • Reduced income
Pureza (Manila)	• More sales	• Made businesses remote • Did not change nature or financial performance of business
V. Mapa (Manila)	• More sales • Businesses more accessible • Better transportation experience for passengers • Made the establishment prominent	• Did not change nature or financial performance of business
Legarda (Manila)		• Did not change nature or financial performance of business
Recto (Manila)	• More sales • Businesses more accessible • Better transportation experience for passengers	• Businesses closed

Source: Evaluation Team KII with Vendors and Businesses

In the 1991 FS, it was noted that impacts on the local economy, including mobility, are beneficial. However, it would seem that *not all key informants were satisfied with the operation of the LRT 2 and its impact on the economy*. While positive benefits are attributed to improvements in the purchasing and market base, the negative perceptions about LRT2 operations stem from reducing accessibility in some areas that resulted to closure of businesses, reduction of sales, or simply, the lack of any tangible benefit from LRT2. One must also note that the impacts are not shared uniformly by all stations and areas. There are areas along the LRT2 corridor where impacts are more pronounced.

6.2.5.3 Other Economic Impacts – Did the LRT2 change the Urban Landscape?

The Evaluation Team recognized that LRT2 construction may have contributed to changes in the metropolitan landscape that can affect the rate of urban renewal. This possibility is explored by comparing land values, before the construction of LRT2 and after its completion. Changes in land values can suggest potential changes in residents' demographics, foster change in social or business activities, and even trigger a shift in ownership of properties in a given area, that can eventually lead to new types of urban development.

With enhancements in accessibility and proximity to destinations, land values in LRT2 impact areas are expected to increase. In developing country contexts, the average premium for commercial properties is estimated at 30%, while the premium for residential properties is close to 5% (ADB, 2019, p. 22). However, these values are not baseline values. Although there is evidence from various international sources suggesting that the operation of mass rapid transit can affect property values, the reported impacts vary greatly across case studies (ADB, 2019, pp. 22-23). Impact, in terms of change in land values, should therefore be contextualized in the urban context where the facility is located.

To determine the impact of LRT2 on land values along the LRT2 corridor, the Evaluation Team obtained changes in residential and commercial land values over time. The impact shall be represented by the trend in property values, covering the decade before LRT2 construction (Phase 1); the period when the facility was completed up to early operation (Phase 2); and up to the present time (Phase 3). This was done to account for the irregular updating of land values by the Department of Finance and the Bureau of Internal Revenue. The representative land values were then computed using the average zonal values of a parcel of land assigned as residential regular and commercial regular.

Of the total 22 barangays classified as influence areas in this study, seven (7) were studied for the purpose of assessing land values. The analysis was limited to these barangays because zonal value data were not available for the most recent period (2010 to present), and the early operation stage (2000 to 2009). Nevertheless, the analysis can still be valuable since it can be used to establish trends in property values. Table 71, Table 72, Table 73 and Table 74 show Land Value changes within the seven influence areas of LRT2. All tables showed increases in land values over the years.

In spite of this observed trends in land values, *the areas studied do not display any consistent pattern*. It must be noted that the change in land values is highest in the influence areas of Santolan (Table 71) and Gilmore stations (Table 72). Residential land values have substantially increased in Santolan, which covered Calumpang in Marikina and Santolan in Pasig. Note that these areas differ from the other influence areas in terms of urban landscape when the LRT 2 was established

Table 71. Land Value Impact - LRT Santolan Station

Land Value Impact in Barangay Calumpang, Marikina			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱5,058	₱6,704	₱9,305
Residential Regular	₱2,003	₱3,120	₱4,846
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	33%	84%
Residential Regular	-	56%	142%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	39%
Residential Regular		-	55%
Land Value Impact in Barangay Santolan, Pasig			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱6,875	₱10,500	₱18,500
Residential Regular	₱3,262	₱4,095	₱5,975
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	53%	169%
Residential Regular	-	26%	83%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	76%
Residential Regular		-	46%

Source: Evaluation Team (various references)

Table 72. Land Value Impact - LRT Gilmore Station

Land Value Impact in Barangay Mariana, San Juan			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱16,450	₱22,250	₱39,688
Residential Regular	₱9,652	₱13,595	₱24,985
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	35%	141%
Residential Regular	-	41%	159%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	78%
Residential Regular		-	84%

Source: Evaluation Team (various references)

It might be expected that land value trends would be the same for influence areas located in the same city. However, the case of Barangay Mariana proved otherwise. Its proximity to an LRT2 station has resulted to a substantially larger increase in residential and commercial land values, in comparison to other barangays that are also located within the City of San Juan (see Table 73 and Table 74).

Table 73. Land Value Impact - J. Ruiz Station

Land Value Impact in Barangay Ermitaño, San Juan			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱19,708	₱21,650	₱23,167
Residential Regular	₱8,707	₱9,561	₱10,867
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	10%	18%
Residential Regular	-	10%	25%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	7%
Residential Regular		-	14%
Land Value Impact in Barangay Pasadeña, San Juan			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱17,233	₱19,500	₱21,500
Residential Regular	₱9,273	₱10,432	₱11,545
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	13%	25%
Residential Regular	-	13%	25%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	10%
Residential Regular		-	11%

Source: Evaluation Team (various references)

Table 74. Land Value Impact - V. Mapa Station

Land Value Impact in Barangay San Perfecto, San Juan			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱12,980	₱14,560	₱16,000
Residential Regular	₱7,203	₱8,140	₱8,679
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	12%	23%
Residential Regular	-	13%	20%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	10%
Residential Regular		-	7%
Land Value Impact in Barangay Progreso, San Juan			
Land Classification	Prior to LRT2 Completion	LRT 2 Completion to Early Operation	Current LRT 2 Operation
	1990-1999	2000-2009	2010-present
Ave. Zonal Value per SQM			
Commercial Regular	₱17,842	₱19,400	₱20,667
Residential Regular	₱7,832	₱8,641	₱9,318
Land Value Impact (1990-1999 value as reference)			
Commercial Regular	-	9%	16%
Residential Regular	-	10%	19%
Land Value Impact (2000-2009 value as reference)			
Commercial Regular		-	7%
Residential Regular		-	8%

Source: Evaluation Team (various references)

Although it can be suggested that the construction of mass rail transit can affect property values, the *impact evaluation study results are not conclusive.* Changes in land prices may be influenced by the existing urban landscape and more complex land use factors, such as land availability, as noted in previous studies (Pacheco-Raguz, 2010) on the impact of LRT1.

The analysis is limited by the availability of data, particularly updated zonal values of land surrounding the LRT2 facilities. In investigating impact on possible urban renewal, this impact evaluation study can be further refined if data become available, in order to account for possible divergence in values.

One possible further study that can enhance this analysis is the computation of the divergence in values across land classifications. In a study by Abiad and Adona (Abiad & Adona, forthcoming) cited in ADB, 2019 on the impact of MRT3 on land prices, it was reported that values of close-in parcels of land (within one-km from MRT3) started diverging when MRT3 was constructed, with larger differences reported in close-in commercial land compared to close-in residential properties (ADB, 2019, pp. 28-29). As shown in Table 75, the suggested impact of MRT3 on close-in residential land values is 123%, compared to just 72% for parcels of residential land farther from the said facility. The impact is greater on close-in commercial land, which is 191%, compared to just 81% for commercial property farther away from MRT3.

Table 75. Land Values over Time (source: Abiad and Adona, forthcoming, cited in ADB, 2019 p.29)

Land Classification	Average Land Values per Sq. m.		Difference-in-Difference	Percent change computed by Evaluation Team
	Before 1995 (A)	After 1995 (B)	B-A	*(B-A)/A*
RESIDENTIAL LAND				
Parcels of land within 1km of an MRT station	₱4,972	₱16,036	₱11,064	123%
Parcels of land more than 2km away from an MRT station	₱2,789	₱7,584	₱4,795	72%
Difference in Difference			₱6,269	
COMMERCIAL LAND				
Parcels of land within 1km of an MRT station	₱13,424	₱52,443	₱39,019	191%
Parcels of land more than 2km away from an MRT station	₱9,336	₱26,214	₱16,878	81%
Difference in Difference			₱22,141	

Source: Abiad and Adona

6.2.5.4 LRTA Financial Performance – Is the LRT 2 Financially Profitable?

Financial performance after LRT2 was constructed should provide an idea on the capacity of LRTA to sustain its operations. To establish how well LRTA performed on an annual basis, one can compare the baseline Farebox Recovery Ratio during the years following completion of LRT2 construction.

The projected (baseline) Farebox Recovery Ratio is between 381% to 403% (refer to Table 60 in Sec. 6.2.3.2 above). This considers the previous performance of LRTA with just Line 1 and the projected recovery if LRTA operates Line 2.

To determine the trend in Farebox Recovery, one has to plot the Annual Rail Revenue and the Cash Operating Expenses. This is shown in Figure 41. The values are based on the Annual Audited Financial Statements of LRTA prepared by COA (COA, n.d.).

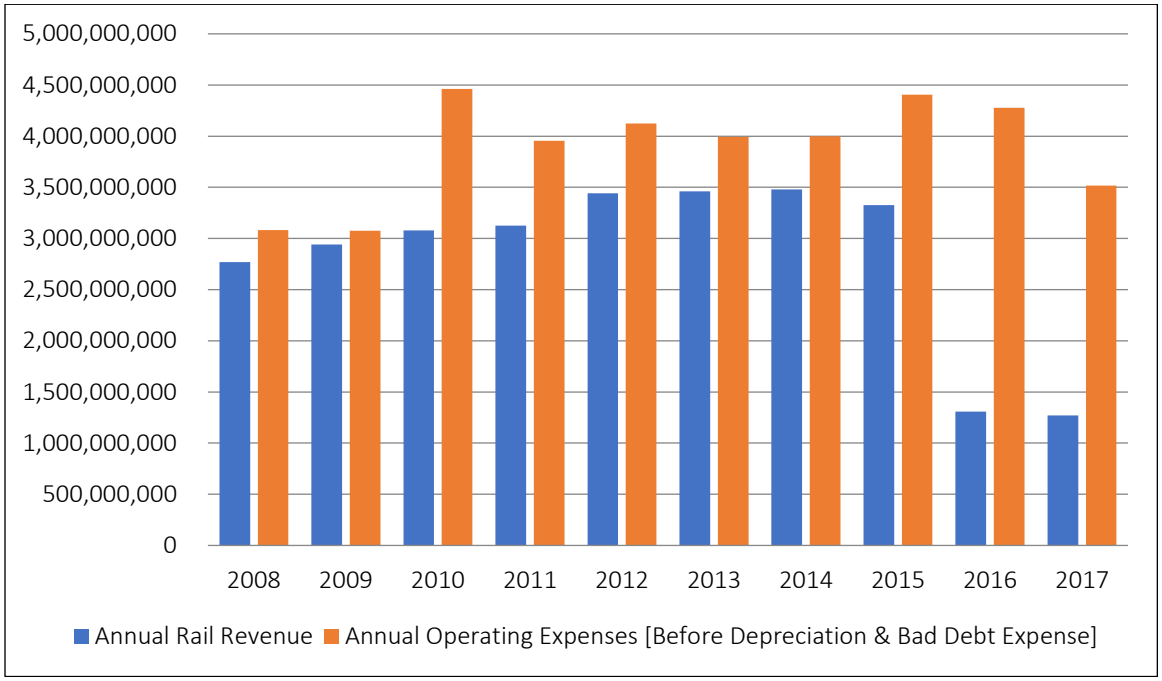


Figure 41. LRTA Rail Revenue vs. Cash Operating Expenses

Source: COA Annual Audited Financial Statements

Note that Rail Revenue went down in 2016 when LRTA transferred the management of LRT1 to LRMC on 12 September 2015 (COA, 2015). Although there was a reduction in revenue, the decrease in operating expenses was not substantial (see Figure 41). This can be explained by the movement of specific cash operating expense items of LRTA (see Figure 42). Direct cost moves with Annual Rail Revenue. However, other Operating Expenses [Personal Services and Other Maintenance and Operating Expenses] remained stable. This means that salaries [Personal Services] and other expenses were fixed costs. In order to recover these costs, *LRTA should charge higher fares and take in more passengers every year*.

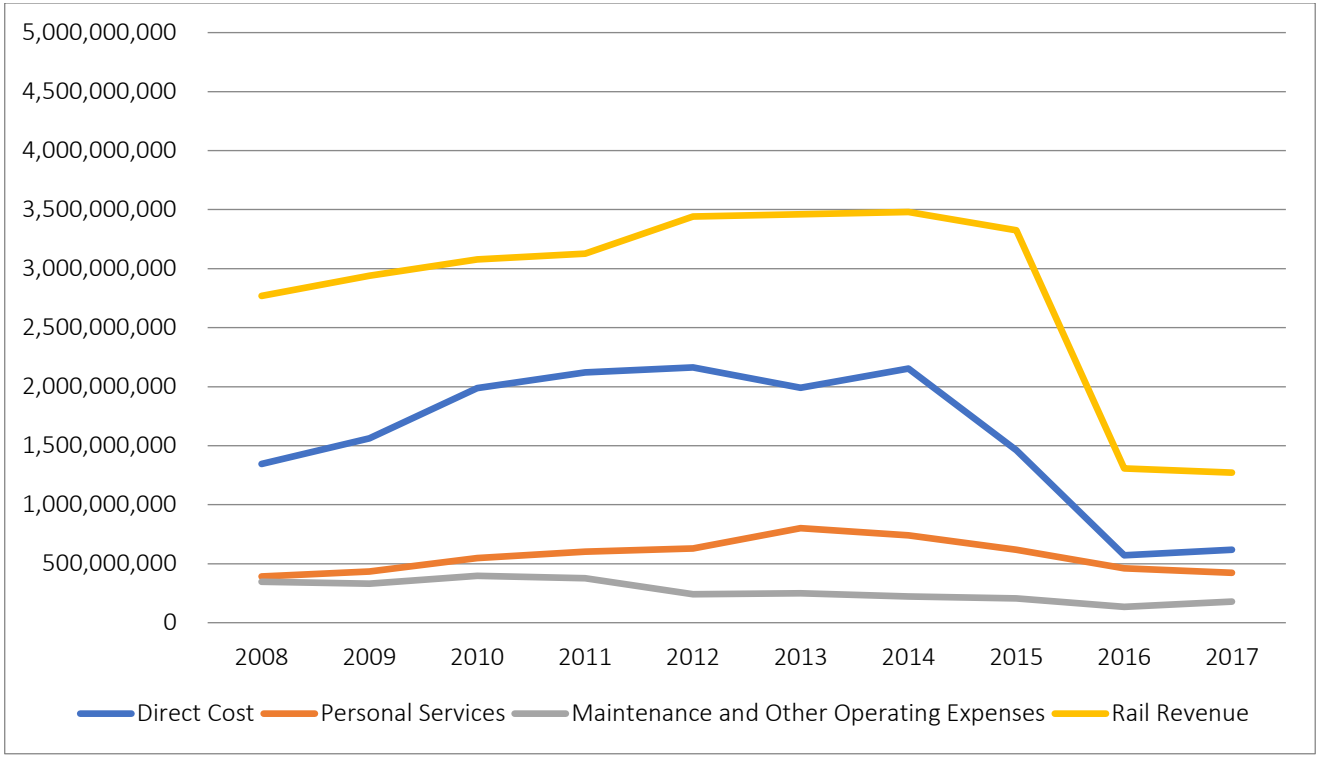
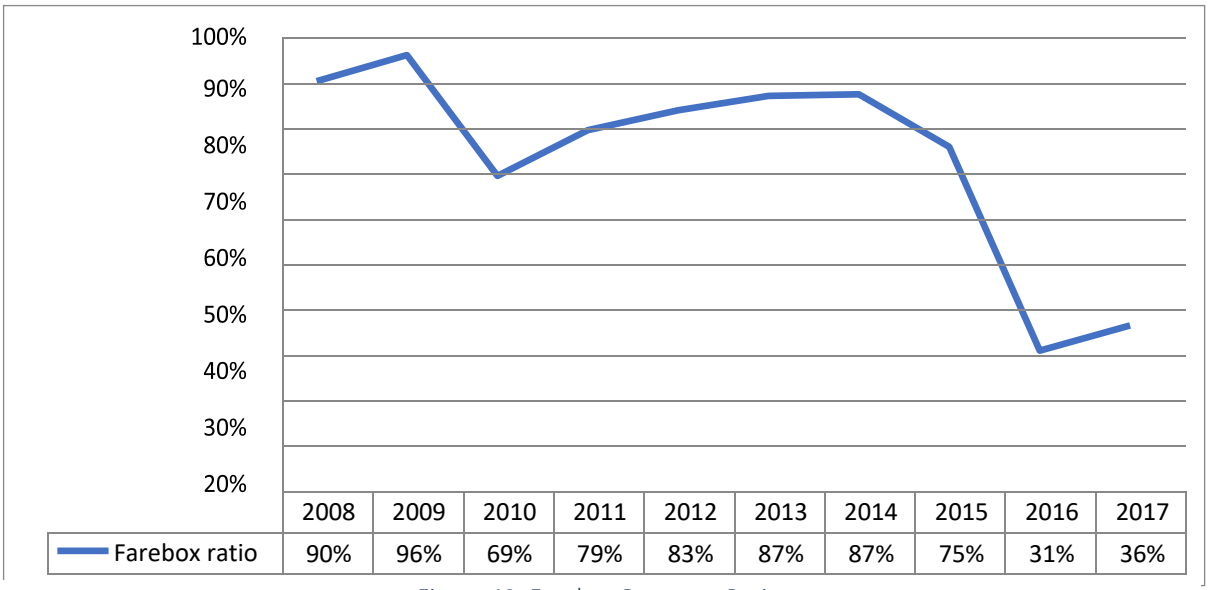


Figure 42. LRTA Rail Revenue and Cash Operating Expenses

Source of data: LRTA

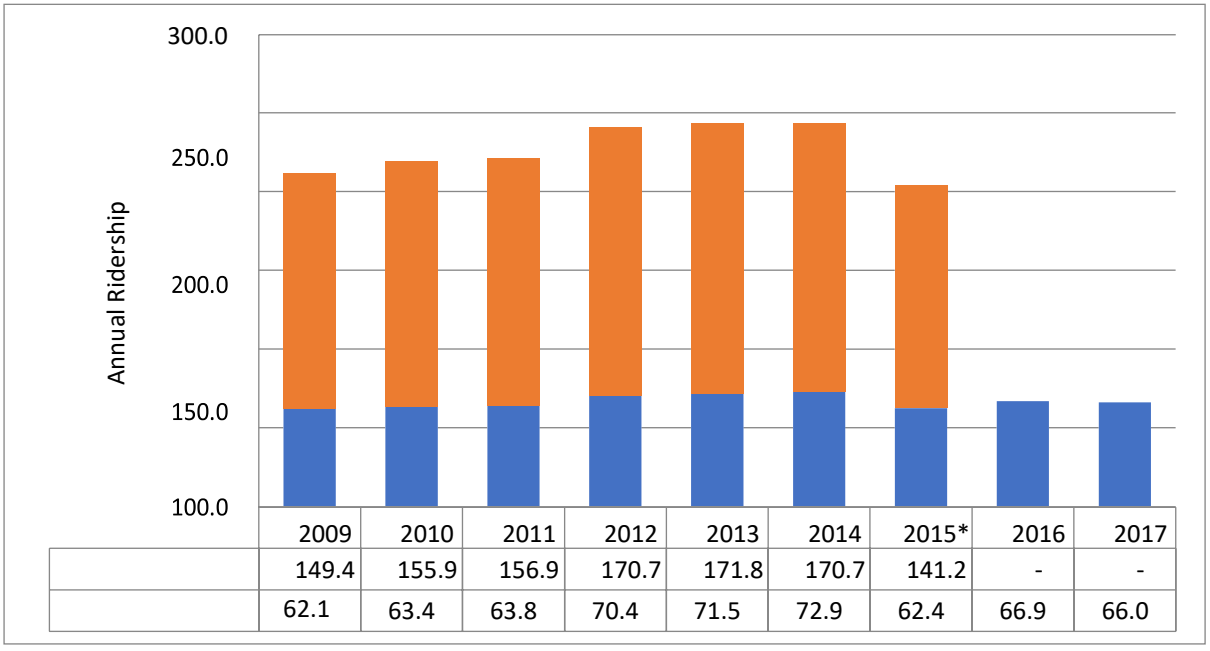
The cost structure has an impact on the Farebox Recovery Ratio. The baseline Farebox Ratio is 381% to 403% (Table 60). From 2008 to 2017, LRTA's Farebox Recovery Ratio was less than 100% (see Figure 43). In spite of the increase in average fares, which rests between PhP 13.00 to about PhP 19.00 per passenger (refer to Figure 45), Farebox Ratio is still below 100%. The below-par ratio can be attributed to the amount of operating expenses (see Figure 41), and low LRTA ridership (see Figure 44). Higher fares could help. In the Feasibility Study, the passenger fare is between PhP 5.00 to PhP 5.50. In past decades, the actual fare is almost PhP 20 (see Figure 45), but even this was not enough to help increase the recovery rate of LRT2.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Farebox ratio	90%	96%	69%	79%	83%	87%	87%	75%	31%	36%

Figure 43. Farebox Recovery Ratio

Source of data: LRTA



	2009	2010	2011	2012	2013	2014	2015*	2016	2017
	149.4	155.9	156.9	170.7	171.8	170.7	141.2	-	-
	62.1	63.4	63.8	70.4	71.5	72.9	62.4	66.9	66.0

Figure 44. LRTA Annual Ridership, in millions of passengers

Source of data: LRTA

* There is no 2016 and 2017 data reported by LRTA since the Line 1 operation was already devolved from the agency.

To facilitate setting of prospective prices, LRTA should look at historical data after Line 1 ridership was devolved from the organization. Using Common Size Analysis (Table 76) to determine the extent of coverage of revenues, it would appear that Operating Expenses, which are expected to rise together with recurring costs, are approximately three times larger than Rail Revenue (see table below). This analysis reveals the amount of subsidy provided by the State in the operation of LRT2 given the present cost structure and operations. In order to recover Operating Expenses alone, the Average Fare should be at least three times higher than the 2016 and 2017 average fares per passenger. The target fare should be about PhP 60 per passenger to cover Operating Expenses of LRT2. In order to recover Other Expenses, the passenger fare should be higher than PhP 60.

Table 76. Common Size Analysis of 2016 and 2017 Statement of Income and Loss

	2016		2017	
	Amount	% of Rail Revenue	Amount	% of Rail Revenue
Rail Revenue	1,307,769,936.00	100%	1,271,532,739.00	100%
Operating expenses	4,410,029,183.00	337%	3,695,543,483.00	291%
Operating income	-3,102,259,247.00	-237%	-2,424,010,744.00	-191%
Other Income (Expenses) - Net	1,426,353,714.00	109%	-283,352,712.00	-22%
Net Income (loss) before Taxes	-1,675,905,533.00	-128%	-2,707,363,456.00	-213%
Income Tax expense	-		-	0%
Net income (loss)	-1,675,905,533.00	-128%	-2,707,363,456.00	-213%

Source of data: LRTA

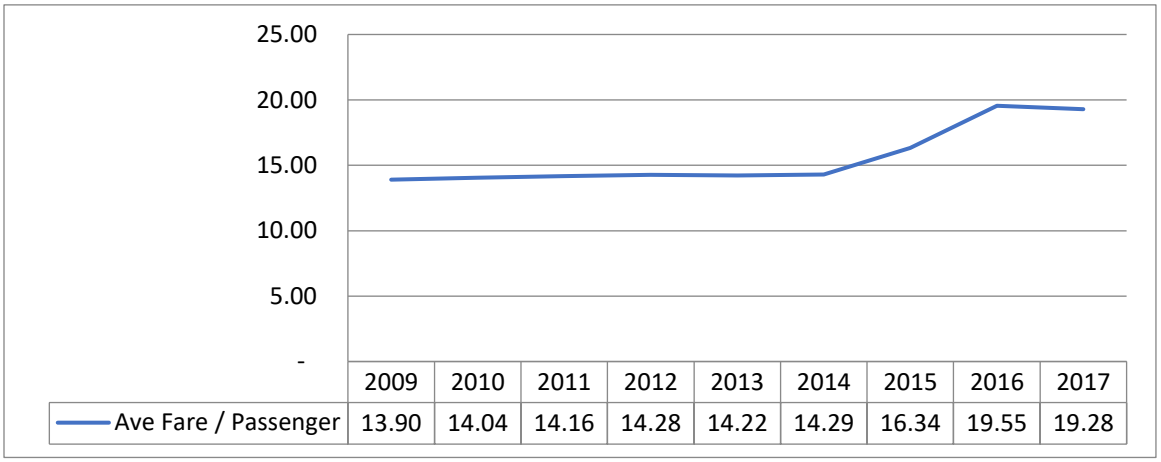


Figure 45. LRTA Average Fare per Passenger

Source of data: LRTA

Considering the nature of LRT2 as a Social Investment, an abrupt fare adjustment is not recommended. Neither is it advisable to pass on the entire cost of operations to passengers. For one, an increase in fare can affect the level of ridership. Figure 46 shows the average Fare per Passenger from 2009 to 2017. The average fare increased abruptly in 2015 by more than PhP 2.00 (Figure 46). This resulted to a sudden drop in ridership on the same year.

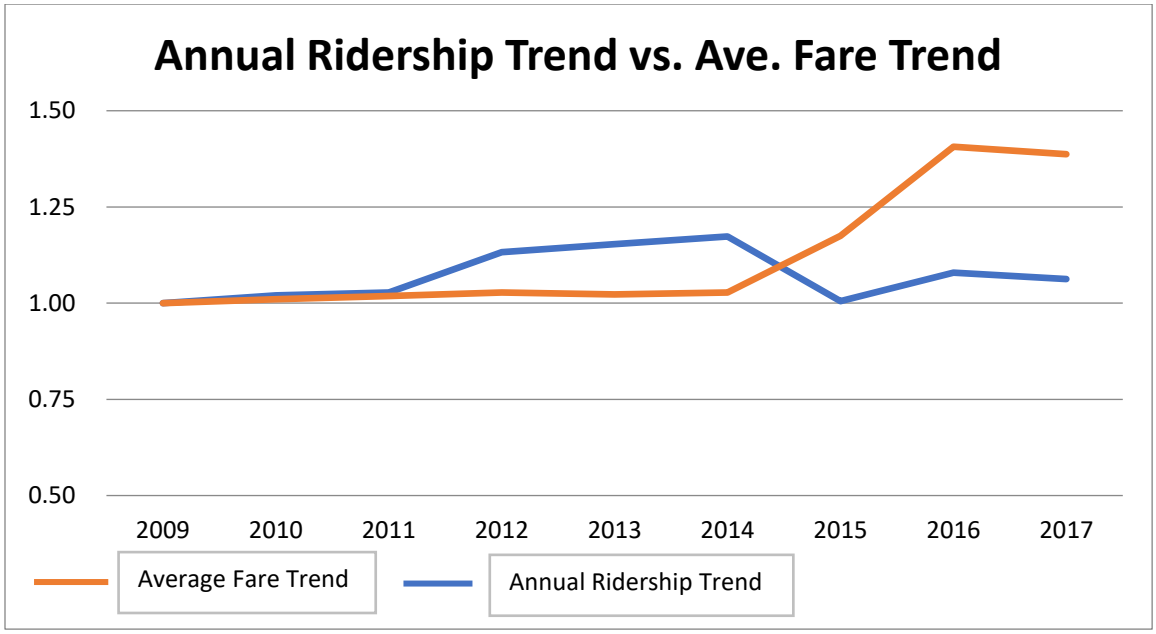


Figure 46. Annual Ridership Trend vs. Average Fare Trend

It would be ideal to increase fares at staggered rates to slowly recover a portion of the annual cost of operating LRT2. Table 77 shows the improvement in Farebox Recovery Ration for every increase of PhP 1.00 and PhP 2.00 in the passenger fare.

Table 77. Fare Box recovery Ration

Farebox Recovery Ratio estimates:	Percentage
At 2017 Ave. Passenger Fare	32%
At 2017 Ave. Passenger Fare + P1.00	33%
At 2017 Ave. Passenger Fare + P2.00	35%

Source of data: LRTA

Table 78. Forecasting Assumptions

Forecasting Assumptions	Php
Ave. Operating Exp per Passenger, in Php	PhP 60.9
Ave. Passenger Fare, in Php	PhP 19.3

Source of data: LRTA

Based on Farebox Recovery Ratio estimates, it is still apparent that the amount of revenues from passenger fares can only slightly improve LRT2's financial performance. Alternative revenue sources should be explored. Government subsidy should also be continuously given to cover operations of LRT2 and to ensure its smooth operation as a social investment.

6.3. Conclusions and Recommendations

6.3.1. Conclusions

This analysis of Financial Performance and Economic Impact aimed to establish how well LRT2 achieved its commitment to sustain operations and deliver mass transport services and help enhance the larger economy. Using EIRR as indicator of economic impact, the LRT2 Project fulfilled its promise to generate VOC Savings and Travel Time Savings. It also contributed to changes in the business climate, albeit impacts among businesses varied depending on the station. Negative

impacts in terms of businesses are also noted. Although prices of real property increased, the degree to which these increases can be attributed to LRT2 operations remains to be established. In terms of Financial Performance, it would seem that LRTA has yet to realize positive income over the next years. Based on the analysis of Rail Revenue and Operating Expenses, LRTA has yet to meet the target income projected in the Feasibility Study of 1991. Non-rail revenue, which was reported only for 2016, remains to be a good potential. An overall summary of financial performance is provided in Table 79 below.

6.3.2. Recommendations

1. Fare increase. To increase revenue, LRTA should consider (within 2019) a slight fare increase of PhP 1.00 to PhP 2.00 across the current destination-based fare matrix. LRT2 patrons' value faster travel time more than transport fare/ expense.

2. Non-rail income. LRTA should aggressively pursue strategies to raise non-rail revenues (starting 2019), through institutional tie-ups with business groups, tourism agencies, and advertising firms. LRTA should continue to pursue naming rights to stations such as done for the LRT1 Monumento Station.

3. Subsidies. LRTA should seek an additional subsidy from the national government, or expand sources of income (especially non-rail revenue) to help sustain its operations (starting 2019).

4. Land value study. Since the impact evaluation findings are not conclusive, NEDA-MES could commission a follow up study to be done as soon as updated zonal values become available.

5. Other possible studies. NEDA-MES could consider other studies such as how to more strongly motivate private vehicle owners to shift to rail/ public transport, e.g., through a "congestion tax" for driving through very busy roads on particular days/ times of day. In assessing the feasibility of future rail projects, "real options analysis" used in private sector projects might be applied. Similarly, "contingent ridership analysis", rather than single projections, could be considered in future FS for rail projects.

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Table 79. Summary of LRTA Financial Performance

Items	2008	2009	2010	2011	2012	2013	2014	2015*	2016**	2017**
Rail Revenue	2,769,801,140	2,940,779,754	3,079,160,755	3,126,826,634	3,442,165,338	3,460,155,998	3,479,960,469	3,325,318,745	1,307,769,936	1,271,532,739
Operating expenses	-3,427,723,029	-3,403,973,644	-4,858,702,408	-4,330,639,313	-4,364,000,285	-4,241,861,382	-4,219,385,969	-4,611,572,817	-4,410,029,183	-3,695,543,483
Operating income	-657,921,889	-463,193,890	-1,779,541,653	-1,203,812,679	-921,834,947	-781,705,384	-739,425,500	-1,286,254,072	-3,102,259,247	-2,424,010,744
Other Income (Expenses) - Net	-11,224,381,832	-431,069,208	-4,152,307,235	-569,227,344	4,722,324,198	4,048,394,296	2,368,000,721	-364,955,636	1,426,353,714	-283,352,712
Net Income (loss) before Taxes	-11,882,303,721	-894,263,098	-5,931,848,888	-1,773,040,023	3,800,489,251	3,266,688,912	1,628,575,221	-1,651,209,708	-1,675,905,533	-2,707,363,456
Income Tax expense	0	0	0	0	0	0	0	-4,345,172	0	0
Net income (loss)	-11,882,303,721	-894,263,098	-5,931,848,888	-1,773,040,023	3,800,489,251	3,266,688,912	1,628,575,221	-1,646,864,536	-1,675,905,533	-2,707,363,456
*Figures adjusted in Audited Statement of Financial Performance for the year ended 2016 and 2015										
**Recomputed Operating Expenses based on new FS format; Operating Expenses are equal to Non-cash Expenses, Direct Operating Cost, Personal Services, and MOOE										

Source: COA Annual Audited Financial Statements

7. Were there any unintended economic/ financial benefits realized and costs incurred due to the Project?

Further to the introduction to unintended consequences analysis provided in Part I, Section 3.3 and Part III Section 6.1.2, this section of the Evaluation Report will dwell on LRT2 impacts that may not have been intended at the time the project was designed. The unintended consequences analysis conducted is qualitative in nature, addressing the basic question: "What benefits and/ or costs were not anticipated/ discussed during project design?"

Apart from unintended consequences, the project has also generated externalities pertaining to accidents near train stations, petty crimes, and parking space availability. These and other externalities (such as government acquired land attracting informal settlers; speculating on road right-of-way; an improved sense of security in the vicinity of the stations) have been captured elsewhere in this Report in line the analyses of riders' perceptions. These externalities are less of unintended consequences and more of typical consequences of projects such as LRT2.

7.1. Findings on Unintended Benefits

In addition to the afore-discussed VOC and travel time savings plus other socio-economic benefits being generated in the course of LRT2 operations, the light rail service can also be seen as: (a) making it easier for thousands of students to go to school; and (b) boosting the tricycle and jeepney sectors.

7.1.1. LRT2 "School Bus Service"

As initially discussed in Part III, Section 6.1.2, LRT2 impacts significantly on education in the short-term and on human resources development in the longer term. As earlier noted in this evaluation report, the Rail Rider Survey as well as household survey showed that a distinct majority (44%) of LRT2 riders are students (Part III, Section 6.1.1.1). Using daily ridership statistics, this percentage translates to close to 100,000 students ferried to and from school every school day. LRT2 is conveying students in a manner that is safe, comfortable, efficient and affordable – precisely the hallmarks of the project goal – but focused on the youth sector. Compared to alternative means of transport, LRT2 is practically weather-proof, which contributes to its being a student-friendly means of transport. This is an economic benefit to society at large that should not be taken for granted in economic impact analysis, as it has both immediate and strategic/ policy implications on mass transport. Without the project, LRT student-riders would have been taking at grade transportation and routinely suffer from traffic chaos and related difficulties.

7.1.2. Boosting the Poor Man's taxi and dyip

LRT2's positive impact on the tricycle and jeepney sectors – as feeder transport – is noteworthy. The transport modal split across Metro Manila shows the jeepney as still the most prominent public transport, followed by the tricycle. Notwithstanding its rough engineering, lack of class, blaring radio, noisy and smoke-belching engine, and king-of-the-road driving style, jeepneys remain ubiquitous in smaller roads, ferrying riders to and from LRT2 stations. The traffic count conducted by the Evaluation Team at the intersection of Recto Avenue and Rizal Avenue shows the significance of PUJs as foremost public transport service provider (21% share of total). Case interviews conducted in the Cubao area showed that jeepney drivers recognize the value of LRT2 in making traffic conditions manageable for jeepney drivers.

Similarly, the impact evaluation FGDs underscore the role of tricycles in providing the last mile connectivity to the commuters' homes, offices, or other destinations. As in the case of jeepneys, tricycles serve as convenient and affordable links to LRT2. In Calumpang, Santolan and Escopa, the Evaluation Team observed tricycles bringing commuters to the nearest LRT stations. Tricycles have extended their usual routes to cater to LRT2 commuters – virtually a poor man's taxi. In Barangay 527, tricycles go as far as Sta. Mesa from Sampaloc, charging from PhP 70 to PhP 100 per ride. Tricycles, jeepneys and light rail can be more fully and closely inter-linked through national and local government policies and regulations, within the framework of an integrated transport network approach used for this impact evaluation. It should be added that considering the clientele of jeepneys and tricycles, more closely integrating them into the LRT2 services has intrinsic social inclusivity benefits.

7.1.3. "Winners and Losers"

One of the concerns under Key Evaluation Question No. 4 on unintended financial and economic benefits was to identify potential and actual losers from the LRT2 project. The Evaluation Team found that the only potentially negative project impact could have been on two groups. The first group comprised residents in areas where the train stations were to be constructed. These individuals would be temporarily or permanently affected/ displaced. The evaluation showed however that the DOTr managed the resettlement process very patiently so as not to aggrieve anyone. Thus, implementation was delayed but there was no forced relocation. See also Mini Case Study No. 1 prepared for this impact evaluation.

The second group of potential losers covered other transport modes with which LRT2 compete. Foremost concern was on PUJs plying the LRT2 route. The evaluation study showed however that LRT2 has both positive and negative impact on PUJs. While some jeepney riders shifted to LRT, there are jeepney drivers who perceive deriving benefits from LRT2, rather than seeing themselves as "losers" in the LRT2 Project. Key informant interviews show that some drivers realize that without LRT2, the R-6 route would have been more congested to the detriment of jeepney operations.

In terms of the broader transport system, LRT2 and PUJs are complementary, with PUJs providing effective feeder transport support to LRT. Thus, LRT2 is seen by some of the potential losers themselves as generating unintended benefits for PUJs. Negative LRT2 impact on PUJs was previously discussed in Section 6.1.2.

7.2. Findings on Unintended Costs

LRT2 can also be seen as generating economic costs that are not incorporated in project cost-benefit analysis.

7.2.1. Unintended Agglomeration

In urban planning, agglomeration is the process by which business enterprises converge or cluster in a particular location in order to share common facilities, build production-marketing networks, and eventually capitalize on economies of scale to reduce costs. While agglomeration can lead to these positive benefits, it can also cause over-crowding and traffic congestion. The Evaluation Team observed that shops and vendors are converging in the vicinity of LRT2 stations. A prominent example is the Anonas Station, whose main entrance is now almost hidden from view owing to too many shops.

The shift towards the direction of the LRT2 stations is not limited to business enterprises. There is a parallel process of students, employees and other regular LRT2 riders relocating to dormitories/ dwelling places nearer to said stations – in pursuit of greater traveling convenience anchored to LRT2 as the major mode of transport. This is reflected in higher rent, in addition to the usual congestion. This trend was discussed during the KII with MMDA and recommended to be further explored. Agglomeration's not-so-positive effects can be managed jointly by LRTA and the concerned LGU.

7.2.2. Unintended Traffic Generator

As a result of agglomeration, LRT2 stations have become indirect traffic generators as well. Customers enter, park, and exit the shops located around the stations, thereby adding to traffic congestion. Students, employees and other regular LRT2 riders who are now residing closer to the LRT2 stations are likewise adding to the congestion.

7.3. Recommendation

Recognizing the project's agglomeration effects, LRTA, MMDA, LTFRB and LGUs should collaborate more closely to better rationalize feeder transport and traffic management in the vicinity of the LRT2 stations starting 2019. Institutional collaboration is discussed in more detail in Sec. 5 of this Report.

8. Is the project contributing to an alternative transport system that is affordable, safe, comfortable, reliable, efficient and sustainable?

In this section, the Report will assess achievement of the project goal, using indicators reflecting the above-enumerated characteristics of the desired alternative transport system.

8.1. Findings on Planned vs. Actual Characteristics

8.1.1. Modal Split

LRT2 operations along R-6 Road significantly provided the ideal transport solution to address the growing road congestion dilemma in light of an ever-growing public transport demand. Among the three (3) LRT2 route considerations (discussed in Part II Section 1), the current route is the most logical alternative, despite its current low ridership. The whole stretch of R-6 Road, composed of Aurora Boulevard, Magsaysay Avenue and Recto Avenue, is generally a four-lane, two-way road except for the very short span of Marcos Highway (formerly Marikina-Infanta Highway) coming from Katipunan Avenue leading to the LRTA compound that serves as the LRT2 depot, maintenance and repair yard. Annex 23, Mobility Options for End-to-End Trip Along R-6 Road, shows that there are seven available public transport modes options and three (3) private transport alternatives. Each has a different level of convenience, safety, affordability, and travel time. Annex 23 provides detailed insights on the advantages and disadvantages of each transport option, and compares the optimum benefits of traveling from east to west (and back) using public or private transport. Then Annex 25 shows the most frequent transport modes taken by the commuting public.

Despite the low day-by-day ridership average of 184,476 (2009-2018), [60] *the daily person-trips served by LRT2 would require an equivalent of about 13,177 PUJs or 18,488 UV Express – or even 2,635 buses.* Without LRT2, this crowd movement scenario would create a chaotic traffic situation on a sustained basis. The whole stretch of R-6 Road is dominated by smaller public, diesel-fed transport like PUJs and UV Express, with PUJs operating over the last five (5) decades. Bus operations will not be sustainable as it will face immense competition from PUJs, due to long-standing traditional patronage of PUJs over the past one-half century. Moreover, due to the narrow roads all the way to Recto and Divisoria, a large-size public transport conveyance like a bus is bound to face maneuvering difficulties along the R-6 Road.

Without a mass transit system, the R-6 Road will be one of the most congested roads in Metro Manila. The ease of vehicular traffic flow experienced at the present time is a derived benefit from LRT2 operations. Some of the PUJ drivers interviewed during trip simulations[61] revealed that majority of the public transport service providers along the route favor the parallel operation of LRT2, since every R-6 Road user undeniably benefits in terms of decongestion (from additional transport service supply if no rail system operates) that translates to higher productivity and revenues.

From the rail rider's standpoint, LRT2 answers the need to travel from both ends of the line wherein

[60] Based on LRT2 10-year historical ridership from 2009-2018.
[61] Trip simulations were conducted on 30 April 2019 using the Cubao-Divisoria PUJ route

the direct benefits align with the project goal. The hierarchy of responses from the Rail Rider Survey is summarized in Table 80.

Table 80. Why Rail Riders Prefer LRT2 over other Modes

RANK	REASON
1	Fastest Mode
2	Cheapest Fare
3	Convenient
4	Safe
5	No other option
6	Near origin
7	Near destination
8	Environment -friendly

Source: Evaluation Team Rail Rider Survey

The modal share has evolved since the introduction of LRT2 in 2004, but the dominance of PUJs will remain not only along the R-6 Road but all across Metro Manila, and even all the way to the provinces. The traffic count conducted by the Evaluation Team at the intersection of Recto Avenue and Rizal Avenue shows the significance of PUJs as ubiquitous public transport service provider (Figure 47). Similarly, the PUJ being a competitive mode to LRT2, has deep-seated roots in many urbanized areas in the country. The MMUTIS[62] Update and Enhancement Project (MUCEP) supported by JICA in 2015 revealed the strong presence of PUJs throughout Metro Manila (Figure 48).

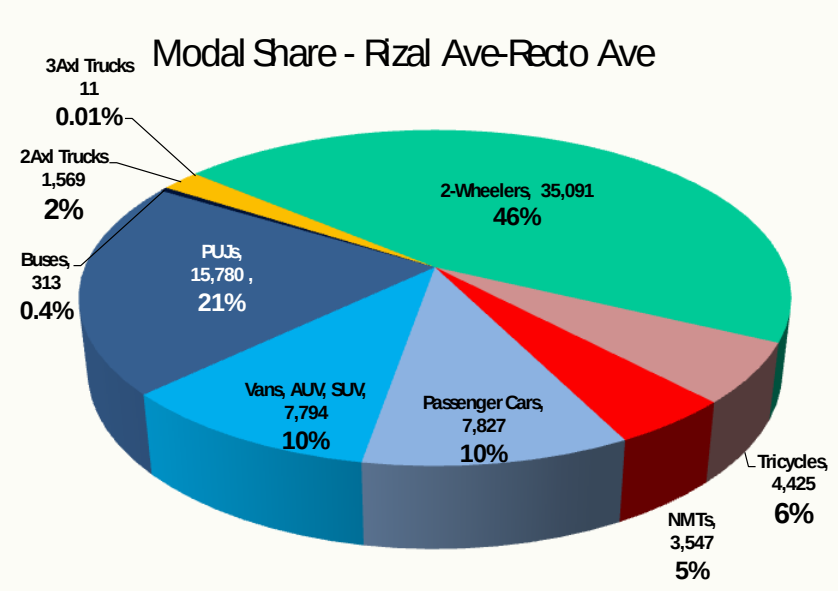


Figure 47. Traffic Volume Summary in Recto Rizal and Rizal Avenue, Feb 2019

Source: Evaluation Team Traffic Count

It is quite notable from Figure 47 that two-wheelers (i.e., motorcycles) have the highest population share in the area. This reflects the natural behavior of people blending with limited road space to maintain mobility. The modal split in Figure 47 is totally different compared to the eastern side of the LRT2 impact area, as shown in Figure 49. At the eastern side, passenger cars dominate the

[62] Metro Manila Urban Transportation Integration Study.

vehicle population.

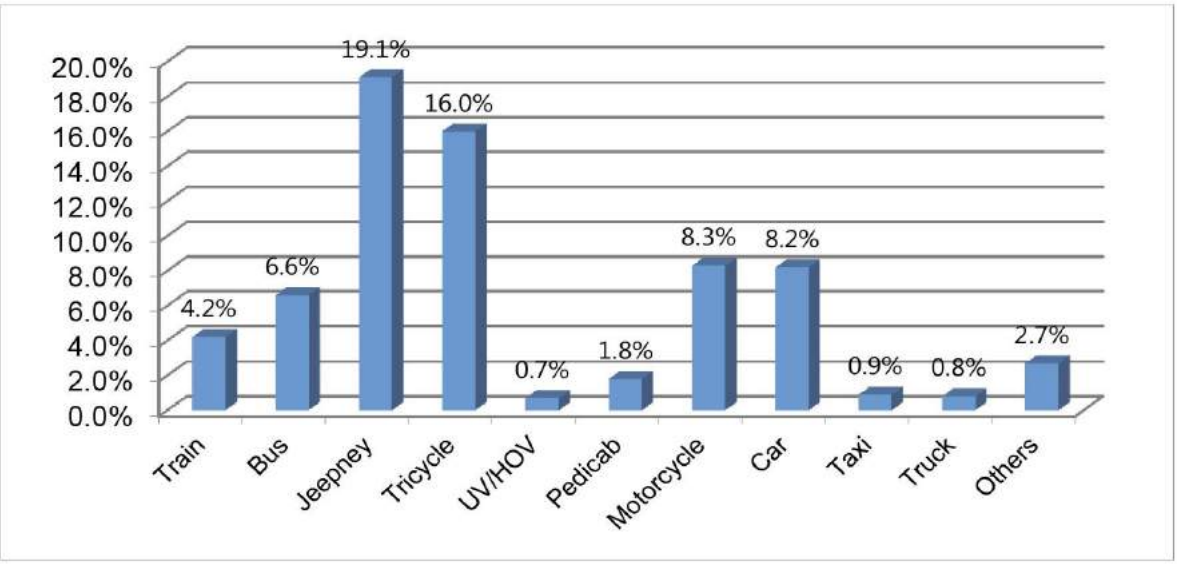


Figure 48. Share of Private and Public Transportation by Mode, 2015

Source: Evaluation Team (basic data from MMUTIS Update and Enhancement Project)

The general modal share or modal split across Metro Manila is represented by the graph in Figure 48 from the MUCEP Study showing the jeepney as the most prominent public transport followed by the tricycle. These modes of transport especially the PUJs are sometimes classified as informal transport, while the tricycle is labeled as the "poor man's taxi". Needless to say, these two transport modes have been aptly serving the transport needs of the riding public for decades.

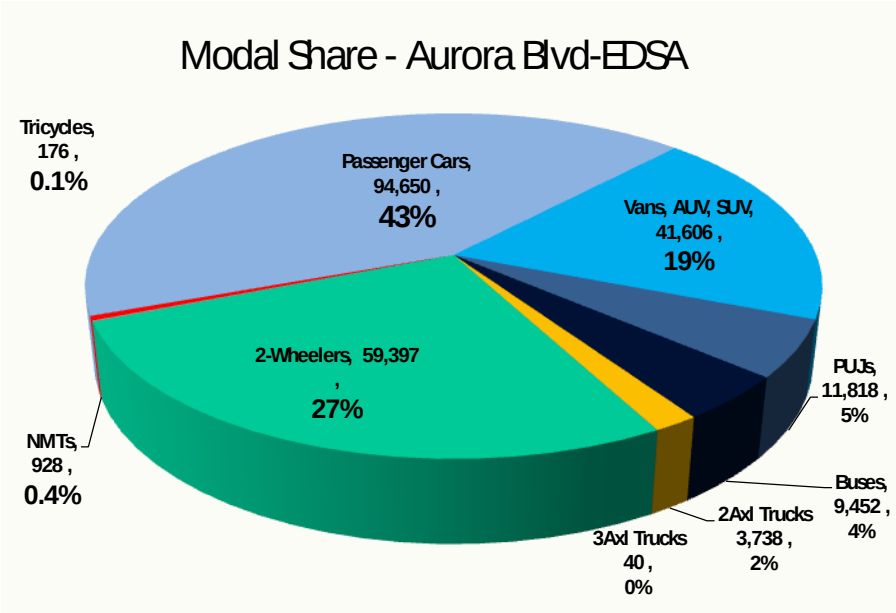


Figure 49. Traffic Volume Summary in Aurora Boulevard-EDSA, Feb 2019

Source: Evaluation Team Traffic Count

Smaller transport services were stimulated to ferry commuters towards the LRT2 stations upon the introduction of LRT2, as in the case of Recto Station which is near Divisoria. The feeder transport

in Recto ranges from pedicabs[63], Manila tricycle (project of the City of Manila), motorcycle taxi, PUJs, UV Express, and even '*traysi*-boat'[64]. In other stations, feeder transport vehicles are just the typical modes that include ride-hailing services like Grab or Wunder.

Figure 50. Feeder transport and street market converge at LRT2 Recto Station ground level

Source: Evaluation Team

The operation of LRT2 has definitely affected the modal split on the whole stretch of the R-6 Road, but the exact number and vehicles types cannot be readily determined. It will require a thorough review of historical vehicle registrations, public transport fleet service line comparison, and/ or even one or more site visits.

8.1.2. Perception Survey Results

On the issue of affordability, this impact evaluation study has established that transport fare is a secondary consideration among rail riders. The key factor that drives rail riders to choose LRT2 is shorter travel time or faster speed. As presented in Table 21- Comparison between LRT2 and PUJs (Part II, Section 1.1.7), there is always a trade-off between competing modes of transport. Below is a quick comparison of alternative modes:

1. PUJ can offer the same ride at 30% lower fare but the travel time may be twice or even thrice longer compared to LRT2, depending on traffic conditions, which can vary at different times of the day, and different days of the year.

[63] Pedicab is a non-motorized three-wheeler transport powered by foot pedals.
[64] *Traysi*-boat is a pedicab powered by an engine of a small motorboat mounted on the rear seat of the driver.

2. Motorcycle taxi (local operator is called Angkas) can go faster than the LRT2 due to non- stop travel, and may even use a shorter route to get to the same destination. Angkas fare is set at PhP 50 for the first 2.0 kilometers and additional PhP 10 for each succeeding kilometer. The downside is the risk of road crash involving motorcycles is highest worldwide.

3. UV Express can offer a faster and more convenient travel than the PUJ although the fare can be more than double compared with LRT2 and PUJ.

4. Buses can also offer the same convenience as LRT2, but there is no bus operation with exactly the same route as LRT2. There are about three bus lines coming from Rizal Province, passing through Ortigas Avenue in Pasig, and then entering the R-6 Road at the boundary of Manila and Quezon City. Bus operations will not be sustainable along a narrow road with rail transit above, as well as alternative at-grade public transport, as direct competitors.

5. Taxi cabs and ride-hailing services can serve any route, but are both expensive.

6. Private car can be convenient, expensive and impractical all at the same time – especially when there is an affordable, faster and convenient alternative means to travel.

Despite the distinctive benefits of LRT2, some commuters are still not convinced to shift away from their current mode of choice. The Evaluation Team's Perception Survey generated interesting information from the non-rail riders. Table 81 lists the reasons cited by non-rail riders, while Table 82 synthesizes the conditions to convince non-rail riders to make the shift.

Table 81. Top 8 Reasons Why Non-Riders Do Not Use LRT2

Rank	Reason
1	Vehicle Owner
2	Discomfort
3	Just Short Trips
4	Ignorance
5	High Fare
6	Out of the Way
7	Prefer Other Modes
8	Others

Source: Evaluation Team Perception Survey

Box 2

This information was extracted from the non-rail rider respondents in the Perception Survey. A portion of the Household Interview Survey also has respondents who are non-rail riders, and who provided additional inputs.

The above-listed reasons are mostly self-explanatory. A non-rail rider is typically one who drives his or her own car or motorcycle, and derives comfort therefrom (Reasons #1 and #2). As discussed in this report, LRT2 is most competitive for travel over longer distances. A non-rail rider who regularly travels a shorter distance would rather take a PUJ or tricycle which is cheaper (Reason #3). "Ignorance" (Reason #4) refers to lack of information regarding LRT2, e.g., location of stations. A non-rail rider finds LRT2 "out of the way" (Reason #6) when the route served is different from that he or she traverses.

Table 82. What Can Convince Non-Rail Riders to Consider Shifting to Mass Transit like LRT2

	Condition	Remarks
1	IF Free Rides	Not willing at all
2	IF I Learn how to ride the LRT2	Ignorance
3	IF THERE ARE Less passengers	Prioritizes comfort
4	ONLY FOR Longer trip	Practical commuter
5	IF THE A/C is fixed	Prioritizes comfort
6	IF THE LRT2 is the logical option	Practical commuter
7	IF THE operating hours extended	Willing but
8	IF THERE ARE More Trains	Prioritizes time, comfort
9	IF car is on coding day	LRT2 as an option
10	IF Own vehicle not usable	LRT2 as an option
11	IF THERE ARE PUJs phased-out	LRT2 as last option
12	IF Rail system completed	Residence out of coverage
13	IF Road traffic gets worse	LRT2 as an option
14	IF Taxi fare too high or phased out	LRT2 as an option
15	IF Time is critical	Prioritizes time, comfort
16	IF THERE IS A Travel Companion	Prioritizes safety

Source: Evaluation Team Perception Survey

LRT2 is currently operating inefficiently due to low revenues and increasing expenses. The number of operational rolling stocks is half the original fleet. This poses risks in LRTA's operations if and when some units start to break down, considering that the whole rail system is more than 15 years old – including the pilot testing period and delayed launching. The spare parts procurement process, based on several KII sessions among LRTA and DOTr officials, is also a hindering factor in LRT2 operations. This creates huge impacts across all departments supporting around 900 employees. The national government is subsidizing the operations of LRT2 in order to maintain service to almost 200,000 daily commuters, and to avoid the specter of transportation chaos along the R-6 Road.

LRT2 is unsustainable given its current situation. The key concern of LRTA is how to increase daily ridership to about half a million passengers. Since LRT2 started operation 15 years ago in 2004, it has never achieved this target, nor has it ever come close to within 50% of the target. If the situation will not change in the coming years, the LRT2 situation will become more untenable, and will gradually compromise overall performance and public image.

On a related note, an independent firm (Philtrak) proposed to replace the LRT2 in 2016 by dismantling the whole facility, and building a BRT to serve the same transport service purpose.[65] Although the proposal did not muster enough credibility as it can only offer a guaranteed daily ridership of 243,000, the lack of a comprehensive feasibility assessment also constrained government approval.

[65] BRT is widely adapted in many countries around the world as an alternative mass transport system using at-grade, connected bus system and offering a more efficient operation and good quality service with low investments and sustainable O&M system.

8.2. Social and inclusivity analysis of LRT2 contribution towards developing an alternative transport system

As mentioned in Section 6.1.2, an impact evaluation is bound to assess project contribution towards achieving the country's poverty reduction and inclusive growth objectives.[66] This section of the Report will examine LRT2 contributions towards helping to develop an alternative transport system, focusing on reliability, comfort, and safety.

There is strong evidence that LRT2 is contributing towards developing an alternative transport system that is affordable, safe, comfortable, reliable, efficient, and sustainable. The distribution of benefits (i.e., reliable, comfortable and safe transport) is correlated to the substantial proportion of passengers from low- and middle-income groups, women, employees, and students (Section 6.1.2).

8.2.1. Reliability

Shown below are the high perception ratings drawn from the household survey. Close to 100% of the respondents perceive LRT2 to be highly reliable, giving a rating of 3 and 4, using a scale of 1 to 4 (lowest to highest). The respondents can depend on a regular/ predictable train schedule.

Table 83. Perceptions Ratings: On-Schedule Departure and Arrival of Trains

Ratings (lowest to highest)	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
1	1	0.5	1	0.5	2	0.5
2	7	3.7	10	5.4	17	4.6
3	73	39.0	83	44.9	156	41.9
4	106	56.7	91	49.2	197	53.0
Total	187	100	185	100	372	100
Average rating	3.5		3.4		3.5	

Source: Evaluation Team HH Survey

8.2.2. Comfort

The next table provides HH survey- elicited perceptions concerning train seat type and dimensions, ventilation, cleanliness, and overall comfort. Similarly, high degree of comfort ratings as for reliability can be seen, except for relatively lower ratings on ventilation inside the trains. This can be linked to the discussion in Part II, Section 4.1.1 that: (a) train temperature is a common complaint; (b) improving A/C is the top suggestion to improve LRT2 services (Table 31 in Section 4.1.2); and (c) that even after repairing air-conditioning facilities, passengers still clamored for cooler trains.

Table 84. Perception Ratings: Comfort

Ratings (lowest to highest)	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
a. Type of seats						
1	3	1.6	1	0.5	4	1.1
2	12	6.4	15	8.1	27	7.2
3	98	52.4	96	51.6	194	52.0
4	74	39.6	74	39.8	148	39.7

[66] NEDA, Terms of Reference for Consulting Services for the Impact Evaluation of the Light Rail Transit (LRT) 2 Project, page 1.

Ratings (lowest to highest)	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Total	187	100	186	100	373	100
Average rating	3.3		3.3		3.3	
b. Leg room						
1	0	0.0	2	1.1	2	0.5
2	11	5.9	21	11.4	32	8.6
3	100	53.8	91	49.2	191	51.5
4	75	40.3	71	38.4	146	39.4
Total	186	100	185	100	371	100
Average rating	3.3		3.2		3.3	
c. Air conditioning system						
1	11	5.9	6	3.2	17	4.6
2	31	16.8	36	19.4	67	18.1
3	89	48.1	89	47.8	178	48.0
4	54	29.2	55	29.6	109	29.4
Total	185	100	186	100	371	100
Average rating	3.0		3.0		3.0	
d. Cleanliness & orderliness in station and train						
1	0	0.0	2	1.1	2	0.5
2	5	2.7	8	4.4	13	3.5
3	91	49.2	85	46.4	176	47.8
4	89	48.1	88	48.1	177	48.1
Total	185	100	183	100	368	100
Average rating	3.5		3.4		3.4	
e. Overall comfort						
1	0	0.0	2	1.2	2	0.6
2	6	3.5	6	3.6	12	3.5
3	90	52.0	87	51.8	177	51.9
4	77	44.5	73	43.5	150	44.0
Total	173	100	168	100	341	100
Average rating	3.4		3.4		3.4	

Source: Evaluation Team HH Survey

In contrast, three (3) out of every four (4) respondents in the on-line perception survey in non-project areas (Reference: Part I, Section 3.1.9.2) noted that their regular travel (on transport modes other than LRT) is now less comfortable compared to Year 2004. Only 12% of the respondents, who regularly traverse Radial Road 7 (C-7), said that they are now enjoying more travel comfort.

8.2.3. Security

From the household survey, perception ratings concerning security are shown below. Ratings are most frequently high "3s" and very high "4s" with respect to pickpockets, lights inside train and in the station, and overall security. Passengers generally feel secure taking the LRT. A possible area for further improvement is security against pickpockets, considering the relatively lower ratings given by the respondents on this matter.

Table 85. Security Perception Ratings from Household Survey

Ratings (lowest to highest)	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
a. Pickpockets						
1	1	0.5	1	0.5	2	0.5
2	15	8.1	10	5.4	25	6.7
3	92	49.7	102	54.8	194	52.3
4	77	41.6	73	39.2	150	40.4
Total	185	100	186	100	371	100
Average rating	3.3		3.3		3.3	
b. Lights inside train						
1			1	0.5	1	0.3
2	4	2.2	4	2.1	8	2.2
3	85	46.2	87	46.5	172	46.4
4	95	51.6	95	50.8	190	51.2
Total	184	100	187	100	371	100
Average rating	3.5		3.5		3.5	
c. Lights in train station						
1						
2	6	3.3	7	3.8	13	3.6
3	86	47.3	82	44.6	168	45.9
4	90	49.5	95	51.6	185	50.5
Total	182	100	184	100	366	100
Average rating	3.5		3.5		3.5	
d. Overall security						
1						
2	4	2.2	5	2.7	9	2.5
3	87	48.1	82	45.1	169	46.6
4	90	49.7	95	52.2	185	51.0
Total	181	100	182	100	363	100
Average rating	3.5		3.5		3.5	

Source: Evaluation Team HH Survey

For comparison, the ratings below were obtained from the Perception Survey on rail riders. The responses are likewise predominantly high: "Good" if not "So good".

Table 86. Security-Related Ratings from Perception Survey

Ratings (highest to lowest)	Pickpockets		Security personnel	Roving patrol	CCTV	Lights in train
	Train	Station				
So good	16	16	20	20	19	19
Good	68	68	64	64	67	66
Bad	1	1	1	1	0	0
So bad	0	0	0	0	0	0
No Reply	15	15	15	15	14	15
Total	100	100	100	100	100	100

Source: Evaluation Team Perception Survey

To compare, one half of the 86 respondents in the on-line perception survey in non-project areas (Reference: Part I, Section 3.1.9.3) reported that they do not now feel safer from criminals compared to Year 2004. Thirty-five percent of the respondents perceive that the situation has not changed compared to the past. A similar pattern of perceptions emerged in terms of the frequency

of road crashes/ accidents along R-7.

8.2.4. Riders' feedback

The two (2) tables below summarize the most important problems experienced by LRT2 riders, and their suggestions to further improve services – based on the household survey. Table 87 re-confirms what we already know from observation: that the three (3) foremost concerns are: (1) crowded stations and trains; (2) long queues; and (3) deficient facilities such as toilets and escalators. LRTA can accord higher priority to these issues. It is worthy to note also that two-fifths of the respondents averred that they have had no problem at all with LRT2.

Table 87. Rank 1 Problems/ Bad Experience cited by LRT2 Riders

Problem/Bad Experience	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Crowding/ standing	57	42.5	43	39.8	100	41.3
Long queues	26	19.4	11	10.2	37	15.3
Lack of air conditioning	17	12.7	11	10.2	28	11.6
Passengers' lack discipline/ behavior	7	5.2	16	14.8	23	9.5
Facilities that are not working or deficient: toilet, escalator	17	12.7	20	18.5	37	15.3
Other inconveniences: tedious/ slow security inspection, distance to station	10	7.5	7	6.5	17	7.0
Total	134	100	108	100	242	100
No problem/ bad experience	24		34		58	

Source: Evaluation Team HH Survey

To match the previous table, following are suggestions, coming from the same household survey respondents, on priorities to further improve LRT2 services. The suggestions as expected mirror the priority concerns in the previous table.

Table 88. Rank 1 Suggestions cited by LRT2 Riders

Suggested Priorities	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Add trains and trips; replace old trains; improve maintenance	56	38.9	58	42.0	114	40.4
Repair escalators, elevators, toilets, aircon, seats, swipe machines. Add seats and toilets	42	29.2	38	27.5	80	28.4
Manage volume and queue of passengers; segregate women	28	19.4	15	10.9	43	15.2
Improve staff relations; extend operating hours; augment vending machines; improve cleanliness of toilets	10	6.9	13	9.4	23	8.2
Improve safety and security: add CCTVs; and security personnel	0	0.0	7	5.1	7	2.5
Reduce fare	6	4.2	5	3.6	11	3.9
Others	2	1.4	2	1.4	4	1.4
Total	144	100	138	100	282	100

Source: Evaluation Team HH Survey

8.3. Conclusions and Recommendations

Here, the Report will present conclusions and recommendations pertaining to the LRT2 contribution towards developing an alternative transport system having the above-enumerated features.

8.3.1. Conclusions

On developing an alternative transport system that is affordable, etc.

The project goal was initially couched in terms of an alternative transport system (underscoring supplied), as light rail is more efficient, environment-friendly and thus, more sustainable compared to buses, jeepneys and other public (and privately-owned) vehicles running on combustion engines. (Note: LRT2 environmental impact is discussed in Annexes 34 and 35.) The urban physical configuration of Metropolitan Manila, not to mention transportation traditions, however, calls for complementation between light rail services and other means of transport. The objective is not for light rail to replace any particular transport mode but rather, to improve the overall transport system. LRT2 can more effectively link up with jeepneys, tricycles and other feeder transport – following an integrated transport system approach.

Urban and transport planners can prepare strategic transport plans that will project a hierarchy of transport modes operating in the corresponding hierarchy of roads defined based on sustainable capacity. Light (and heavy) rail will be on the top tier, running on elevated and underground viaducts. At the other end, tricycles and pedicabs will be at the lowest tier in the hierarchy, operating as they are in narrow roads and alleys. Below the light rail service will be bus services running on wider roads. In between the light rail and buses will be the jeepneys – whether modernized or not – plying narrower roads where buses cannot fit. Here, we can envision a systematic and symbiotic range of major and feeder transport modes operating sustainably where each is most suited.

Privatization

The proposal from Philtrak is one indicator that there are private investors with an eye on transport sector opportunities, and who can come up with a potentially viable solution. Private sector interest has already been witnessed when LRT1 was devolved from LRTA through privatization, and awarded to a joint venture company called LRMC.

Privatization is not an assured guarantee of successful and profitable solution especially for the mass transit subsector. It should be noted with care that most mass transit systems are not that profitable, and the majority normally achieves a breakeven situation. The LRMC is not a mass transit company; nor does it have a good track record in rail operations – which means it has to rely on experts possessing the required specialization. If LRMC's goal is to see good profit out of rail revenues alone, then there might be a risk. However, if LRMC has a different business plan (considering the partners behind LRMC) to match rail revenue with non-rail revenue (which might even exceed rail revenue), then there could emerge a new business model in the Philippine mass transport sector.

Privatization is not the sole and ultimate solution to save LRT2's increasingly unsustainable operations. LRTA has achievements and success milestones to prove its untapped potential to spearhead a prime initiative in mass transport operations.

Long-term operational sustainability

The potential impacts of LRT2 east line extension (in Masinag, Antipolo) are yet to be seen. It is hoped that the extension will live up to its goals and meet the projections, particularly a significant increase in ridership.

8.3.2. Recommendations

1. LRTA should consider a fare increase (within 2019). Despite the public's view that LRT2 is an affordable means of transport, it is not a constraint to consider a slight fare increase of PhP 1.00 to PhP 2.00. If implemented based on this recommendation, a regular end-to-end rail rider will pay a minimum fare increase of P520[67] per month or a maximum of PhP1,040 monthly. Majority of LRT2 users do not consider fare as prime reason for patronage. The safest option would be a PhP 1.00 increase across all stations. (See financial analysis in Sec. 6.2.5.4 above.) This will augment rail revenue and help cushion LRTA's operating expenses.
2. LRTA should study the feedback (starting 2019) received from non-rail riders and the conditions for non-rail riders to consider shifting from their current mode to rail. Some may be viable and doable without putting too much strain on the LRTA budget.
3. If LRMC becomes successful with its business strategy, LRTA – being the only mass transit agency in the country – must learn how to replicate or even do better than current other rail lines (next three years).
4. The national government, coordinated by LRTA as LRT2 Project implementer, must endeavor more to pull its act together (starting 2019) with other agencies, LGUs, and non-government sector, towards strengthening its capacity in mass transit operation. The government has the power to plan, acquire and implement plans that will benefit the general public.
5. LGUs should ensure more stringent implementation (starting 2019) of zoning and land use, in order to create a difference in government infrastructure projects, and even multiply opportunities for future generations.
6. LRTA should explore further (beginning next year) the socio-economic potentials of Masinag Station as the future east endpoint, before private investors put pressure on the surrounding environment and serve only a narrow agenda rather than the larger public good.
7. Finally, LRTA must address inefficiency, unsustainable operations, and comfort issues – while at the same time build on its good performance relating to reliability, affordability and safety and security (starting 2019).

[67] Assuming a regular LRT2 rider making trips of about 5-10 times weekly at PhP 25 per end-to-end trip from Recto to Santolan. The total weekly fare will be PhP260 if PhP 1.00 is added to the fare or PhP 1,040 maximum total monthly fare. If the rider is not consistently taking LRT2 daily, the total monthly fare shall be lower.

9. To what extent has the project contributed to the overall goal of sustained public transport-based development?

This is the last of the six (6) major evaluation questions, focusing on project impact/ results. "Sustained public transport-based development" is the Government's goal in the transport sector.

9.1. Findings Regarding Changes Attributable to LRT2

The Evaluation Team's major findings are provided below, organized into two (2) main indicators of "sustained public transport-based development": (a) access to key destinations; and (b) ease of passenger movement.

9.1.1. Access to Key Destinations

The impact evaluation perception survey results show that LRT2 riders feel it is now easier to go to: (a) schools, 82% of respondents; (b) work, 82%; (c) government offices, 64%; (d) hospitals, allied medical services and place of worship, 59%; (e) commercial or trading centers, 56%; and (f) police stations and local security offices, 56%. In comparison, the aforementioned NEDA/ JICA Ex-Post evaluation study showed similar enhanced accessibility to key locations in the metropolis: (a) place of work, 24% of respondents; (b) social services, 24%; and (c) markets/ shops/ trading centers, 22%.[68] Comparing the two survey results (Year 2008-2009 versus Year 2018), we can observe palpable improvements in access over time, as shown on the following table:

Table 89. Access to Key Destinations: 2008-09 vs. 2018

Key Destinations	Percent of LRT2 Riders Noting Improvement	
	2008-09	2018
Place of work	24	82
Social services/ government offices	24	64
Markets/ shops/ trading centers	22	56

Source: NEDA/ JICA Ex-Post Evaluation Study and Evaluation Team Perception Survey

The above results support the notion of "democratization of transportation" to be discussed in Sec. 9.2. below. The perception survey corroborates LRT2's impact on the transport sector, as discussed elsewhere in this report. LRT2, in combination with other transport modes, has increased overall transport efficiency, particularly for heretofore difficult-to-reach faraway destinations,

The on-line perception survey in non-project areas, i.e., R-7 (see Part I, Section 3.1.9.2 above), shows markedly contrasting results with respect to non-rail riders:

Table 90. Access to Key Destinations in Non-Project Areas

Key Destinations	Percent of Respondents Noting that Access Now More Difficult
Place of work	63
Social services/ government offices	58
Markets/ shops/ trading centers	54

Source: Evaluation Team On-Line Survey

In non-project areas, commuters do not enjoy the same transport efficiency as in the project areas. None of the 86 randomly selected respondents who commute regularly through R-7 said that travel

[68] Yasuhiro Kawabata and Hiroshi Aoki, Metro Manila Strategic Mass Rail Transit Development I, II and III, page 9.

to their usual destinations has become faster. Commuters, now more numerous, rely on PUJs/ conventional means of transport, which similarly are now more numerous and contribute more to traffic congestion.

The Government's current action to extend the LRT2 eastward to Masinag, Antipolo is the most logical and doable move to date in order to enhance system operations. LRT2 is the only urban rail that follows the radial road since Burnham's Manila Plan was prepared more than a century ago.

The west endpoint of the LRT2 in Masinag will be a critical factor in ridership, trade and commerce, realty, and many other economic – and social – opportunities that can be generated from this extension project. This will capture the untapped market in the eastern region that is unable to patronize LRT2 due to lack of connectivity. Masinag is about five kilometers from Santolan. When completed, the total length of the LRT2 will be extended to approximately 18 kilometers from east to west endpoints. *To date, LRT2 is the only urban rail that will connect communities located outside Metro Manila.*

In the same vein, if the west extension (Divisoria and Port Area) can be built as originally planned in the Feasibility Study, LRT2 patronage is expected to increase, and a new group of rail riders may even consider patronizing. The east and west extension lines would help promote livelihood/ entrepreneurship. This is discussed in detail in the succeeding pages.

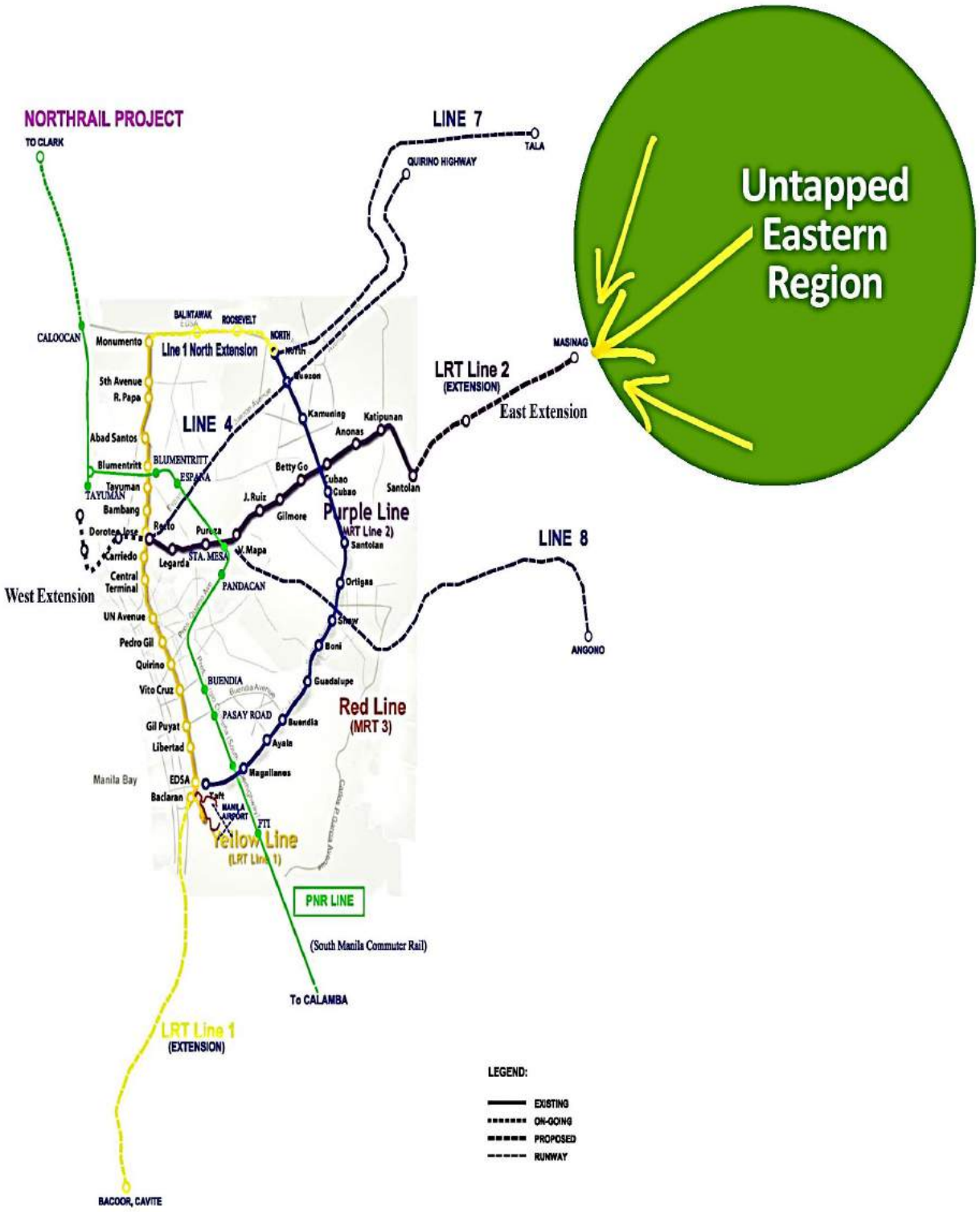


Figure 51. Existing and Planned Rail Lines in Metro Manila and Beyond

Sources: Rail Map: Marubeni Corp., Oriental Consult Co. Ltd., Katahira Eng'g Int'l., Tonichi Eng'g Consult., Ltd.; Final // Image: Evaluation Team

Referring to Figure 51, LRT2 will play a strategic role in connecting the eastern region to north and south transport access points using rail. This will translate to more time-efficient trips and fuel savings for motorists who will shift to LRT2.

Table 91. Passenger Flow Rate by Year

Year	Average Daily Ridership	Passenger Flow Rate		
		Per Hour	Per minute	Per Second
2004	57,158	3,008	50	1
2005	116,107	6,111	102	2
2006	131,258	6,908	115	2
2007	153,431	8,075	135	2
2008	168,060	8,845	147	2
2009	172,473	9,078	151	3
2010	175,988	9,263	154	3
2011	177,262	9,330	155	3
2012	195,348	10,281	171	3
2013	198,862	10,466	174	3
2014	202,354	10,650	178	3
2015	173,426	9,128	152	3
2016	186,119	9,796	163	3
2017	183,216	9,643	161	3
2018	179,709	9,458	158	3

Source of data: LRTA

SBE Rail Line Concept

Further to Part II Section 1.2 above, LRT2 can serve as "commodities transit" for SBE, transporting small retails items in manageable packages, broadly replicating the concept of a farm-to-market road. Divisoria and Antipolo can become end-to- end SBE supply hubs to generate more livelihood opportunities for people. Following this line of thought, LRT2 might opt to explore the dedicated car train concept catering to SBE and retail business. LRT2 could dedicate specific car trains to SBEs.

The LRT2 car train may need some minor customization to accommodate the dedicated car train concept. With ample room for passengers, LRTA might dedicate one of the car trains per trip for SME/ retail business, or make scheduled trips to maximize the ridership for the small business sector. Corresponding policy directives, security support, information campaign, and fare restructuring will be needed to make this happen. At the ground level, feeder transport can also become additional opportunities to complete the loop of the accessibility and mobility model.

9.1.2. Ease of Passenger Movement

Survey respondents confirmed that with LRT2, travel is faster, more comfortable, and convenient – sub-indicators of "ease of movement". Based on FGDs, tricycles play a significant role conveying commuters to and from LRT2 stations or national roads where passengers can board other modes of transportation. Such was the case in Calumpang, Santolan and Escopa where tricycles bring commuters to the nearest LRT stations; and in Roxas where tricycles bring commuters to Quezon Avenue to take other modes of transportation. Tricycles have extended their usual routes to cater to LRT2 commuters. In the case of Barangay 527, the tricycle is the main mode of transportation that operates almost like a taxi - going as far as Sta. Mesa from Sampaloc, and charging from PhP 70 – PhP 100 per ride.

From the initial LRT2 travel time simulations from Recto to Santolan (or vice versa), average travel time ranges from 21-25[69] minutes for a typical trip on a fair, sunny day. This, however, does not include access and exit time as discussed in the survey. That all the stations in the LRT2 system have elevated access is also a factor affecting public patronage. Some stations are easily accessible especially when the elevator and escalator are working. This is not the case for all stations. The elevators can only hold up to ten (10) people. Stairs and escalators remain to be the practical

[69] Actual travel time on-board the train only. The total travel time including the queue time and waiting time is about 26.55-27.55 minutes. It would b safe to use 28.00 minutes

facilities. Escalators remain functional even if the motor does not work. From the 15-year ridership data from LRTA, the average number of riders by any measure of time is shown in Table 91.

Table 34 in Part II, Section 4.1.2, showed the sample passenger flow rate per station, per person (per minute), which might differ in any given time within the total operating hours of LRT2. Using historical average daily ridership data as reference, the passenger flow rate has tripled since 2004 (Table 91).

Employing the level of service standard discussed in the Interim Report (see also Footnote 34 in this Report), where LOS = 1 means 3.0-sq. meter personal space and LOS=5 is 0.5 sq. meter, ease of movement inside the LRT2 facility will fall under LOS=2.5. This is still convenient to move about, and there is clear indication of ease of movement that also provides a more in-depth understanding of accessibility.

9.2. Social and Inclusivity Analysis of LRT2 Contribution to the Overall Goal

In previous Sections 5.1.2 and 7.2, key elements of social and inclusivity analysis were covered. In this section, we will discuss the two indicators: (i) improvements in accessibility; and (ii) sustainability of benefits, which are important because as discussed earlier, most of LRT2 benefits are broadly inclusive, i.e., these accrue to low- and middle-income groups, women employees, students, and individuals with special needs.

9.2.1. Inclusive Contribution to Overall Goal

LRT2 is contributing to the overall transport sector and project goal in an inclusive manner. As discussed in Section 9.1.1 of this Report, the perception survey results showed that riders feel that LRT2 has facilitated their access to: (a) schools, 82% of respondents; (b) work, 82%; (c) government offices, 64%; (d) hospitals, allied medical services and place of worship, 59%; (e) commercial or trading centers, 56%; and (f) police stations and local security offices, 56%. What might be more meaningful to mention is that according to the household survey, LRT2 has considerably expanded – and perhaps diversified – the destinations accessible to commuters. This change is referred to in this Report as "democratization of transport" (Table 92). *LRT2 has enabled many more people to more regularly travel to farther destinations, which before only those with private vehicles/ personal means could regularly reach.* The table below shows that almost half of the respondents are presently going to different destinations as a result of LRT2 services.

Table 92. Democratization of Transport under LRT2

Destinations before and after LRT2	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Same	91	56.9	96	54.9	187	55.8
Different	69	43.1	79	45.1	148	44.2
Total	160	100	175	100	335	100

Source: Evaluation Team HH Survey

5.1.1 Sustainability of Benefits

Aside from contributing to the transport sector and project goal in an inclusive manner, LRT2 is generating sustainable contributions. From household survey data gathered by the Evaluation Team, the major benefits being generated by LRT2 are sustainable. One key indicator is the number of years during which patrons have been using LRT2, as shown below.

Table 93. Number of Years Riding LRT2

Period of Patronage	Influence Area		Outside Influence Area		Total Project Area	
	No.	%	No.	%	No.	%
Less than 1 year	1	0.5	1	0.5	2	0.5
1-3 years	20	10.5	40	20.4	60	15.5
4-6 years	34	17.9	49	25.0	83	21.5
7-9 years	45	23.7	34	17.3	79	20.5
10-12 years	38	20.0	38	19.4	76	19.7
13-15 years	52	27.4	34	17.3	86	22.3
Total	190	100	196	100	386	100
Average no. of years as LRT2 Rider	9.3		7.9		7.9	

Source: Evaluation Team HH Survey

The above table shows that two-thirds of riders have been taking LRT2 for seven (7) years or more. Almost a fifth have been regular patrons for 13 to 15 years. These figures could be linked to reliability/ regularity and predictability of the train schedule as noted earlier in Sec. 8.2. Providing dependable train service is one of the major objectives of LRT2 (see Part 1 sec. 1.1.1). On the other hand, only 16% of riders are relatively new customers, i.e., less than one (1) year up to three (3) years. These could include the newer residents of communities agglomerating near the LRT2 stations.

Related to the number of years is the frequency of using the LRT, as revealed by the household survey. Here, we juxtapose "length of loyalty" (number of years riding) and the "intensity of loyalty" (frequency of riding) – alluding to LRT2 being a "brand" as discussed in Part II Section 5.2.2 of this Report. Please refer to Table 94.

Table 94. Frequency of Use of LRT2 in Year 2018

Frequency of use	Project Area						Non-project area		All areas	
	Influence area		Non-influence area		Total project area					
	No.	%	No.	%	No.	%	No.	%	No.	%
Daily	14	7.5	18	9.4	32	8.5	2	8.3	34	8.5
Weekdays	7	3.8	6	3.1	13	3.4	13	54.2	26	6.5
2-8 times a year	15	8.1	11	5.8	26	6.9	0	0.0	26	6.5
4-6 times a month	19	10.2	13	6.8	32	8.5	2	8.3	34	8.5
1-3 times a month	67	36.0	84	44.0	151	40.1	6	25.0	157	39.2
3-4 times a week	20	10.8	16	8.4	36	9.5	0	0.0	36	9.0
1-2 times a week	42	22.6	36	18.8	78	20.7	1	4.2	79	19.7
Once only	2	1.1	7	3.7	9	2.4	0	0.0	9	2.2
Total Responses	186	100	191	100	377	100	24	100	401	100

Source: Evaluation Team HH Survey

We see that from the above table that in the project area, one-fifth of the household survey respondents boarded the LRT2 once or twice each week, while another 9.5% take the train three to four times each week. In contrast in the non-project area, one-fourth of respondents rode the LRT only once to thrice each month. Loyal patrons of LRT2 consistently use the train service. LRT patrons regularly rather than occasionally have been taking the train over the years.

Mini Case Study 2. Diminishing Church Goers – A Vendor's Dilemma

My name is Antoniol, 52 years old, married with two children. I sell newspapers and flowers in front of St. Joseph's Shrine along Aurora Blvd., Project 3, about ten meters from the LRT2 Anonas Station. My stand used to be located near the street, but because of developments in this area, the authorities told me to move closer to the church. St. Joseph's Shrine allows vendors like me to sell in this area, and we don't pay have to pay rent.

I started selling here in 1986 – I was still single then. Prior to this time, a church-based organization named PABLO (I forgot what it stands for) invited me and some other young people to attend a business seminar. This got me interested, and decided to partner with my aunt in setting up and managing this business. Now that my aunt is already old, I practically manage it all by myself.

My clients are usually the church goers. During the construction of LRT2, that portion of Aurora Blvd. from Anonas to Dapdap Streets was closed off. Vehicles detoured to Molave Street, behind the church. The number of church goers and other buyers was significantly reduced then, because the area had become inaccessible. Several vendors discontinued their business, and moved somewhere else. Though my income immensely decreased, I still decided to stay.

Now that LRT2 is in operation, there are a lot more people walking along the footpaths, most of whom are LRT2 passengers. Yet, my income is still considerably lower than before LRT2 came into being – because these passengers are not church-goers. In addition, the authorities put up a fence at the middle of Aurora Blvd., so that people who want to cross from either side of the street have to take the footbridge. This is very difficult, especially for senior citizens who are the usual church-goers. In effect, the volume of church-goers significantly decreased, along with my income.

The area where the church is located has also become congested because of the big establishments built around it - Jollibee, McDonald's, Shakey's etc. Someone new to the area will hardly notice that there is a church there but perhaps, get a hint from vendors selling flowers or religious items. I don't think the food vendors earn that much either, because they will not be able to compete with these big food industries given amenities like air conditioning, comfortable seats, and pleasant ambiance.

The effect of LRT2 on my business is not that all bad. I take LRT2 when I go to Claro M. Recto to buy flowers. It saves me time and it is more comfortable than traveling by road. The LRT management just needs to repair broken elevators and escalators.

Source: Evaluation Team Case Interviews

9.3. Findings regarding changes in indicators of other transport modes within the LRT2 impact area

Apart from access to key destinations and ease of passenger movement, the project's contribution to the transport sector overall goal of sustained public transport-based development can also be assessed using other indicators including travel time, VOC savings, traffic volume, road maintenance cost, and choke points.

9.3.1. Travel Time Savings

Further to the initial discussion in Part III Section 6.1.1.2 above, a quantitative analysis of travel time savings is presented in this section, as such savings is a key measure of benefits as presented in the Project logframe. The intended beneficiaries of travel time savings are 600,000 road users with an equivalent 44% savings in travel time (PhP1,400 million in 2004), if the beneficiaries in mind will patronize rail over other current mode of preference. The time savings estimation below is based on a simple approach using ridership projection and current attainment, as follows:

Daily time savings in minutes (Col. B) is multiplied by daily ridership (Col. C). The result is then divided by 60 to derive the savings in hours (Col. D). Next, daily savings (hours) are multiplied by the peso value of hourly savings (Col. E) to obtain pesos saved per day. This daily peso value is then multiplied by 365 days to show annual savings in peso terms (Col. G). Finally, life-of-project (15-year) savings are shown on the last column.

Table 95. Measurement of Travel Time Savings

A	B	C	D	E	F	G	H
Base Year	Est. Ave. Travel Time Savings in min.	Ave. Daily Ridership	Est. Time Savings, hrs	Est. Time Value, PhP /hr	Min. Daily Wage, PhP	Est. Total Annual Time Savings, PhP	Est. 15-Year Time Savings, PhP
1995	10.3	510,000	87,550	5	165	159,778,750	
2018	18.9	184,476	58,110	16	537	339,362,050	5,090,430,774

Source: Evaluation Team HH Survey

NOTES:

Col. A: Use the 1995 value for 2004 when LRT2 started operation.
Col. B: Estimated average travel time savings from HH survey.
Col. C: Ave. daily ridership. For 2018, the average value from the last 10 years was used, first few years of LRT2 operation was still low
Col. D: B x C ÷ 60.
Col. E: Estimated time value, per hour, reference used was daily wage ratio
Col. F: daily wage (Reference for Col. E)
Col. G: D x E x 365

The ridership projection from 1995 is three times the actual attainable number for LRT2. Despite this reality, there is still considerable time savings that benefits the public which does not necessarily translate into financial returns to the government.

A different approach may also be tested in order to provide a deeper understanding and gainful appreciation of travel time savings. In most cases, estimations are based on available standards or even assumptions from other funded researches. Travel time savings may also be determined by doing an actual simulation of all the possible routes and means of mobility, to and from the two endpoints of LRT2 as well as other alternative modes. The exercise can be tedious, unsafe, and

repetitive due to the need to establish a 'regular' travel pattern.

To provide an idea of the cross-section of R-6 vehicular traffic, below is the historical number of vehicle trips plying the same LRT2 route, narrowed down into four types of vehicles.

Table 96. Vehicles Plying the LRT2 Route (R-6), 2004-2017

	CARS	UV	TRUCK/BUS	MC/TC	TOTAL
2004	637,296	192,362	27,562	281,965	1,139,185
2005	657,007	198,311	28,414	290,685	1,174,417
2006	677,326	204,445	29,293	299,676	1,210,740
2007	698,275	210,768	30,199	308,944	1,248,186
2008	719,871	217,286	31,133	318,499	1,286,789
2009	742,135	224,007	32,096	328,350	1,326,588
2010	765,087	230,935	33,089	338,505	1,367,616
2011	788,750	238,077	34,112	348,974	1,409,913
2012	813,144	245,440	35,167	359,767	1,453,518
2013	821,358	247,919	35,522	363,401	1,468,200
2014	829,654	250,424	35,881	367,072	1,483,031
2015	838,035	252,953	36,244	370,779	1,498,011
2016	846,500	255,508	36,610	374,525	1,513,143
2017	855,050	258,089	36,979	378,308	1,528,426
2018	863,687	260,696	37,353	382,129	1,543,865

Source of data: LRTA (Annual Average Daily Traffic (ADDT))

NOTE:

CARS include all type of cars – sedan, two-door, wagons and all variants
PUV include jeepneys, UV Express, vans, pick-ups and all in-betweens
TRUCK/BUS include small trucks, big trucks, trailers, small & big buses
MC/TC are motorcycles, scooters, all motorized three-wheeler

The numbers presented in Table 96 show the inventory of public and private vehicles passing through the R-6 Road. Among the goals of the LRT2 is to attract commuters to take the rail and reduce dependence on cars. However, over the 15-year period since 2004, an increase in vehicle use of about 35% was noted. This increase did not only translate to additional congestion but also to an increase in air pollution as well.

It may also be noted that the increase in car use could have also contributed to low ridership in LRT2 especially when rider-hailing services using 4-wheel vehicles and motorcycles were introduced in 2013. Technically, the presence of LRT2 in R-6 Road may have cut the congestion to a certain level but did not translate to a reduction in vehicle use especially when ride-hailing is much more convenient and significantly different from what rail commuting can offer. The ease by which households can now own cars is another factor that might not have been foreseen in earlier traffic studies.

9.3.2. VOC Savings

Vehicle operating cost targeted the same number of road users (600,000) and an estimated VOC savings of PhP1,400 million in 2004 should people shift from road to rail and minimize their carbon footprint. Below is a presentation of the estimated savings.

Table 97. VOC Savings Estimation

	A	B	C	D	E	F	G
	Base Year	Ave. trip-km per rider	Average daily ridership	Total rider-km/ day	VOC savings per LRT2 rider-km	Annual VOC savings	15-year VOC savings
1	1995	6.6	510,000	3,366,000	0.15	184,288,500	
2	2018	8.05	184,476	1,485,032	0.15	81,305,502	1,256,169,840
3	2018	8.05	184,476	1,485,032	0.15	81,305,502	1,256,169,840
4	2018	8.05	184,476	1,485,032	0.16	86,725,869	1,304,953,125
5	2018	8.05	184,476	1,485,032	0.17	92,146,236	1,341,540,600

Source: Evaluation Team VOC Key Informant Interviews

NOTES:

Item A: Use the 1995 value for 2004 when LRT2 started operation.
Item B: Estimated trip-km per rider (8.05) for 1-5 was estimated based LRT2 ridership demographics Estimated average person-trip is 7 stations from both east and west endpoints. There is no other means but to estimate since the much-needed O-D vs Fare Matrix is a long-standing request from LRTA, no data had been provided.
Item C: Ave. daily ridership for A-E was estimated based on 2004-2018 ridership data
Item D: B x C
Item E: VOC savings per LRT2 Rider-km (B-C): assumed increase of 3%-10% based on 1995 data
Item F: D x E x 365 (1 year)
Item G: F x 15 years (2004 – 2018)

With a large student base population of riders, the average trip made by a typical commuter is estimated to cross about seven (7) stations of the LRT2, which is equivalent to about 8.05 kilometers. Four (4) scenarios were drawn on the rate of increase on the VOC savings per LRT2 rider-km, based on the 1995 data. The range of assumptions varies from 3%, 5%, 7% and 10% over a period of 15 years. The whole picture was presented to show the range of possibilities.

Ridership remains to be the most critical factor to address. The projection from more than two decades ago is still unattained. It may appear to be a disadvantage, but it is also an assurance that LRT2 is ready to accommodate more than its current load, especially when the east extension becomes operational by the third quarter of 2020. As discussed in this report, the east extension will open new passenger markets for LRT2, i.e., the growing settlements in eastern Metro Manila. On the other hand, the west extension will integrate Divisoria to the rail network, thus establishing LRT2 as a "Small Entrepreneurs Rail Line" that can raise ridership by an estimated 14% (Part II Sec. 1.2.1).

9.3.3. Traffic Volume

The annual average daily traffic (AADT[70]) for the LRT2 route that is mainly composed of Aurora Boulevard, Magsaysay Boulevard, and Recto Avenue can be seen in Table 98. The AADT is classified into different transport modes. Figure 52 shows nine modes of transportation for the past six (6) years, excluding non-motorized transport. Nevertheless, AADT can still give an indication about the composition of traffic along the LRT2 route. The volume of traffic is relative to the length of each road where Aurora Boulevard is the longest and Recto Avenue is the shortest as far the LRT2 route is concerned.

The six-year AADT is further broken down into private and public transport. Figure 52 shows the dominance of cars and motorcycles on the three (3) roads. For public transport, the same figure

[70] AADT is the number of vehicles passing through a certain road throughout 365 days for 24 hours.

shows that UV Express and the PUJ are the dominant commuter service modes, while buses are not viable along the route, due to the narrow roads approaching the west end, Manila. There are deficiencies in the information released from MMDA – Traffic Engineering Center: UV Express and taxis are not fully accounted for in the records.

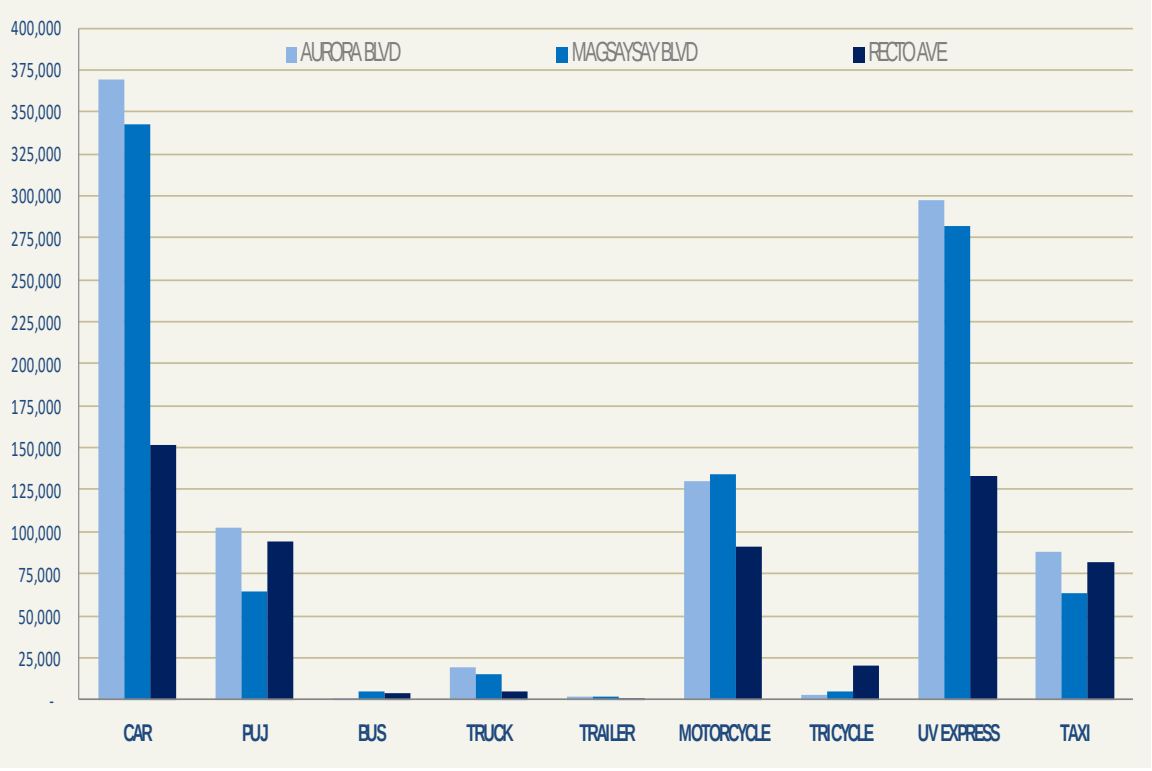
The numbers shown on Table 98 are consistent with actual findings from the traffic volume count made by the Evaluation Team despite slight differences in transport mode classifications. Other than motorcycles, PUJ is the most prominent mode having characteristics that almost run parallel to the LRT2 project goals – safe, affordable convenient, reliable and sustainable public transport. Speed of travel affects all surface transport along the same route. Motorcycle is fast, accident-prone, and can carry only a limited number of passengers.

Table 98. AADT Summary of Major Roads

Mode	Aurora Boulevard	Magsaysay Boulevard	Recto Avenue
CAR	369,239	342,876	151,572
PUJ	102,399	64,425	93,872
PUB	582	4,869	4,082
TRUCK	18,869	15,142	4,513
TRAILR	1,518	2,237	1,011
MOTORCYCLE	130,387	133,884	90,634
TRICYCLE	2,352	5,106	19,766
UV EXP	297,506	282,367	132,818
TAXI	88,428	63,716	82,096

Source: MMDA – Traffic Engineering Center / Evaluation Team

Figure 52. Vehicle Traffic along Aurora Blvd - Magsaysay Blvd - Recto Ave



Source: Evaluation Team Traffic Count

During this six-year period, new developments in public transport services may have been captured in the data but were not clearly covered. The TNVS front liner, Grab, started operations in the Philippines in mid-2013; Uber started in February 2014; Wunder (carpool services) was launched in February 2016; and Angkas (motorcycle taxi) became operational in February 2017.

The traffic count in this study included NMTs in the survey but focused on intersections, rather than a costly year-round monitoring for the R-6 Road. Based on a site assessment, the Santolan station has significantly high entry records because it is the endpoint but with no significant traffic volume from various directions. Aurora Boulevard[71] and EDSA[72] are the perfect road corridors to measure vehicular flow. Two weekdays were chosen to represent high-volume and low-volume traffic for a 16-hour survey duration from 6:00 A.M. to 10:00 P.M.

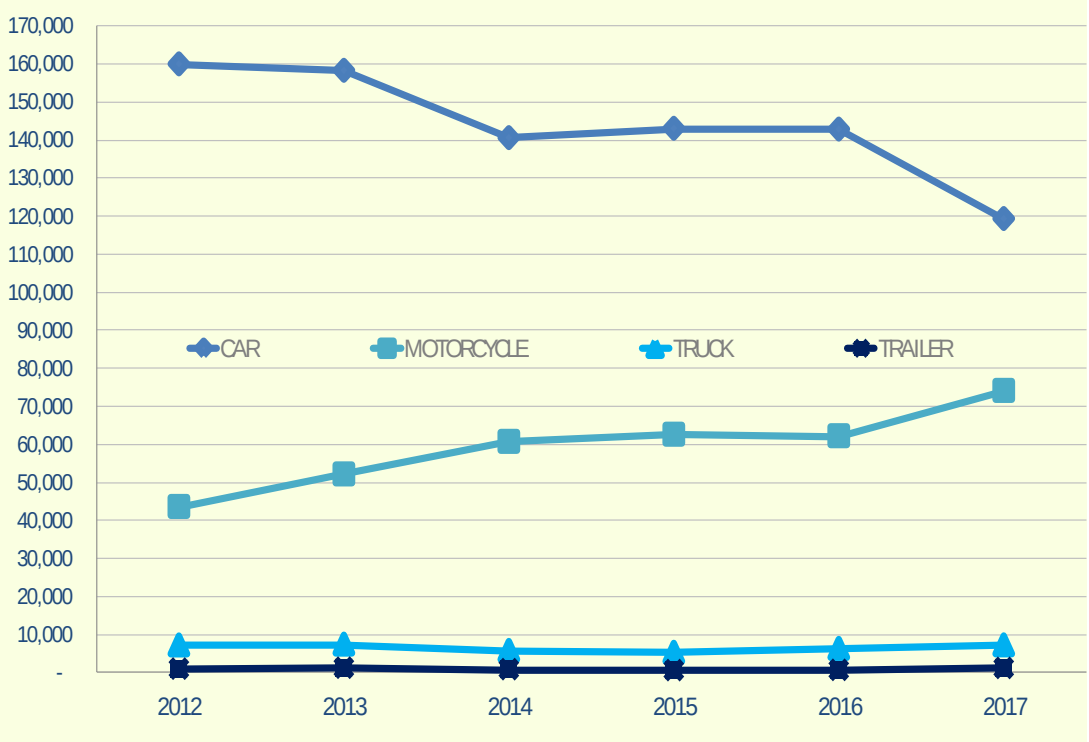


Figure 53. Private Vehicle Traffic along Aurora Blvd - Magsaysay Blvd - Recto Ave

Source: Survey / Evaluation Team Traffic Count

[71] Aurora Boulevard is Radial Road No. 6 or R-6

[72] Epifanio De Los Santos Avenue (EDSA) is Circumferential Road No. 4 or C-4

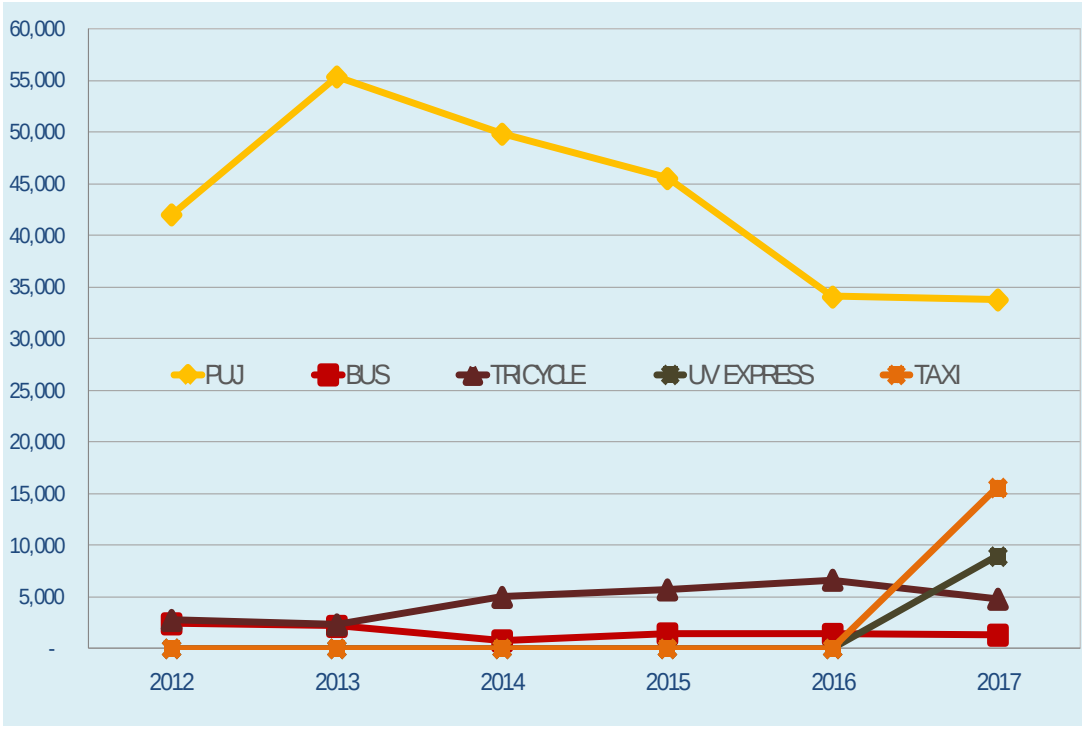


Figure 54. Sample Traffic Volume Derived from High-Volume and Low-Volume Weekdays

Source: Survey / Evaluation Team Traffic Count

Table 99. Sample Traffic Volume Derived from High-Volume and Low-Volume Weekdays: Aurora Boulevard-EDSA

Time		Vehicle Type	Passenger Cars	Vans, AUV, SUV	Jeepneys	Buses	Trucks (2-axle)	Trucks (> 3-axle)	Motorcycles ,Scooters	Tricycles	Bicycles & NMTs	TOTAL
6:00	-	7:00	4,131	2,205	578	591	152	7	3,260	32	85	**11,039**
7:00	-	8:00	5,733	2,454	871	636	176	9	4,682	23	111	**14,694**
8:00	-	9:00	5,601	2,155	861	541	231	4	4,385	33	75	**13,884**
9:00	-	10:00	4,726	2,212	785	571	266	2	3,355	8	45	**11,968**
10:00	-	11:00	5,397	2,521	739	640	284	2	3,496	11	53	**13,141**
11:00	-	12:00	4,603	2,357	837	545	220	1	3,098	12	51	**11,722**
12:00	-	13:00	5,895	2,450	742	606	322	1	3,352	6	35	**13,406**
13:00	-	14:00	5,524	2,482	653	592	274	4	3,395	3	18	**12,943**
14:00	-	15:00	5,750	2,580	783	576	332	3	3,258	4	29	**13,314**
15:00	-	16:00	6,555	2,821	661	638	262	0	4,359	7	26	**15,327**
16:00		17:00	6,792	2,929	776	533	314	2	4,078	4	74	**15,500**
17:00		18:00	8,222	3,420	839	563	161	0	4,475	11	109	**17,798**
18:00		19:00	5,987	2,993	829	581	209	4	4,616	11	90	**15,317**
19:00		20:00	7,463	2,823	758	601	137	2	4,170	3	62	**16,017**
20:00		21:00	5,921	2,682	547	575	163	3	3,182	7	35	**13,113**
21:00		22:00	6,352	5,052	1,121	1,335	478	0	4,479	10	65	**18,892**
		Total	**94,650**	**44,132**	**12,378**	**10,120**	**3,977**	**40**	**61,637**	**181**	**960**	**228,074**

Source: Survey / Evaluation Team Traffic Count

Traffic volume count in the Aurora Boulevard and EDSA intersection indicates high dependency on private vehicles instead of public transport. In comparison, data from the Recto–Rizal Avenue traffic volume count show a lower concentration of private vehicles and greater significance of public transport. This is a classic case of infrastructure investment scenario called '*If you build it, they will come'*. Tables 99 and 100 indicate the proportionate share of public transport with private cars and vans/AUVs/SUVs. Motorcycles and other motorized two-wheelers will definitely be among the natural choices to move around in Manila being a high-density area.

Table 100. Sample Traffic Volume Derived from High-Volume and Low-Volume Weekdays: Recto Avenue-Rizal Avenue

Time \ Vehicle Type	Passenger Cars	Vans, AUV, SUV	Jeepneys	Buses	Trucks (2-axle)	Trucks (> 3-axle)	Motorcycles ,Scooters	Tricycles	Bicycles & NMTs	TOTAL
6:00 - 7:00	366	248	917	19	52	5	1,229	244	204	**3,282**
7:00 - 8:00	518	322	1,171	24	67	1	2,004	345	410	**4,860**
8:00 - 9:00	486	421	1,284	26	80	0	2,439	317	282	**5,333**
9:00 - 10:00	531	423	1,248	19	136	0	2,767	290	236	**5,648**
10:00 - 11:00	427	672	976	17	163	1	2,093	260	228	**4,835**
11:00 - 12:00	467	547	972	17	147	0	2,136	254	205	**4,743**
12:00 - 13:00	546	583	1,021	21	134	1	2,516	272	205	**5,296**
13:00 - 14:00	545	526	1,027	19	125	2	2,089	287	194	**4,811**
14:00 - 15:00	620	519	990	21	135	0	2,949	277	197	**5,706**
15:00 - 16:00	536	608	1,058	21	142	0	2,292	284	212	**5,152**
16:00 17:00	565	552	947	18	117	1	2,509	321	293	**5,321**
17:00 18:00	521	549	985	26	85	1	2,753	363	344	**5,624**
18:00 19:00	567	561	995	23	63	0	2,848	299	220	**5,575**
19:00 20:00	469	532	974	21	55	0	1,830	342	165	**4,385**
20:00 21:00	420	363	694	15	34	0	1,624	163	86	**3,398**
21:00 22:00	247	374	525	10	37	1	1,017	110	69	**2,388**
Total	**7,827**	**7,794**	**15,780**	**313**	**1,569**	**11**	**35,091**	**4,425**	**3,547**	**76,353**

Source: Survey / Evaluation Team Traffic Count

9.3.4. Road Maintenance Cost

The maintenance cost of roads is usually estimated as a percentage of its construction cost per kilometer. The cost estimates of the road were current values if the road will be constructed. This will give a safe allowance for price escalation. A range of percentages was used to determine maintenance costs of the main roads, namely Aurora Boulevard, Magsaysay Boulevard, and Recto Avenue. For the non-expressway standard type of roads, 0.08% to 0.10% can be used as cost factor. The estimated maintenance costs of the roads are in Table 101.

Table 101. Estimated Road Maintenance Cost per Year

	Aurora Boulevard	Magsaysay Boulevard	Recto Avenue
Length (km)	7.9	2.2	3.2
Cost (PhP)	108,213,706	30,135,463	43,833,400
0.08%	86,571	24,108	35,067
0.10%	108,214	30,135	43,833
0.15%	162,321	45,203	65,750
0.20%	216,427	60,271	87,667
0.30%	324,641	90,406	131,500
0.50%	541,069	150,677	219,167
0.60%	649,282	180,813	263,000
0.80%	865,710	241,084	350,667

Source: DPWH for Maintenance Cost Rates and factors / Estimation and road details - Evaluation Team

Notes:

1. *Surface type of roads will be asphalt over concrete at 100 mm overlay*
2. *Cost of maintenance per kilometer: PhP13,697,937.52*

9.3.5. Choke Points

For alternative public transport going westward to Manila, the choke points start right after the Katipunan station. Aurora Boulevard is a four-lane, two-way road where the island is dedicated to the LRT2 substructure (concrete columns and foundations) easement. All the intersections along Aurora Boulevard become choke points especially if the intersection allows crossing and turning traffic. Some intersections have been closed to minimize congestion and only turning traffic can be possible. See Figure 55.

Based on the Evaluation Team's findings, the choke points after EDSA continue on an intermittent basis to Magsaysay Boulevard all the way up to Recto. The two (2) least performing stations in terms of ridership, Betty-Go Belmonte and J. Ruiz, need improved connectivity with feeder transport which results to lesser congestion at the ground level of the station. On the west endpoint, Recto, the choke point is not merely caused by vehicular traffic but more of commercial activities in the impact area all the way to Divisoria as discussed earlier in the previous section. See Figure 56.

Figure 55. Aurora Boulevard Day Traffic, with road widening along with high-rise condominium construction

Figure 56. Night scene at Recto Station neighborhood, all business and street retails blend with slow foot and car traffic

9.3.6. Emergence of Innovative Transport Concepts

It is worthwhile to take note of some of the various initiatives and alternatives that may offer solutions to the overall mobility and circulation issues across cities.

9.3.6.1 Telecommuting

Telecommuting is a term to denote traveling, commuting, and navigating using a telephone / smart phone. In the last ten (10) years, there had been numerous developments in information technology that gradually found its way into mobile applications (or apps) especially the smart phone. With the pool of Information Technology (IT) professionals, innovative apps are also made for transport and mobility. The emergence of digital maps with on-line support paved the way to providing navigational apps for anyone. Waze, Google Maps, and other similar applications enable people to go to unfamiliar places and find their way to the destination with the use of a telephone. Driving and commuting are more convenient than before.

LRTA has already adapted this ahead of the other urban rails, using the PARDS. The system was developed by an all Filipino Team named Track Mate, using local technology. For urban rail application, PARDS will enable the public to connect with the system, check schedules, track the train, and receive updates. Inside each train are forty 19" flat screen monitors continuously giving trip information to passengers, providing news, announcements, and updating the location while on-board. Track Mate is improving the mobile app to ensure ease of use.

9.3.6.2 Web-Supported Navigation

Navigational apps enable commuters to pre-determine the fastest route to their destination, and thus compete directly with LRT in terms of offering faster travel. Digital mapping is now enabled on mobile devices with on-line support for real-time guided travel. An Israeli company called Waze developed a software providing turn-by-turn navigation information and user-submitted travel times and route details, while downloading location-dependent information through a mobile telephone network. Waze describes its app as "a community-driven GPS navigation app, which is free to download and use". Launched in the Philippines in 2013, Waze became so effective that Google acquired it and integrated its own application, Google Maps.

The usefulness of Waze is key to its rapid popularity. Motorists especially the younger generation have embraced Waze, along with other mobile applications. Waze allows an efficient way to find and reach a destination. It helps avoid congestion by showing alternative routes with supplementary information like distance, time, names of places, and landmarks. Traveling with a companion acting as navigator can be convenient; even solo drivers can enjoy this mobile application since Waze is equipped with voice instruction capability which makes driving safer. Waze and Google Maps[73] now share similar digital platforms with voice guidance and strong on-line support.

9.3.7. Web-Supported Ride-Hailing Service

What planners used to call intelligent transport in past decades has already become domestically available. Since 2013, the web-based ride-hailing service provider, Grab, has been catering to the need for convenient travel other than what is provided by the usual taxi cab. The company has spawned service variations that include ride-sharing, Grab-taxi, food delivery (not limited to a single restaurant),

[73] Recently, Waze and Google Maps applications on any mobile device present the same features – voice assisted trips that make it easier for the driver to handle the wheel without taking the eyes off the road. Google Maps started as a simple digital map display across the globe which showcases different areas and is capable of zooming into certain points of interest. Google Maps now also features navigation assistance, voice-guided driving, real-time interaction, and detailed directions on the map much like Waze.

Grab Express for parcel, shuttle service, and other innovations. This multiplied into smaller web-assisted transport services companies dealing mostly with delivery of food, parcels, and medicines.

The dominance of the transport network vehicle service in the market is an indication of economic and cultural transformation. People are willing to pay for the convenience even if shorter travel time is not guaranteed like in mass transit. But nevertheless, TNVS is a game changer in the transport service industry that is difficult to beat because it serves the needs of the commuting public with affordable convenience. And yet, TNVS contributes to overall congestion. The people's willingness-to-pay will be the sustainability indicator for TNVS.

TNVS does not compete directly with LRT2 or any other urban rail and it may even serve as feeder transport. On the other hand, Grab has already filled-in what the government has planned to 'remove' from the road to create a more sustainable environment. *LRT2's targeted number of road users (600,000) to shift to rail is also the same number of daily bookings for Grab.*

9.3.8. Sustainability

BRT: Many cities worldwide are adopting BRT to address the need for urban mobility. In fact, quite a number of city governments favors BRT over rail-based mass transit for practicality and ease of operation. In recent projections, a one-kilometer mass transit track is 10 times the cost of a BRT track. BRT is made up of a series of bus coaches that can ferry the same number of passengers, without the same heavy infrastructure requirements of light rail. As far as sustainable transport is concerned, BRT is among the top choices due to cost, adaptability, accessibility, familiarity, and ease of implementation.

Jeepney: The Philippine jeepney is viewed differently from various standpoints and many times, it has been looked down upon. Despite the rough engineering, lack of class, blaring radio, noisy surplus engines, smoky tailpipes, backyard model image, and undisciplined drivers, the jeepney has withstood the test of time, the recurring waves of phase-out proposals, the unending '*tigil-pasada*' (strike) due to fare hikes, and politicized operations. Jeepney drivers and operators belong to different organizations that are 'sometimes unorganized' to lobby on issues that can be readily agreed upon. After almost 70 years since the first locally adapted jeepney unit was deployed as public transport mode, it still continues to serve the public's needs and remains as the prime public transport mode. Jeepney qualifies as sustainable transport not because it is able to meet the demand, but because it re-uses old engines and recycled parts, runs on recapped tires, and operators do not just scrap the old units. It is an icon of enduring sustainability.

9.3.9. Fossil-Fuel Free

Electric Vehicle (EV): After the government institutionalized the commercial application of electric vehicles in the late 2000s, proponents gradually invested and the market is changing. Just like mass rail transit, EVs do not run on fossil fuel, but indirectly use fossil fuel. Electricity is generated from the power plants that use crude oil. A number of public transport vehicles is already serving short trips. In nearby communities, electric vehicles can serve as feeder transport especially for LRT2.

Solar Powered Vehicles: The technology is still not mature for commercial operation but serious efforts are being made to develop the right battery to store power longer and drive the electric motor to run the vehicles. It is projected that solar vehicles will be ready for public use by 2030.

9.3.10. Back to Basics

Before the wheel was invented, water transport already existed. Buoyancy is natural, while rotation is man-made. Cities and kingdoms in ancient times were located near a body of water because it was the most efficient mode of navigation. Cities and communities flourished because water is a natural magnet. Water transport can be adopted as feeder transport for LRT2 in areas where there are inland waterways. *There are two LRT2 stations that are not too far from the Pasig River: Pureza Station and Legarda Station. LRT2 can link up with the Pasig River Ferry Service (PRFS) being run by MMDA.*

9.4. LRT Line 2 Milestone: Levelling-up the Riding Experience

LRTA partnered with Track Mate Business Solutions, Incorporated (TBSI) which developed a navigational application to facilitate a pleasant riding experience for LRT2 passengers. The application is called PARDS, and it was launched in May 2017. TBSI is a local firm using Filipino technology. PARDS has features providing train location, real-time information on train arrival and departure, emergency communication and notification, Infotainment and announcements regarding nearby establishments per station. This information is helpful to passengers to make them become aware of where they are, or if they are nearing a government office, hospital, school, or other key destination.

The system also ensures additional safety and security features which allows LRTA to keep track of passengers in real-time, or facilitate rescue in emergency situations. These are all made possible because PARDS equipment includes close circuit television (CCTV) across the stations and selected parts of the train, global positioning system (GPS) relaying location in cloud-based information storage then translated into audio-video (AV) display. The whole system requires a 22-inch digital display monitor as the medium for the passengers to view and listen to the AV contents. There are about 400 of these monitors installed on the current rolling stocks of LRT2 (Figure 57).

Figure 57. The digital monitor installed on the upper panel of the cabin's interior of the train replacing print ads.

Source: philkotse.com

Figure 58. Information contents vary and are displayed simultaneously

Source: jamesdeakin.com

PARDS also developed a mobile (IOS and Android) application through which passengers can access real-time feed on train schedules among other useful information. See Figure 58, 59 and 60. This will further improve the ticketing system using mobile devices when the system has fully integrated the features. Eventually, a significant reduction in queueing time is feasible using BEEP cards and single journey tickets made of plastic.

LRTA plans to expand the services of the system by exploring other means of interface. PARDS was offered as a proprietary technology by TBSI to LRTA at no cost to the government. The system is sustained by advertisers whose products and services are displayed on video screens. The system is very efficient because it is like a television network and signaling system combined, designed exclusively for mass transit operations. The system package includes installation of a command center that allows LRTA to monitor train performance and passenger flow with real-time images.

Figure 59. Content display on digital monitor showing train arrivals

Source: YouTube / Sabina Cruz

Figure 60. Mobile application of PARDS will soon be expanded

Source: http://www.ronnotthedj.com

The system had been cited by passengers as one of the main reasons for giving LRT2 the highest score during a Department of Transportation customer satisfaction survey. MRT3 unsurprisingly scored the lowest, while LRT1, despite being taken over by Light Rail Manila Corp., a joint venture consortium of Ayala Corp. and Metro Pacific, took second place[74].

TBSI is also eyeing a wider market and considering LRT1 and MRT3 to be the next mass transit that can benefit from PARDS. Two years after its launching and successful system market performance, TBSI re-launched the system on March 2019 with a new brand called TUBE. It is now fully implemented across all LRT2 trains.

9.5. Conclusions and Recommendations:

LRT2 contribution towards the overall transport sector goal of sustained public transport-based development will be wrapped up in this section.

9.5.1. Conclusions

The transportation landscape is changing. Developments that were never even thought of from the last two decades are serving as mainstream applications for the regular urban dweller. LRT2 is playing a key role in this transformation.

The role of feeder transport in rail development is important as well in existing mass rail transit facilities like LRT2 to hasten passenger movement across the urban landscape. The challenge is to achieve greater efficiency in the entirety of the transport system.

The interconnection between LRT2 and LRT1 has been improved. The rundown areas where the Recto Station connecting bridge passes through is contradictory to the image of good government. The area is much too blighted.

9.5.2. Recommendations

1. DOTr and LRTA should embrace change and accept the reality that technology is innovating the way things are done even in rail operations. For example, the Passenger Assist Railway Display System (PARDS), now rebranded as TUBE even in MRT3, can be further developed for on-line tracking of train schedules, and even electronic ticketing. Moreover, the automatic fare collection system[75] (AFCS) had been advancing in recent months to enable more than seamless transfer across LRT 1, LRT 2 and MRT 3, but is also considered for other modes of road transport especially with the modernized jeepneys that are equipped with the system. The modernized jeepneys fall into the Public Utility Vehicle Modernization Program (PUVMP) which aims to significantly improve jeepneys and other feeder transport for the LRT 2.

2. LRTA might consider extending its operation to include feeder transport, in order to ensure patronage and to promote LRT2 services (next one (1) to two (2) years). This is commonly done in many countries where the same agency operates not only trains but also inter-linked transport services.

[74]https://www.philstar.com/business/science-and-environment/2017/09/13/1738752/pinoy-tech-startup-develops-gps-info-system-lrt-2#KuZWx5ai5bXeHUhY.99

[75] The AFCS is an initiative of the Philippine government under the Public-Private Partnership (PPP) Center and is implemented by the DOTr. The project involved the decommissioning of the old magnetic-based ticketing system and replacing the same with contactless-based smart card technology called the *Beep Card ™* on LRT Line 1 and 2 and MRT Line 3, with the introduction of a centralized back office that will perform apportionment of revenues. The private sector operates and maintains the fare collection system. (Source: PPP Center)

3. LRTA should more aggressively tap (next one to two years) the business potential of LRT2. Expedite the west line extension.

4. LRTA should not be limited to rail operations (next two to three years). At this point, it should also consider other strong and sustainable modes especially the BRT. LRTA may expand its reach to other areas, especially when the Masinag extension is opened. This can be made by conducting a study on the area to identify the transport corridor where a BRT can operate. See Annex 36 for further discussion on BRT.

5. LRTA should expand the capability of PARDS to continuously support improvement of LRTA services (within 2019).

6. LRTA should consider the SBE Line Concept (next one (1) to two (2) years). Some entrepreneurs were noticed at the Recto Station with two large bags of toys but were denied entry. A feasibility study can be made to validate the business potential.

7. NEDA-MES should study how to minimize unwanted impacts of infrastructure development (continuing). It was observed that the stations can also cause a negative effect – blight particularly underneath the viaducts.

10. Consolidated Conclusions and Recommendations

Key Evaluation Question #1: Was LRT2 Project implemented according to how it was originally planned?

1. **Project period.** Implementation was significantly delayed. LRT2 was originally scheduled to operate first quarter of Year 2001. Santolan to Cubao services started third quarter 2003, and Cubao to Recto, first quarter 2004. Delays are attributable to: (1) acquiring road right-of-way (RROW), which in turn required design changes; and (2) procurement. The same reasons are highlighted in the previous (2008/ 2009) Ex-Post Study, which counted a total delay of three (3) years and five (5) months. The delays exposed the project to higher prices and interest charges, exacerbated by foreign exchange fluctuations.

2. **Ridership projection.** The projected level of 510,000 daily was too optimistic. The previous Ex-Post Study noted the actual number of passengers to be one-third of planned. Actual levels range from 175,156 to 202,333 (2012-2017). The projection exceeds the full system capacity of 463,650 passengers derived in the course of the impact study (8 train sets multiplied by 282 daily trips). It will not be fair to declare that LRT2 is underperforming based on ridership projection alone. The ridership projection also drove VOC savings, time savings, and other targets to correspondingly high levels. In the 1990s, similarly high projections were being made in the United States until a landmark study of 19 projects conducted by a transport economist, Don H. Pickrell, created the "Pickrell effect" of improving forecasts.

3. **Rolling stocks.** At the time of the previous Ex-Post Study, 14 out of the 18 train sets were operational. Now, only eight (8) are running. Delays in procurement of spare parts translate to lower operating capacity. The engineering and maintenance group of LRTA can only resort to usable parts from other non-operating trains. Rolling stocks across urban rails vary in specifications, and there is no chance of parts interchangeability, which was one of the recommendations in the previous Ex-Post Study.

MAJOR RECOMMENDATIONS

1. **Right of Way.** As ROW issues persist and affect major projects across agencies/ sectors, ICC (next one to two years) should consider setting up an inter-agency council that can more efficiently address the major issues and constraints in project implementation. NEDA, DOTr and LRTA should explore plan-based ROW land acquisition, in contrast to project-based acquisition.

2. **Route enhancements.** To boost ridership, LRTA should expedite operation of the Masinag extension (within 2019) to open up a new market in terms of growing settlements in eastern Metro Manila. At the west end, LRTA should expedite the Tutuban extension (next three years), and up to Port Area (next six years) – thereby putting in place the R-6 Small Entrepreneurs Rail Line anchored to Divisoria.

3. **Spare parts procurement.** DOTr should delegate procurement to LRTA (starting 2019) as the agency accountable for efficient operation of all rolling stocks. LRTA should consider three (3) options, individually or in combination: (i) include parts in a 20 to 30-year agreement with train supplier; (ii) include parts as an obligation of the local train supplier partner; and (iii) support research and development and local manufacture.

4. **Filling facility gaps.** LRTA should build major transport hubs in both east and west endpoints in

support of a more efficient feeder transport system (next one to two years). By including park and ride facilities, the road-to-rail shift will be accelerated. Financing of the facilities need not come from government. Income potentials from transport hub operations are sufficient to attract private investors.

5. **Rail master plan.** Beyond extension lines and transport hubs, LRTA should program investments based on a comprehensive, multi-year plan as general reference integrating socio-economic, environmental, and land use and zoning considerations (next two years). The plan will guide private initiatives to complement public infrastructure. The plan can provide the basis for a "plan-based ROW acquisition approach" to preempt costly delays in implementation.

SUMMARY PERFORMANCE RATING FOR KEQ 1 (SCALE OF 1-5, LOWEST TO HIGHEST) = 3

Key Evaluation Question #2: Is the project being operated according to how it was intended?

1. **LRT2 efficiency.** The "tipping point" for LRT ridership is shorter travel time. Majority of riders (81%) ranked comfort, accessibility, affordability, and safety after travel time, with a very wide margin. As part of travel time, queue time on average is 2.1 minutes. Queueing time can be further reduced through IT/ smartphone applications. The average waiting time (for the train to arrive) at a station is 3.0 minutes. This is consistent with the standard headway at 2 minutes and 9 seconds.

2. **LRT2 accessibility, comfort, security and safety.** Passengers rated overall accessibility to the LRT2 rail system as good. This includes access leading to the stations, stairs, escalators and lifts, and queuing at ticket booth/ vending machines and turnstiles. Riders are comfortable with seating. Commuters boarding near end-stations like Santolan rated comfort higher than those boarding at middle stations like Cubao. Riders noted that elevators and escalators were sometimes out of order. There were also complaints on rest rooms. Passengers' perceptions on safety and security within the trains and stations are notably good. Despite the presence of security personnel, however, various incidents have been recorded by LRTA which usually involve personal belongings.

3. **Non-rail operations.** These are activities that are not directly required to operate the rail system. LRTA is incorporating commercial operations as added attraction and convenience to the riding public, and generating needed additional income. The business sector is involved, e.g., as advertisers or as Wi-Fi service provider. However, non-rail revenue is reported only for Year 2016.

4. **Operations and Maintenance (O&M).** LRT2 is being operated and maintained as planned. Even though LRT2 is a government-owned and operated urban rail, its performance has been better than Line 1 and Line 3 in terms of disruption in operations. LRTA has responded swiftly to isolated incidents including the train collision on May 18, 2019.

MAJOR RECOMMENDATIONS

1. **Operating hours.** LRTA should trial test (within 2019) an extension of rail operating hours up to 12:00 midnight, to gauge effects on ridership and financial viability. With emerging work shift patterns and 24/7 business operations, LRT1 and MRT3 might also explore this recommendation.

2. **Expand Passenger Assist Railway Display System (PARDS).** LRTA should upgrade (within 2019) the PARDS to include regular on-line surveys to enable LRTA to more regularly "engage in a conversation" with riders. LRTA can institutionalize (within 2019) a Rapid E-survey of Riders using LRT2 Stations Wi-Fi.

SUMMARY PERFORMANCE RATING FOR KEQ 2 (SCALE OF 1-5, LOWEST TO HIGHEST) = 5

Key Evaluation Question #3: Were the intended economic benefits of the project realized? By how much? How could cost recovery be improved?

1. **LRT2 patronage.** A substantial majority (93%) of households living within the project impact area have members who take LRT2. In the non-project area, less than 10% of respondents have members riding LRT2 – as expected, given that said area is more than one kilometer away from any LRT2 station. Benefits will rise along with ridership.

2. **Ridership profile.** There are slightly more males (52%) than females (48%), as similarly noted in the previous (2008/ 2009) Ex-Post Study. Out of every 10 riders, four (4) are studying while three (3) are working. In addition, majority (88%) of riders do not own a vehicle. Riders are on average 38 years old. Around 3% are children, while 10% are senior citizens.

3. **VOC savings.** With average LRT2 trip length going up from 6.6 km (1991) to 8.05 km (2018), and estimated VOC savings per kilometer increasing from PhP 0.15 (1991) to PhP 0.17 (2018), LRT2 is generating VOC savings with an estimated value of PhP 92.1 million (2018), compared to the projected PhP 1,000 million (1991). The optimistic ridership projection accounts for VOC savings not reaching the target level.

4. **Travel time savings.** LRT2 is generating savings with an estimated annual value of PhP 339 million (2018), compared to the target of PhP 1,400 million (1991). Again, the optimistic ridership projection accounts for the target not being reached. A DID analysis with propensity score matching was used to estimate LRT2 impact on travel time of both riders and non-riders. Compared to the baseline (1991) figure of 10.3 minutes, the current net travel time reduction is computed at 8.8 minutes, which however is statistically insignificant. In any case, the pivotal view is that transport chaos would occur without LRT2 operating along R-6.

5. **Travel expense reduction.** Travel expenses expectedly rose as prices hardly ever go down. Nominal daily expenses of LRT2 riders averaged PhP 62.00 per round trip. Travel expense increased by an average of PhP 20.00 in the project area, which converts to PhP 10.00 in 2006 prices. Considering an average of nine years' use of LRT2, the yearly travel expense increase is 4% in the project area.

6. **Social inclusivity.** Majority of LRT2 riders fall under two (2) professions, both of which are building blocks for equitable and sustainable development: students (44% of total) and employees (31%). Six out of every ten riders reached high school level, and less than one-fourth are college graduates. Over half of riders (56%) are middle income (PhP 15,917 to PhP 50,250 monthly income). Another one-third are lower income (max. PhP 15,917 monthly income vs. income threshold of PhP 10,481 in 2018).

MAJOR RECOMMENDATIONS

1. **Projections and baseline.** The ridership projection is close to three times the attainable level. Recalling the Pickrell effect, NEDA should ensure that future projects will generate realistic ridership and other projections, as these will affect impact evaluation ratings. Further, NEDA should ensure that a baseline study is conducted for all major projects.

2. **Nominal vs. real expenses.** Project evaluators, in analyzing transport and other expenses, should take into account inflationary effects. Fares can be seen to go down: (i) in terms of a benchmark fare charged by alternative transport mode/s such as TNVS; and/ or (ii) in real terms, by deflating current expenses so that these will be comparable to a given base year.

3. **Travel time savings.** Project evaluators should assess savings based not only on the train ride itself but rather on the entire "LRT experience", from entering the station, queueing, waiting for the train, and exiting the station. Beyond LRT2, time savings analysis must cover the entire origin-to-destination journey, including connecting rides via feeder transport, in the context of an integrated transport system approach. Value of travel time savings should be expressed in both nominal and real terms.

FINANCIAL PERFORMANCE AND ECONOMIC IMPACT

1. **Expected economic impact at proposal stage.** Based on projected VOC and travel time savings as quantifiable benefits, the project was deemed economically viable given the 1990s circumstances when it was proposed. The Economic Internal Rate of Return (EIRR) was recomputed and remains at 18% compared to the SDR of 15%.

2. **Expected financial performance at proposal stage.** As a social investment, LRT2 is expected to charge affordable fares. It is implied that the project will not be able to fully recoup its investments. However, LRTA has to maintain sufficient resources to fulfill its mission.

3. **Variance analysis.** Comparing actual and planned costs, Unfavorable Variance was reported for the superstructure, consulting services, and interest and tax levies. The extended construction period and a strong Japanese Yen compared to the Philippine Peso were main causes of Unfavorable Variance.

4. **Economic impact assessment.** By comparing the Social Discount Rate (SDR) (10% in 2016) with the EIRR of LRT2 (15.35% at the time of the previous Ex-Post Study), LRT 2 is deemed to be economically viable.

5. **Impact on land values.** LRT2 is one of the factors affecting land values. However, project impact is not conclusive. Of the 22 barangays classified as influence areas in this study, seven (7) were studied and found to have higher land values. However, the increases do not display any consistent trend.

6. **Financial performance assessment.** The baseline (projected) Farebox Ratio is 381% to 403%. From 2008 to 2017, the Farebox Ratio was less than 100%. The below-par ratio can be attributed to the amount of operating cost, cost structure, and low ridership. The previous Ex-Post Study noted that revenues barely cover operating expenses, and "that the financial status of LRTA is in critical condition".

MAJOR RECOMMEDATIONS

1. Fare increase. LRT2 patrons value faster travel time much more than transport fare/ expenses. In this light and to enhance financial viability, LRTA should consider a slight fare increase of PhP 1.00 to PhP 2.00 (within 2019) across the current destination-based fare matrix. LRTA should balance two (2) considerations: (1) financial sustainability; and (2) affordability by patrons who are fixed-/ low-income earners, as well as students who comprise the majority of loyal patrons.

   Fare can be reviewed every two years and linked to price indices, to maintain revenues required for operation and maintenance.

2. Non-rail income. LRTA should aggressively pursue strategies to raise non-rail revenues (starting 2019), through institutional tie-ups with business groups, tourism agencies, and advertising firms. LRTA should continue to pursue naming rights to stations such as done for LRT1 Monumento Station. In combination with pursuing non-rail income, LRTA could seek an additional subsidy from the national government (starting next budget year).

3. Areas to explore. NEDA-MES could study how to more strongly motivate private vehicle owners to shift to rail/ public transport, e.g., through a "congestion tax" for driving through very busy roads on particular days/ times of day. In assessing the feasibility of future rail projects, "real options analysis" used in private sector projects might be applied. Similarly, "contingent ridership analysis", rather than single projections, could be considered in future FS for rail projects.

SUMMARY PERFORMANCE RATING FOR KEQ 3 (SCALE OF 1-5, LOWEST TO HIGHEST) = 4

Key Evaluation Question #4: Were there any unintended economic/financial benefits realized and costs incurred due to the project?

1. LRT2 "school bus service". The project impacts significantly on education. The 44% share of students translates to 100,000 regular school bus riders. LRT2 is conveying students in a manner that is safe, comfortable, efficient and affordable. Without LRT2, students would suffer from traffic chaos.

2. Boosting the poor man's taxi and *dyip.* LRT2's positive impact on the tricycle and jeepney sectors – as feeder transport – is noteworthy. The transport modal split shows PUJs as most prominent public transport, followed by tricycles.

3. Unintended agglomeration. Agglomeration is the process by which business enterprises cluster in a particular location in order to share common facilities and capitalize on economies of scale. It can also cause over-crowding and traffic congestion. Migration towards LRT2 stations is not limited to businesses. Loyal riders relocate to condos/ dorms sprouting near LRT2 stations.

4. Unintended traffic generator. As a result of agglomeration, LRT2 stations have become traffic generators. Customers enter, park, and exit shops located around stations. Students, employees, and other riders now residing closer to stations are themselves adding to the congestion.

MAJOR RECOMMEDATIONS

1. Institutional coordination. Recognizing the project's agglomeration effects, LRTA, MMDA, Land Transport Franchising and Regulatory Board (LTFRB) and Local Government Units (LGUs) should collaborate more closely to better rationalize feeder transport and traffic management in the

vicinity of the LRT2 stations (starting 2019).

SUMMARY PERFORMANCE RATING FOR KEQ 4 (SCALE OF 1-5, LOWEST TO HIGHEST) = 4

Question #5: Is the project contributing to an alternative transport system that is affordable, safe, comfortable, reliable, efficient and sustainable?

1. Modal split. LRT2 operations along R-6 provided the ideal transport solution to address the growing road congestion dilemma. Despite the low day-by-day ridership average of 184,476 (2009-2018), the daily person-trips served by LRT2 would require an equivalent of about 13,177 PUJs or 18,488 UV Express – or even 2,635 buses. Without LRT2, R-6 will be one of the most congested roads in Metro Manila.

2. Comfort, convenience and safety. Despite the distinctive benefits of LRT2, some commuters are still not convinced to shift away from their current mode of choice. Non-rail riders will shift to LRT2 for longer trips that are comfortable, convenient and safe.

3. Operational efficiency. LRT2 is currently operating inefficiently due to low revenues. The number of operational rolling stocks is half the original fleet. This poses risks in LRTA's operations if and when some units start to break down, considering the whole system is over 15 years old.

4. Sustainability. LRT2 is unsustainable given its current situation. The main challenge to LRTA is to increase daily ridership to about half a million passengers. Otherwise, the situation will become more untenable in the next year or so, and compromise overall performance and public image.

5. Social inclusivity. There is strong evidence that LRT2 is contributing towards developing an alternative transport system that is affordable, safe, comfortable, reliable, efficient, and sustainable from the viewpoint of riders. On reliability, close to 100% of HH survey respondents gave a rating of 3 and 4, using a scale of 1 to 4 (lowest to highest). Similarly, high perception ratings are given for comfort. Security perception ratings are most frequently high "3s" and very high "4s".

6. Alternative transport system. The project continues to be highly relevant, as also noted in the previous (2008/ 2009) Ex-Post Study. The project goal was initially couched in terms of an alternative system, as rail is more efficient, environment-friendly and thus, more sustainable compared to vehicles running on internal combustion engines. The physical lay-out of Metro Manila, not to mention transportation traditions, however, calls for complementation between light rail services and other means of transport. The objective is not for light rail to replace any particular transport mode but rather, to improve the overall transport system.

MAJOR RECOMMENDATIONS

1. LRT2 replication. If Light Rail Manila Corporation (LRMC) becomes successful with its business strategy, LRTA – being the only mass transit agency in the country – must learn how to replicate or even do better than current other rail lines (next three years).

2. Institutional coordination. The national government must exert greater effort to pull its act together with other agencies, LGUs, and non-government sector, towards strengthening its capacity in mass transit operations (starting 2019). The government has the power to plan, finance and implement plans that will benefit the general public.

3. Towards sustainability. LRTA must address (starting 2019) inefficiency (esp. spare parts procurement), unsustainable operations (based on fare box ratio), and comfort issues – while at the same time build on its good performance relating to reliability, affordability and safety and security.

SUMMARY PERFORMANCE RATING FOR KEQ 5 (SCALE OF 1-5, LOWEST TO HIGHEST) = 4

Key Evaluation Question #6: To what extent has the project contributed to the overall goal of sustained public transport-based development?

1. Access to key destinations. LRT2 riders feel it is now easier to go to: (a) schools, 82% of respondents; (b) work, 82%; (c) government offices, 64%; (d) hospitals, allied medical services and place of worship, 59%; (e) commercial or trading centers, 56%; and (f) police stations and local security offices, 56%. Compared to the previous Ex-Post Study, there is palpable improvement in access. For instance, only 24% of respondents then reported enhanced access to place of work.

2. Democratization of transport. LRT2 has considerably expanded and diversified destinations accessible to commuters. This change can be referred to as "democratization of transport". LRT2 enabled many more people to more frequently travel to farther destinations, which before only those with private vehicles/ personal means could do.

3. Small Entrepreneurs Rail Line. LRT2 can serve as "commodities transit" for small business entrepreneurs (SBEs), transporting retail items in manageable packages, broadly replicating the concept of a farm-to-market road. Divisoria and Antipolo can become end-to-end SBEs supply hubs to generate more livelihood opportunities. A customized, dedicated car train and security check facility will be needed to cater to SBEs.

4. Length of loyalty. One key indicator of the sustainability of LRT2 benefits is the number of years during which patrons have been using LRT2. Two-thirds of riders have been taking LRT2 for seven (7) or more years. Almost a fifth have been regular patrons for 13 to 15 years. Only 16% are relatively new customers, i.e., less than one (1) year up to three (3) years. The latter could include the newer residents of communities near the LRT2 stations.

5. Intensity of loyalty. Another indicator of benefit sustainability, complementing the length of loyalty indicator, is the frequency of using the LRT, which can be referred to as "intensity of loyalty" – alluding to LRT2 being a "brand". Forty-two percent of household survey respondents took LRT2 at least once or twice each week. In the non-project area, one-fourth of respondents rode the LRT once to thrice each month.

6. Traffic volume. Traffic volume is expectedly rising along with the Metro Manila population (est. 10.0 m in 2000 vs. 12.9 m in 2015). In any case, LRT2 is impacting significantly in reducing traffic volume along R-6. The traffic volume count in Aurora Boulevard and EDSA indicates high dependency on private vehicles instead of public transport. On the other hand, the Recto–Rizal Avenue traffic count shows a lower concentration of private vehicles and the greater role of public transport.

MAJOR RECOMMEDATIONS

1. **Bus Rapid Transit (BRT).** LRTA should consider investing in BRT (next two to three years) *running under the LRT2 viaduct*. Many cities worldwide favor BRT as a more practical way to address the need for urban mobility. A one-kilometer mass transit track is 10 times the cost of a BRT track. BRT can ferry the same number of passengers, without the same heavy infrastructure requirements of light rail.

2. **Feeder transport.** LRTA should diversify its operations to include feeder transport (next one to two years), in order to enhance patronage and further promote LRT2 services. This is commonly done in many countries where the same agency operates not only trains but also inter-linked transport services (e.g. buses) under the same "brand".

3. **SBE Line Concept.** LRTA should pursue the strategy of making LRT2 a key driver of enterprise development along R-6 (next one (1) to two (2) years). A feasibility study should be made to validate business potentials.

SUMMARY PERFORMANCE RATING FOR KEQ 6 (SCALE OF 1-5, LOWEST TO HIGHEST) = 4

11. Lessons Learned

1. The overarching project implementation issues are ROW acquisition and procurement esp. of spare parts. NEDA and implementing agencies are continuing to focus on resolving these two bottlenecks. ROW requirements and processes substantially delayed implementation and resulted to higher project cost, interest payments, and reduced cost-benefit ratios. While evidence points to successful ROW acquisition in LRT2, and subsequent measures to speed up have been put in place, further measures could be explored to streamline the ROW requirements and processes including "Transport Plan-Based Land Acquisition" in contrast to project-based acquisition.

2. An equally important concern is implementation delay resulting from the long and complicated procurement process, particularly for spare parts. LRTA engineering and maintenance group resorts to using parts from non-operating trains.

3. LRT2 is a social investment project which should not be subjected to the usual financial performance standards and criteria. To wean the rail system away from subsidies, non-rail revenues should be aggressively pursued.

4. Non-rail operations are crucial given the LRT2 mandate of providing affordable transport. There is much scope to increase LRT2 non-rail revenue, for instance, through institutional tie ups with business groups, tourism promotion agencies, and advertising firms. Non-rail revenue should be substantially increased using a variety of strategies.

5. Transport planning needs to be more comprehensive and long-term, to include feeder transport, land use planning, and zoning. Transport hubs are noticeably missing from some of the LRT2 stations. Plans should be legislated to be effectively funded and implemented.

6. LRT2 is well operated and maintained. In any case, its operations can be enhanced through improved and expanded institutional collaboration. For example, with LTFRB to better rationalize the mix of feeder transport around stations; with LGUs to better organize tricycle support and enhance traffic management; with DTI to promote investments in spare parts fabrication; and/ or with DOST and engineering to explore local fabrication of spare parts.

7. Light rail being a prime mode of sustainable transport, careful planning must be strictly observed in projections and study of the routes that will attract the most passengers. Failure to establish correct and substantial ridership results to a financially unsustainable mass transit system.

8. Seamless connectivity across mass transit lines requires serious attention to comprehensive planning as urban rails should be treated as an integrated system made up of different routes to serve the travel demand and attain efficient mobility.

9. While Government is promoting public-private partnership, allowing the private business sector to take the lead in light rail station infrastructure development could potentially compromise broader plans and distort the established budget.

Data collection and management

1. A major deficiency in project impact evaluations is lack of baseline data. There needs to be a policy requiring that a baseline study be conducted for all major projects such as LRT2. In this regard, a methodology for conducting baseline-constrained impact evaluation was developed for the LRT2 study and could be useful in similar other project evaluations.

2. The higher the degree of urbanization of the target survey area, the more survey respondents are sensitive to the day and time – and duration – of interview. This is a phenomenon that should be recognized in future surveys because it has significant budget and time implications.

3. A better document filing/ archiving system can help improve the access of future evaluation teams to major references. Such a system, which can consist of physical and/ or electronic files, will also serve to support greater institutional learning. An archiving system will be especially useful for projects that were designed many years ago. In the case of LRT2, 27 years have passed since the FS was completed.

Proposed Action Plan Matrix

Major Recommendations	Responsible Entity	Timeline	Resources Needed	Assumption and Risk
National/Policy Level				
1. Finance research and development on local production of train spare parts. Set up spare parts restoration laboratory.	LRTA/ DOST/ DTI/ BOI/ engineering universities, local parts fabricators, development partners	Next one to two years	Feasibility study Budgetary allocation	Assumption: FS will show that local spare parts fabrication is technically and financially feasible.
2. Prepare rail master plan that can serve among others as basis for "plan-based RROW acquisition". Plan to be legislated.	DOTr/ LRTA/ NEDA Congress	Next two years	DOTr/ LRTA/ NEDA technical resources Transport studies	Risks: plan will not be legislated for political reasons; early RROW acquisition can draw illegal occupants.
3. Establish inter-agency ROW council or committee to address common problems across major projects	ICC and InfraCom	Next one to two years	Study	Assumption: LRT2 ROW issues are similar to those in other agencies and projects.
4. Require realistic ridership and other projections and baseline data for all future rail projects.	NEDA-MES	Immediate	NEDA technical resources	Assumptions: funds available to generate baseline data; input data available for projections.
5. Evaluation TORs should require that both nominal and real transport and other expenses be analyzed.	NEDA-MES	Immediate	NEDA technical resources to prepare and manage TOR	
6. Assess travel time savings based on entire "LRT experience" and origin-to-destination journey.	NEDA-MES	Immediate	NEDA technical resources to prepare and manage TOR	
7. Consider investing in BRT running under the LRT2 viaduct.	DOTr/ LRTA/ ICC/ InfraCom/ development partners	Next two to three years	Feasibility study Infrastructure investment funds	Assumption: funding for BRT prioritized over alternative transport projects.
Project Level				
8. Expedite operation of Masinag extension for new markets, and Tutuban extension supporting small enterprise development.	LRTA	Within 2019 (Masinag) Next six years (Tutuban)	Operational plan Feasibility study Infrastructure investment funds	Assumptions: RROW and procurement delays can be managed more efficiently compared to the original project.

Major Recommendations	Responsible Entity	Timeline	Resources Needed	Assumption and Risk
9. Build major transport hubs in east and west ends to support feeder transport development and road-to-rail shift.	DOTr/ LRTA/ InfraCom/ Private investors	Next one to two years	Feasibility study Infrastructure investment funds	Assumptions: RROW and procurement delays can be managed more efficiently compared to the original project.
10. Trial test extending rail hours up to 12:00 midnight, to gauge effects on ridership and financial viability.	LRTA	Within 2019	LRTA technical resources	
11. Upgrade Passenger Assist Railway Display System (PARDS) to include smartphone applications (e.g., to reduce queueing time).	LRTA	Within 2019	LRTA technical resources Technical assistance	
12. Consider fare increase of PhP 1.00 to PhP 2.00 across current fare matrix. Balance financial sustainability and affordability.	LRTA	Within 2019	LRTA technical resources	
13. Pursue strategies to raise non-rail revenues through tie-ups with business groups, tourism agencies, advertising firms, and similar others.	LRTA	Starting 2019	LRTA technical resources	
14. Address inefficiency (esp. spare parts procurement), unsustainable operations (fare box ratio), and comfort issues.	LRTA	Starting 2019	LRTA technical resources	
15. Diversify operations to include feeder transport to enhance patronage promote LRT2 “brand”.	LRTA	Next one to two years	LRTA technical resources	Assumption: LRTA can manage feeder transport as well as train operations.
Agency Level				
16. Delegate procurement actions to LRTA as agency accountable for efficient operation of all rolling stocks.	DOTr	Starting 2019	DOTr study LRTA technical resources	
17. Collaborate more closely to enhance feeder transport and traffic management in the vicinity of LRT2 stations.	LRTA, MMDA, LFTRB and LGUs	Starting 2019	LRTA technical resources	Assumption: DOTr/ LRTA can mobilize support from other concerned institutions/ stakeholders.

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