Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan Project

LRT Line 1 Capacity Expansion Project (II)

External Evaluator: Masami Tomita, Sanshu Engineering Consultant

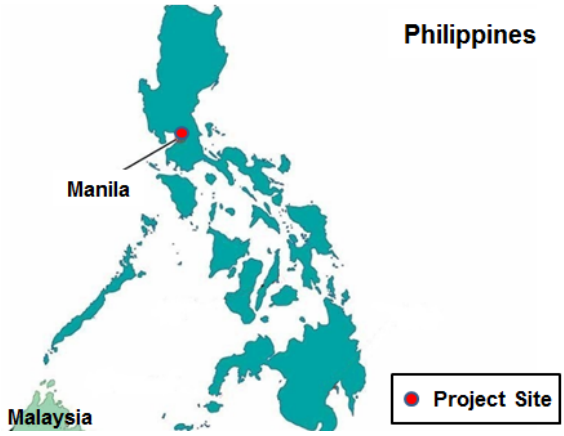
0. Summary

This project aimed at developing an urban transportation system in Metro Manila which was mainly dependent on road transport, reducing traffic congestions and materializing mass passenger transportation, by additionally procuring rolling stocks and improving signalling system etc. for Light Rail Transit (LRT) Line 1.

Relevance of this project is high, as the project is consistent with priority areas of Philippine's development plans and Japan's ODA policy, and moreover development needs for the project are high. While the actual number of passengers of Line 1 at the time of ex-post evaluation is about the half of the estimated number in the project appraisal, the number has been increasing steadily year by year, and evaluating comprehensively by taking into account the operating rate of rolling stocks, operation interval, and results of the beneficiary survey etc., effectiveness is judged to be fair. Efficiency of the project is also fair, as while actual project cost was lower than planned cost, actual project period significantly exceeded planned period. Sustainability of the project is also fair, as some problems were observed in the financial situation of the Light Rail Transit Authority (LRTA), which is responsible for operation and maintenance (O&M) of Line 1, and future O&M system.

In light of the above, this project is evaluated to be partially satisfactory.

1. Project Description



Project Location

Third Generation Vehicle Procured Under the Project

1.1 Background

At the time of project appraisal, traffic congestions in Metro Manila were reaching the limit of its capacity, due to increasing numbers of vehicles and travels accompanying the economic recovery since the 1990s (average velocity was 18km/hour)[1]. The number of vehicles in the main parts of Metro Manila had been regulated since 1995, in order to mitigate economic losses and air pollutions caused by heavy traffic congestions. In this situation, an earlier provision of a public mass transit system was required for safe, comfortable, economical and reliable transportation.

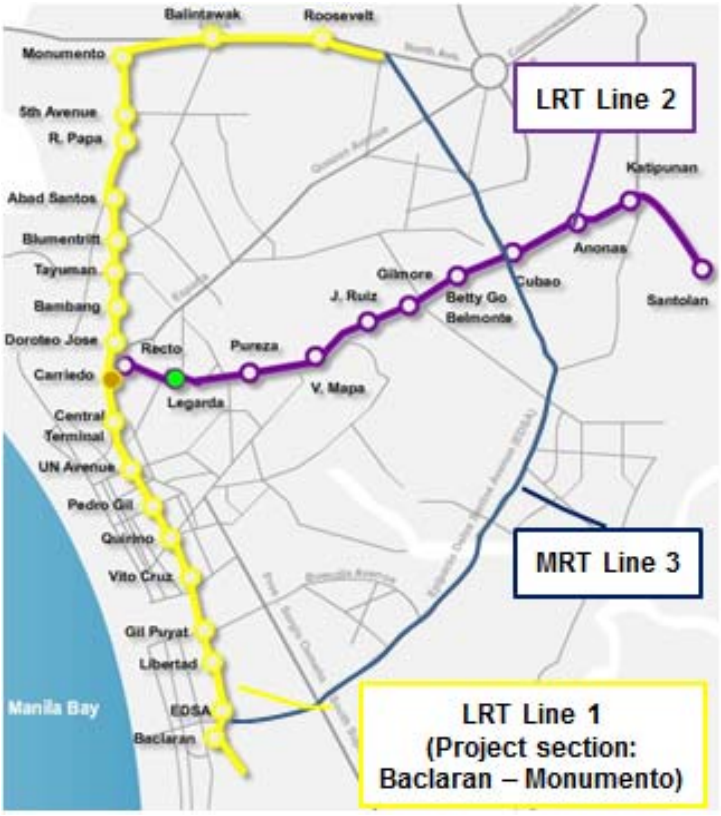
LRT Line 1, whose capacity was expanded by the project, was fully opened in 1985, and at the time of project appraisal, LRT Line 2 was being constructed with Japanese ODA loan and Mass Rapid Transit (MRT) Line 3 was being constructed with private sector capital, for development of railway networks in Metro Manila. LRT Line 1 was credited with its safety and reliability and the number of passengers increased, and as a result, it faced with a chronic shortage of transport capacity. Thus a project to expand its capacity by 50% was implemented with Japanese ODA loans as Phase 1 of this project, which was completed in 2002. However, its capacity was expected to become insufficient when the railway network in Metro Manila is completed, as there would be increased demands for Line 1 from transfer passengers from Line 2 and 3, as a synergy effect of improved convenience. Therefore, this project was implemented, as additional capacity expansion of Line 1 was deemed necessary.

1.2 Project Outline

The objective of this project is to develop an urban transportation system in Metro Manila which was mainly dependent on road transport, reduce traffic congestions and materialize mass passenger transportation, by additionally procuring rolling stocks and improving signalling system etc. for LRT Line 1, and thereby contributing to improvement of urban environment and reduction of global warming.

Figure 1 below shows the project site map.

[1] Source: Japan International Cooperation Agency (JICA) appraisal documents



Source: edited based on LRTA HP

Figure 1: Project Site Map

Loan Approved Amount/ Disbursed Amount	22,262 million yen / 20,540 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	April, 2000 / April, 2000
Terms and Conditions	Construction Works/Procurement: Interest Rate: 1.0% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Japan tied[2] Consulting Services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: bilateral tied

[2] This project was implemented utilizing the Special Yen Loan (SYL). SYL was introduced by the Government of Japan in 1998 as one of the financial relief measures for Asian countries suffered from the Asian economic crisis. SYL was to provide concessionary financial assistance for the development of infrastructures in the fields of transportation logistics, foundation for productive facilities and large-scale disaster prevention. The terms and conditions of SYL is set at greater concessionary level than standard terms and conditions of ODA loans, while the eligibility of the prime contractors under SYL is limited to Japanese nationals or judicial persons and procurement of goods and services under SYL is tied to Japanese goods and services (goods and services whose country of origin being other than Japan can be procured up to no more than 50% of the total loan amount), to promote participation of Japanese firms in projects.

Borrower / Executing Agency	Government of the Philippines / Light Rail Transit Authority (LRTA)
Final Disbursement Date	September, 2008
Main Contractor (Over 1 billion yen)	Marubeni Corporation (Japan) / Itochu Corporation (Japan) / Sumitomo Corporation (Japan) (JV)
Main Consultant (Over 100 million yen)	Japan Railway Technical Service (Japan) / Oriental Consultants Co., Ltd. (Japan) (JV)
Feasibility Studies, etc.	Feasibility Study by the Philippine government, 1998
Related Projects	・Japanese ODA Loan: LRT Line 1 Capacity Expansion Project (1994), Metro Manila Strategic Mass Rail Transit Development (I)(II)(III) (I: 1996, II: 1997, III: 1998) ・Belgian government: rehabilitation of LRT Line 1 vehicles ・French government: introduction of automatic fare collection system for LRT Line 1

2. Outline of the Evaluation Study

2.1 External Evaluator

Masami Tomita, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: October, 2012 – September, 2013

Duration of the Field Study: January 24 – February 9, 2013, April 14 – April 27, 2013

3. Results of the Evaluation (Overall Rating: C[3])

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of the Philippines

At the time of project appraisal, the Mid-Term Development Plan (1999-2004) stated that the railway sector was prioritized among development of urban transport infrastructures[5]. LRT Line 1 capacity expansion project (Phase 1) and Line 2 construction project were being implemented with Japanese ODA loans, and MRT Line 3 construction project was being implemented with private sector capital, to develop railway networks in Metro Manila where traffic congestions were exacerbated.

On the other hand, at the time of ex-post evaluation, in the Philippine Development Plan (2011-2016) Chapter Five (Transport Sector), to ensure an integrated and coordinated transport network, to address the overlapping and conflicting functions of transport and other concerned agencies, and to promote development of conflict-affected and highly impoverished areas etc.

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ② Fair, ① Low

[5] Source: JICA appraisal documents

are stated as goals for the transport sector, and strategies to achieve these goals are; (1) adopting a comprehensive long-term national transport policy; (2) developing strategic transport infrastructure and maintaining and managing transport infrastructure assets; (3) developing an integrated multimodal logistics and transport system; (4) separating the regulatory and operation functions of transport and other concerned agencies; and (5) improving transport networks in underdeveloped regions and conflict-affected areas to open up economic opportunities etc.[6] Particularly, an priority to achieve (2) above is stated as upgrading the quality of the existing railroad tracks and services, and an priority to achieve (3) above is stated as establishing an efficient long-distance, high-speed mass transit system integrated with the mass transit commuter rail system in Metro Manila[7].

Therefore, development of railway networks is emphasized in Philippine's development plans both at the time of project appraisal and ex-post evaluation, and the project is consistent with development plans.

3.1.2 Relevance to the Development Needs of the Philippines

At the time of project appraisal, the traffic volume in Metro Manila was 17.43 million trips per day (as of 1996) and approximately 2% of the volume, which was equivalent to 350,000 to 400,000 passengers, was being transported by LRT Line 1 (fully opened in 1985)[8]. As explained above, Line 1 faced with a chronic shortage of transport capacity and the project to expand its capacity by 50% was implemented with Japanese ODA loan (completed in 2002), however, additional capacity expansion was required, since there would be increased demands for Line 1 from transfer passengers from Line 2 and 3 when the railway network in Metro Manila is completed, as a synergy effect of improved convenience, and the existing Line 1 was expected to be insufficient to absorb such increasing demand.

At the time of ex-post evaluation, LRT Line 1 and 2 and MRT Line 3 are operated in total, and Line 1 is connected with Line 3 at EDSA Station and with Line 2 at Doroteo Jose Station (a transfer from and to both lines is possible). Moreover, Line 1 was extended to North Avenue Station with Philippine government budget, and a project to extend Line 1 from Baclaran Station to Cavite region in the south is currently implemented with Japanese ODA loan[9]. The volume of passengers of Line 1 decreased to approximately 300,000 passengers per day in 2000, due to raising fares and slowdown of economic growth of the country stemming from Asian economic crisis etc.[10], however, the volume has grown to approximately 470,000 passengers per

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6 Source: http://devplan.neda.gov.ph/chapter5.php

7 Source: same as above

8 Source: JICA appraisal documents

9 Source: 50% of the project is being implemented utilizing the STEP (Special Terms for Economic Partnership) facility, and the rest of the project is being implemented by PPP (Public Private Partnership).

10 Source: ex-post evaluation report of LRT Line 1 Capacity Expansion Project Phase 1

day at the time of ex-post evaluation. The extension project of Line 1 from Baclaran Station to Cavite region mentioned above is expected to be completed in 2017, and the further increase of passenger volume is expected when the section is fully opened, and thus, the need for capacity expansion of Line 1 remains high.

On the other hand, Table 1 shows the transition of the number of registered vehicles in Metro Manila from the time of project appraisal to the time of ex-post evaluation.

Table 1: The Number of Registered Vehicles in Metro Manila

(Unit: vehicles/year)

Year	2001	2002	2003	2004	2005	2006
Number of Registered Vehicles	1,255,140	1,390,579	1,389,808	1,505,409	1,580,753	1,555,174
Year	2007	2008	2009	2010	2011	-
Number of Registered Vehicles	1,592,036	1,670,150	1,768,033	1,904,395	2,014,750	-

Source: Land Transportation Office, Department of Transportation and Communications

As shown above, the number of registered vehicles in Metro Manila at the time of ex-post evaluation is 1.6 times of the number at the time of project appraisal, and the number of vehicles in Metro Manila is still regulated today, and thus the need for LRT is high for reducing traffic congestions in Metro Manila.

Therefore, the number of registered vehicles in Metro Manila has been increasing since the time of project appraisal, and the volume of passengers of LRT Line 1 has also recently been increasing and is expected to further increase in future, and thus, the relevance of this project, which aimed at reducing traffic congestions in Metro Mania, remains high.

3.1.3 Relevance to Japan's ODA Policy

According to the Country Assistance Policy for the Philippines (2000), Japan emphasized the followings as prioritized areas for assistance based on the experience of Asian economic crisis; strengthening of industrial structures (particularly development of supporting industries) for medium to long term development and promotion of construction and management of economic infrastructures (transport and energy), lack of which becomes development constraint[11]. Moreover, the economic cooperation mission in March 1999 emphasized construction of mass transit system as an important assistance area as part of economic infrastructures needed for reduction of traffic congestions, and the Japanese government positively supported the policy, and this project was consistent with such policy[12].

[11] Source: The Country Assistance Policy for the Philippines, Ministry of Foreign Affairs

[12] Source: JICA appraisal documents

This project has been highly relevant with Philippine's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[13] (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

3.2.1.1 Volume of Passenger Transportation

Table 2 shows estimated and actual volume of passengers of LRT Line 1 subject to the project.

Table 2: Volume of Passenger Transportation of Line 1

(Unit: annual: million people, peak hour: people)

Year	2001	2004	2007	2010	2011	2012
Estimated Volume in Project Appraisal						
Annual	301.68	316.86	332.80	349.55	359.97	370.69
Peak Hour[14]	N/A	N/A	N/A	40,000	N/A	N/A
Actual Volume						
Annual	109.94	96.84	119.12	155.91	156.93	170.72
Peak Hour	N/A	N/A	N/A	17,866	17,130	17,839

Source: estimated: JICA appraisal documents, actual: documents provided by LRTA

Regarding annual volume, actual volume decreased from 2002 to 2004, due to aggravated operating rate of rolling stocks caused by difficulties of procuring spare parts and the increase of fares[15], however, the volume has been increasing afterwards. However, while the exact target figures were not set in project appraisal, comparing estimated and actual volume of passengers for 2012, the actual volume is largely below the estimated volume, which is 46% against the estimation.

Regarding peak hour volume, the maximum volume of passengers per peak hour per direction in 2010 (6 years after project completion) was estimated approximately 40,000 persons in project appraisal, however, the actual volume is approximately 18,000 persons and 45% against the estimation.

However, in project appraisal, it was expected that Lines 1 to 3 would be operational by 2000, and that Lines 1 to 5 would be operational by 2010, on the other hand, Lines 1 to 3 only are currently operational at the time of ex-post evaluation, which means that the precondition at the time of appraisal is different from the actual situation. Moreover, when the evaluator was on board of Line 1 during the field surveys, it was very congested and handing the further increase

[13] Sub-rating for Effectiveness is to be put with consideration of Impact

[14] This represents maximum cross-sectional passenger flow per peak 1 hour (between 7:00-9:00 am and 5:00-7:00 pm) per direction. Maximum cross-sectional passenger flow means maximum volume of passengers on board between certain sections. Figures for peak hour in Table 2 show maximum volume among cross-sectional volume between each station on Line 1.

[15] Source: LRT Line 1 Capacity Expansion Project Phase 1 Ex-Post Monitoring Report

of passenger volume would be difficult under the current situation, due to the limited numbers of operational rolling stocks and slowing down the running speed because of deteriorated rail tracks (maximum speed was planned to be 60km/hour in project appraisal, however, actual speed currently is 40km/hour), according to the executing agency. However, a project to rehabilitate rail tracks and rolling stocks is currently being implemented and fourth-generation of rolling stocks (120 vehicles) are planned to be procured under the south extension project of Line 1 through Japanese ODA loan, and conditions of rail tracks and operating rate of rolling stocks are expected to be improved in near future, which will enable Line 1 to handle the further increase of passenger volume.

3.2.1.2 Number of Operational Rolling Stocks / Operating Rate of Rolling Stocks

Table 3 shows actual numbers of operational rolling stocks and operating rate during peak hours in Line 1 from the time of project appraisal to the time of ex-post evaluation.

Table 3: Number of Operational Rolling Stocks / Operating Rate during Peak Hours in Line 1

(Unit: number of operational rolling stocks: vehicles, operating rate: %)

Year	2001	2002	2003	2004	2005	2006
Number of Operational Rolling Stocks	66	67	61	62	68	71
Operating Rate*	72.5	73.6	67.0	68.1	74.7	78.0
Year	2007	2008	2009	2010	2011	2012
Number of Operational Rolling Stocks	98	104	100	100	102	99
Operating Rate	70.5	74.8	71.9	71.9	73.4	71.2

Source: documents provided by LRTA

Note*: the total number of vehicles was 91 from 2001 to 2006, and it was 139 since 2007 onwards, and operating rate was calculated based on this (number of operational vehicles during peak hours / total number of vehicles x 100). Figures above include the number of first and second generation vehicles as well as third generation vehicles procured under the project (48 vehicles in total).

According to the executing agency, numbers of operational rolling stocks in the table above are all numbers that can be operated during peak hours and the rest are non-operational due to lack of spare parts etc. In general, operating rate of rolling stocks during peak hours should be approximately 80-90% excluding numbers of rolling stocks that are under inspection[16], and thus the actual operating rate of Line 1 is slightly lower than standard.

3.2.1.3 Number of Running Trains / Operation Interval

Table 4 shows numbers of running trains and operation interval during peak hours in Line 1 from the time of project appraisal to the time of ex-post evaluation.

[16] Source: JICA internal document

Table 4: Number of Running Trains / Operation Interval during Peak Hours in Line 1

(Unit: number of running trains: number/hour, operation interval: minutes)

Year	2001	2002	2003	2004	2005	2006
Number of Running Trains*1	14	15	13	13	15	15
Operation Interval*2	4.2	4.1	4.5	4.5	4.0	3.9
Year	2007	2008	2009	2010	2011	2012
Number of Running Trains	21	23	22	20	17	N/A
Operation Interval	2.8	2.6	2.7	3.0	3.6	N/A

Source: documents provided by LRTA

Note *1: number of running trains: data on numbers of operational vehicles during peak hour only was available from LRTA, and according to LRTA, the average number of vehicles per train is 3.5 (there are 3-car trains and 4-car trains at the time of ex-post evaluation), and thus, numbers in the table were calculated based on this (numbers of operational vehicles during peak hour / 3.5 vehicles).

Note*2: operation interval: calculated by using numbers of running trains per hour (60 minutes / number of running trains). Thus, figures in the table above are all approximate figures.

Minimum operation interval was planned to be two minutes in 2010 (6 years after project completion) in project appraisal, however, actual interval is three minutes at the time of ex-post evaluation, and as explained above, numbers of operational rolling stocks are currently limited, and thus the actual interval is 1.5 times longer than the plan. Numbers of running trains have reached its peak in 2008 and have been decreasing slightly afterwards, and this is considered to be mainly due to decreasing operating rate of rolling stocks and deterioration of rail tracks.

3.2.1.4 Rush Ratio during Peak Hours

According to documents provided by the executing agency, rush ratio during peak hour was 77.3% in 2011 and 90.2% in 2012[17]. However, when calculating rush ratio by using the average of maximum cross-sectional passenger flow during peak hours (7:00-9:00 am and 5:00-7:00 pm) (monthly)[18], the ratio becomes 107% in 2011 and 113% in 2012. Moreover, as explained below, in the beneficiary survey, majority of beneficiaries replied that the congestion situation of Line 1 is uncomfortable, and thus, the actual rush ratio is considered to be higher than the figures provided by the executing agency.

3.2.1.5 Required Travelling Time for Specific Sections

Travelling time from Baclaran station to Monument station (the project section) by LRT is approximately 38 minutes (length 15 km / current average speed 40km/hour). On the other hand, travelling by taxi on roads parallel to LRT Line 1 from Baclaran station to Monument station

[17] According to LRTA, it was calculated by the volume of passengers per peak hour / (passenger carrying capacity of train X numbers of running trains during peak hour) X 100.

[18] Calculated by (the average of maximum cross-sectional passenger flow during peak hours (7:00-9:00 am and 5:00-7:00pm) (total of northbound and southbound, monthly)) / ((passenger carrying capacity of Third generation vehicle 346 persons per vehicle x 3.5 vehicles per train) X (numbers of running trains per peak hour in 2011: 17 per hour))

(Taft Avenue and Rizal Avenue: 18km in total) during the field survey (7:00 am, Thursday, February 7th, 2013) required 1 hour and 10 minutes. Travelling time by LRT is almost half of that by road transport, and thus LRT is more efficient. In the beneficiary survey, 102 people out of 125 people in total (multiple answers) replied that the reason for using Line 1 was to save travelling time.

3.2.2 Qualitative Effects

The beneficiary survey was conducted in the ex-post evaluation in order to understand qualitative effects of the project[19]. The overview of the results of the survey is shown below.

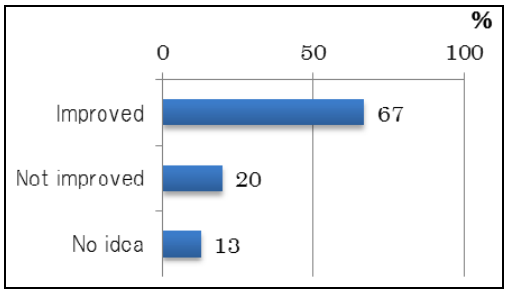

Figure 2: Comfort Level in LRT Line 1 after Project Completion

Main reason of improvement is due to trains being equipped with air conditioners in the project.

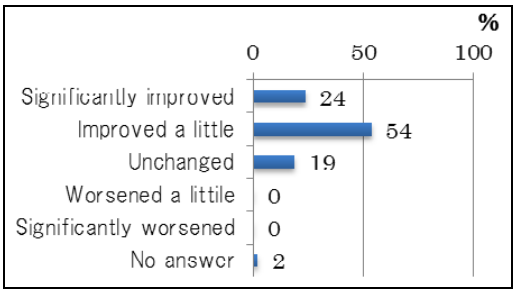

Figure 3: Conditions of Infrastructures in Stations after Project Completion

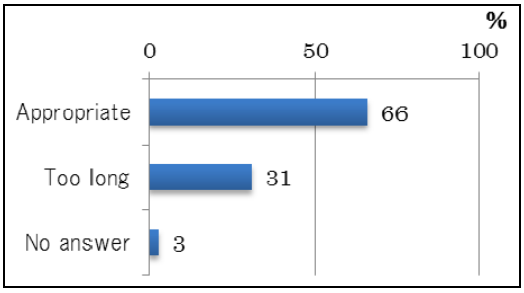

Figure 4: Operation Interval of Line 1

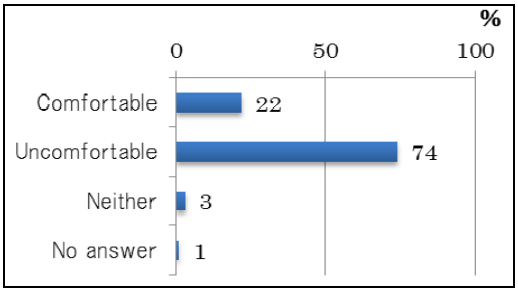

Figure 5: Congestion Situation of Line 1

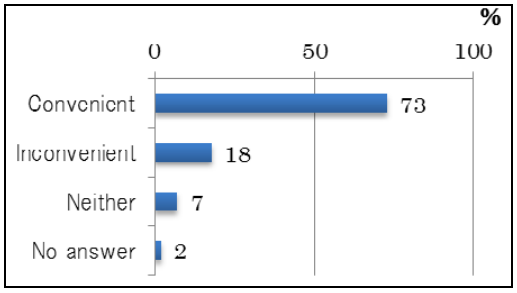

Figure 6: Connection of Line 1 with Other Lines

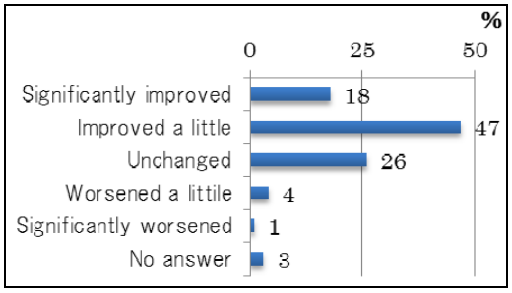

Figure 7: Traffic Congestion on Roads along Line 1 after Project Completion

[19] The beneficiary survey was conducted in the following manner. Time: February 2013, the number of samples: 125 in total (Blumentritt station 31, Doroteo Jose station 31, EDSA station 31, Monumento station 32 (male: 63, female: 62)), method: questionnaire survey

As direct effects of this project, approximately 70% of beneficiaries replied that the level of comfort in LRT Line 1 was improved mainly due to air conditioners being provided in this project, and approximately 80% replied that infrastructures in stations were improved after project implementation. Moreover, improvements were made at Doroteo Jose station and EDSA station to make transfers from Line 1 to Lines 2 and 3 more convenient in this project, and approximately 70% of beneficiaries replied that connection of Line 1 with other lines became convenient, and thus, this project is considered to contribute to the project objective to a certain extent, which is to develop an urban transportation system in Metro Manila which has been mainly dependent on road transport, by improving the level of comfort in trains and making transfers to other lines more convenient. Particularly, as the majority of beneficiaries replied that their means of transportation before starting to use Line 1 were jeepneys[20] and buses, this project is considered to contribute to reduction of numbers of these vehicles to some extent. On the other hand, while the majority of beneficiaries replied that operation interval of Line 1 is appropriate, approximately 30% replied that it is too long, and moreover, approximately 70% replied that the congestion situation in Line 1 is uncomfortable, and thus, it is required to solve problems of the limited numbers of operational rolling stocks and deteriorated rail tracks as mentioned above, in order to promote a further transfer of passengers from road transport to urban rail transport. Regarding traffic congestions on roads along Line 1, while the beneficiary survey asked about comparison of the situation before (about 10 years ago) and after project implementation, the result shown above is a pro forma figure, as not many people would remember precisely about the situation of 10 years ago. However, still, approximately 60% replied that they think traffic congestions on roads along Line 1 were improved after project implementation.

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Reduction of Urban Pollution Including Air Pollution and Traffic Noise Problems

Results of the beneficiary survey on changes of situation regarding air pollution and traffic noise problems along Line 1 after project completion are shown below.

[20] A share-ride taxi converted from a small motor truck that are widely used in the Philippines.

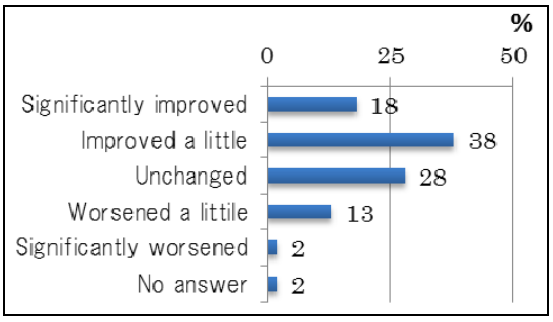

Figure 8: Air Pollution in Areas along Line 1

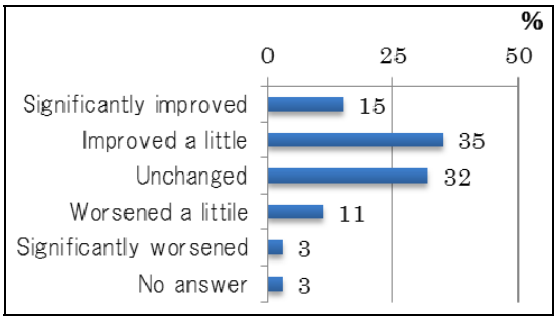

Figure 9: Traffic Noise in Areas along Line 1

As mentioned above, since the beneficiary survey asked about comparison of the situation before (about 10 years ago) and after project implementation, the result shown above is a pro forma figure, however, approximately 50% replied that they think air pollution and traffic noise were reduced after project implementation.

As explained above, the volume of passenger transportation by Line 1 at the time of ex-post evaluation is approximately 470,000 per day on average, and the majority of beneficiaries replied that their means of transportation before starting to use Line 1 were jeepneys and buses. Thus, converting the passenger volume of Line 1 into the number of jeepneys (assuming 8 passengers per vehicle on average) results in 60,000 jeepneys per day, and the same for buses (assuming 15 passengers per vehicle on average) results in 30,000 buses per day, which suggests that the project contributed to reduction of considerable traffic volume on roads, and this in turn suggests it also contributed to reduction of urban pollution such as air pollution and traffic noise to some extent.

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

Contents of this project were almost the same sort as those of Phase 1, and thus, at the time of project appraisal, Department of Transportation and Communications (DOTC)/LRTA requested Department of Environment and Natural Resources (DENR) an issuance of an Environmental Compliance Certificate (ECC) of Non-coverage, which was to be issued shortly[21]. At the time of ex-post evaluation, according to the executing agency, ECC of Non-coverage was issued, which exempted environmental monitoring, and thus, monitoring of noise problems has not been conducted. However, monitoring on air pollution by the project was conducted at depot during project implementation (April 2006: baseline monitoring, July 2006: first monitoring, and October 2006: second monitoring), and figures of total suspended particles, sulphur dioxide and nitrogen dioxide were below standards set by the government[22].

[21] Source: JICA appraisal document

[22] Source: document provided by LRTA

3.3.2.2 Land Acquisition and Resettlement

At the time of project appraisal, land acquisition was planned only for entrances of stations of Line 1 that were to be added and the depot that was to be expanded, and the land for depot expansion was already acquired and cleared[23]. Acquisition areas for entrances of each station were planned to be small, and no problem was seen, as these were commercial areas and there was no illegal settler in these areas[24]. At the time of ex-post evaluation, according to the executing agency, there was no resettlement and land acquisition only was conducted, however, data on the area acquired was not provided and unknown.

While the actual passenger volume is approximately half of estimated figures, taking into account the fact that the current situation of development of urban rail networks is different from preconditions of project appraisal, other indicators such as operating rate of rolling stocks and operation interval and the results of the beneficiary survey etc., this project has somewhat achieved its objectives, therefore its effectiveness and impact are fair[25].

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Outputs of the project (planned and actual) are shown in Table 5.

[23] Source: JICA appraisal document

[24] Source: same as above

[25] According to JICA's rating system, effectiveness and impact are rated as follows; if the achievement rate of actual figures against targets is over 80%, then they are rated as ③, if the achievement rate is over 50% and below 80%, then they are rated as ②, and if the achievement rate is below 50%, then they are rated as ①. Among operation and effect indicators of this project, comparison of planned (estimated) and actual figures is possible for volume of annual passenger transportation, volume of peak hour passenger transportation, operating rate of rolling stocks and operation interval. Then the achievement rate of these indicators against planned figures is 62% on average. As the importance is higher for volume of passenger transportation compared with other indicators, when calculating the weighted average of the achievement rate by doubling the weight of annual and peak hour passenger volume resulted as 56%. Thus, effectiveness and impact are evaluated as fair, by judging comprehensively including the results of the beneficiary survey.

Table 5: Comparison of Outputs (Planned/ Actual)

Item	Planned	Actual
Package A (Procurement of rolling stocks / Civil works)	・Procurement of rolling stocks (4 car-train x 12 sets = 48 cars, air-conditioned) ・Procurement and installation of signalling system (ATC/ATP/ATO/ ATS) ・Upgrading of the existing communication system ・Procurement of additional equipment for the existing automatic fare collection system (AFCS) ・Track-work within depot ・Upgrading of power distribution equipment ・Civil works (upgrading of stations and depot)	Below were added to the original scope: ・Structural soundness study of Line 1 structures ・Replacement and strengthening of walls at 15 stations ・Replacement of a roof and walls of the depot
Package B (Procurement of air conditioners for exiting rolling stocks)	・Procurement of air conditioners for existing (first generation) rolling stocks (64 cars)	Below were added to the original scope: ・Renovation of existing rails and sleepers (approximately 4km) ・Replacement of faulty air conditioning units of the 2nd generation vehicles ・Procurement and installation of equipment for AFCS (automatic gates / ticket machine) delivered by French company, as some of them were non-usable ・Procurement of equipment and spare parts for track works
Consulting Service	・Procurement assistance ・Supervision of civil (construction) works ・Assistance for preparation of operating plans ・Assistance for management of LRTA ・Environmental management through monitoring of compliance with conditions set in ECC and providing instructions for contractors etc.	Below were added to the original scope: ・Structural soundness study of Line 1 structures ・Assistance for contract management and supervision of civil works related to additional outputs ・Supervision of civil works for Package B ・Assistance for LRTA business improvement study
	International CS: 344M/M Local CS: 677M/M	International CS: 440M/M Local CS: 1,038M/M

Source: planed: JICA appraisal document, actual: documents provided by LRTA, interviews with LRTA, JICA internal documents

As shown above, outputs were added to the original scope according to necessity in the field as far as possible during project implementation. The reason for walls at 15 stations and a roof and walls at the depot being replaced was because a segment of the pre-cast fell off on a street in September 2005 due to deterioration of Line 1 structures[26]. Responding to this accident,

[26] Source: documents provided by LRTA

LRTA conducted the structural soundness study of Line 1 structures.

Expansion of Platform (EDSA station)

Signalling (Operation) System

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned project cost at the time of project appraisal was 26,190 million yen (foreign currency: 19,639 million yen, local currency: 6,551 million ten), of which Japanese ODA loan portion was 22,262 million yen[27]. On the other hand, the actual project cost was 21,841 million yen[28] (breakdown of foreign and local currencies is unknown), of which Japanese ODA loan portion was 20,540 million yen, and it was lower than planned (83% against the plan). The actual cost exceeds the planned cost in Philippine pesos by approximately 10% due to additional outputs explained above, however, the actual cost is lower than the planned cost in Japanese yen even including additional outputs due to fluctuation of exchange rates (the exchange rate at the time of project appraisal was 1 peso = 3.0 yen). The actual cost for civil works and procurement of equipment etc. was lower than the planned cost as a result of competitive bidding[29]. As explained above, this project was implemented utilizing the Special Yen Loan (SYL), and the customer satisfaction survey was conducted regarding SYL. The executing agency replied that the bid price was almost the same level as in other projects implemented in the Philippines and that they are satisfied with the quality of contractors' works.

3.4.2.2 Project Period

The planned project period at the time of project appraisal was 46 months in total from April 2000 (signing of the loan agreement) to January 2004 (project completion was defined as

[27] Source: JICA appraisal document

[28] Calculated by multiplying the actual cost by the average exchange rate of 1PHP=2.27JPY (the average exchange rate of the Japanese ODA loan disbursement period of April 7, 2000 –September 4, 2008), based on documents provided by LRTA.

[29] Source: documents provided by LRTA

completion of civil works/procurement and start of operation)[30]. On the other hand, the actual project period was 111 months in total from April 2000 (signing of the loan agreement) to June 2009 (completion of civil works/procurement)[31], and it was significantly longer than planned (241% against the plan). The reasons for the actual project period significantly exceeding the planned period were; 1) the executing agency requested a selection method of a consultant that was not allowed in Japanese ODA loan, and it took a long time within the executing agency to deal with comments from JICA regarding the issue, and as a result, the entire process of consultant selection was delayed; 2) it required a long time to prepare bidding documents particularly for parts related to conditions for SYL and detailed design, as the project was the first project that utilized SYL and a first design-build project for the executing agency; 3) the bidding process was delayed, as it required a long time for the executing agency to handle legal issues raised by losing bidder; and 4) outputs were added to the original scope as explained above, etc.[32] Based on these reasons, the expiry date of the Japanese ODA loan was extended from September 2006 to September 2008. The actual project period excluding time required for additional outputs was 89 months in total from April 2000 to August 2007, which is 193% against the planned period and still significantly longer than planned.

Table 6: Comparison of Planned and Actual Project Period

Content	Planned	Actual
Package A (Procurement of Rolling Stocks and Civil Works)		
Selection of Consultant	November 1999 – October 2000 (12 months)	Unknown – January 2002
Detailed Design	November 2000 – April 2001 (6 months)	February 2002 – August 2002 (7 months)
Bidding/Contracting	November 2000 – January 2002 (15 months)	August 2002 – March 2005 (32 months)
Procurement/Civil Works	February 2002 – January 2004 (24 months)	March 2005 – August 2007 (30 months)
Additional Outputs	-	April 2008 – December 2008 (9 months)
Package B (Procurement of Air Conditioners for Exiting Rolling Stocks)		
Detailed Design	November 1999 – April 2000 (6 months)	Unknown
Bidding/Contracting	November 1999 – January 2001 (15 months)	Unknown
Procurement/Civil Works	February 2001 – January 2002 (12 months)	April 2002 – April 2004 (25 months)
Additional Outputs	-	May 2008 – June 2009 (14 months)

Source: planned: JICA appraisal document, actual: documents provided by LRTA

[30] Source: JICA appraisal document

[31] Source: documents provided by LRTA

[32] Source: JICA internal documents

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

3.4.3.1 Financial Internal Rate of Return (FIRR)

Results of calculation of FIRR both at the time of project appraisal and ex-post evaluation are shown below. FIRR at the time of ex-post evaluation is lower than that of project appraisal, as the passenger volume and the rate of fare revision were overly estimated in the appraisal, and the actual project cost was slightly more than the planned cost (in Philippine pesos) etc. FIRR is approximately 2%, assuming that O&M cost is constant and fares of Line 1 will be increased by 0.5 peso each year since 2013.

Table 7: Comparison of FIRR

Time of Calculation	Conditions for Calculation	Result
Project Appraisal (1999)	Cost: Investment Cost, O&M Cost Benefit: Fare Revenue Project Life: 30 years	6.4%
Ex-Post Evaluation (2012)	Same above	2.2%

Source: project appraisal: JICA appraisal document, ex-post evaluation: calculated based on documents provided by LRTA[33]

3.4.3.2 Economic Internal Rate of Return (EIRR)

Due to the fact that detailed information on the basis for calculation of EIRR at the time of project appraisal was not available, analysis for EIRR was not possible.

Although the project cost was within the plan, the project period significantly exceeded the plan, therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

At the time of project appraisal, operation and maintenance (O&M) of LRT Line 1 was outsourced to METRO Inc. which was under LRTA's 100% shareholding, however, the contract was terminated in July 2000, and maintenance of Line 1 has been outsourced to CB&T-PMP-GRAS (CPG) joint venture (JV) since 2009[34]. The company is responsible for

[33] Conditions for calculation: in JICA appraisal document, fare revenue was calculated based on an assumption that the increase of the passenger volume by this project would be approximately 10% of the entire passenger volume of Line 1, and thus, the same assumption was used in ex-post evaluation. For the annual passenger volume, actual figures were used until 2012, and the volume after 2013 was increased by 8% per year, which is the actual average of volume increase from 2007 to 2012. For fare revenue per passenger, 14.5 pesos per passenger was used until 2012, which was the actual average from 2007 to 2012, and it was assumed to be increased by 0.5 peso each year after 2013 onwards. O&M cost was assumed constant at 10 pesos per passenger, which was the actual cost in 2009.

[34] According to LRT Line 1 Capacity Expansion Project Phase 1 Ex-Post Monitoring Report, CPG JV seems to have been selected through competitive bidding. Moreover, maintenance of Line 1 seems to have been outsourced to a different company from July 2000 to 2009.

preventive maintenance, corrective maintenance and management of consumables including spare parts etc. for Line 1, and LRTA supervises the performance of the company. At the time of ex-post evaluation, bidding is being conducted for implementation of the south extension project of Line 1 from Baclaran station to Cavite region and O&M of Line 1 (they are planned to be conducted under public-private partnership (PPP)), and O&M of existing Line 1 is planned to be handed over to a private company in 2015[35]. The south extension project is expected to be completed in 2016, and concession period is expected to be 32 years and concession contract amount paid by a private company is expected to be 16 billion pesos in total[36]. According to the executing agency, the concession contract will probably be signed among DOTC, LRTA and a private company, however, which organization to receive the concession contract amount has not been determined, and there are many uncertainties regarding the concession contract.

The number of permanent staff in LRTA is 357 in total and that of contract staff is 1,319 in total, as of the end of September 2012[37]. Among these, 50 permanent staff and 842 contract staff are assigned in the Line 1 Operations Department, 41 permanent staff are assigned in the Line 1 and 2 Engineering Department, of which 19 staff are assigned for Line 1[38]. The number of staff in CPG JV company is 463 in total as of January 2013, of which 154 staff are assigned in Rolling Stock Department, 67 staff are assigned in Tracks and General Repair Department, 110 staff are assigned in Infrastructure Department, and 84 staff are assigned in Electronics Department (48 staff in other departments)[39]. LRTA checks performances of CPG JV company through check lists and regular reporting is required from the company based on the monitoring procedure for engineering and maintenance activities, and proper supervision is conducted by LRTA.

In summary, while currently sufficient numbers of staff are assigned for O&M of Line 1 and no major problem is seen in institutional aspects of O&M, there are many uncertainties regarding details of future O&M system, and future steps need to be monitored.

3.5.2 Technical Aspects of Operation and Maintenance

Majority of permanent staff assigned for Line1 in LRTA's Engineering Department are engineers, and majority of staff assigned in Rolling Stock Department, Tracks and General Repair Department, Infrastructure Department and Electronics Department in CPG JV company are also engineers and technicians[40]. Various manuals for proper O&M are prepared in LRTA, and trainings are provided based on these manuals, and a check test is conducted once or twice a

35 Source: interviews with LRTA
36 Source: same as above
37 Source: documents provided by LRTA
38 Source: same as above
39 Source: same as above
40 Source: documents provided by LRTA

year to check the level of proficiency[41]. Trainings have been provided on train driving of first to third generation vehicles on Line 1 (360 hours in total), vehicle and infrastructure control and operating system (for operation supervisors) (32 hours in total), Automatic Train Protection (ATP) system (8 hours in total), and automatic fare collection system (96 hours in total) etc.[42]

At the time of ex-post evaluation, sufficient numbers of technical staff are assigned, various O&M manuals are in place and trainings have also been provided, and thus, no major problem is seen in technical aspects of O&M.

3.5.3 Financial Aspects of Operation and Maintenance

Fares of Line 1 have been fixed at 12 to 15 pesos, and while the proposed fare revision was approved by LRTA Board of Directors in February 2011, it was deferred by DOTC due to the public nature of urban railways[43]. Due to fares being fixed at low levels, LRTA's net operating profit has been in chronic deficit (net income has been largely in deficit even with government subsidy) as shown in Table 8, and farebox ratio (operating revenue / operation cost except for depreciation cost) for recent three years has been 101-115%, which is just to cover operation cost. Moreover, at the time of project appraisal, while LRTA's capital was approximately 2.9 billion pesos, accumulated deficit was approximately 5.2 billion pesos, which resulted in capital deficit of approximately 2.3 billion pesos[44]. In order to improve the financial standing of LRTA, the Philippine government planned to amend LRTA's charter to enable an increase of its authorized capitalization, however, according to the executing agency, the proposed Bill to increase its capitalization to 100 billion pesos is still at the stage of proposal, and the amount of liabilities in 2012 is 3.3 times of the 2001 level, and capital deficit has been continued to the present as shown in Table 9. As explained above, O&M of Line 1 is planned to be conceded to a private company in the near future and four companies have bid for the contract so far, however, which organization to receive the concession contract amount has not been determined, or a government guarantee for a certain portion of fare revenue is not planned to be provided to a private company, despite the fact that it is difficult to revise fares, and under this situation, hundreds of questions have been raised by bidders[45]. Thus, it will require a long time to conclude a concession contract, and currently it is unforeseeable whether O&M of Line 1 will really be conducted through concession. However, as shown in Table 10, cash flows of LRTA have been positive due to regular subsidies from the Philippine government. While major improvement of LRTA's financial status is desired, cash flows in recent years have been positive

41 Source: documents provided by LRTA and LRT Line 1 Capacity Expansion Project Phase 1 Ex-Post Monitoring Report
42 Source: documents provided by LRTA
43 Source: same as above
44 Source: JICA appraisal document
45 Source: interviews with LRTA

and the possibility for the Philippine government to provide LRTA with financial support continuously would be high due to LRT's highly public nature, even if O&M of Line 1 is not conducted through concession.

Table 8: Profit and Loss Statement of LRTA

(Unit: million pesos)

	2010	2011	2012
Operating Revenue	3,079	3,127	2,858
Direct Operating Expense	1,989	2,122	1,818
Maintenance Cost	628	709	606
Gross Profit	1,090	1,005	1,040
Net Operating Profit	▲1,780	▲1,204	▲614
Net Income	▲5,932	▲1,772	▲1,549

Source: prepared based on documents provided by LRTA

Note: figures of 2012 are results of transactions until October 2012.
Net operating profit was calculated by gross profit - selling and general administrative expenses (salary, depreciation cost, bad debts etc.).
Recovery of net income in recent years is mostly attributed to fluctuation of exchange rates.

Table 9: Balance Sheet of LRTA

(Unit: million pesos)

	2010	2011	2012
Asset			
Fixed Asset	46,262	45,886	44,981
Current Asset	6,046	12,593	11,864
Asset Total	52,308	58,479	56,846
Capital/Liability			
Capital	▲17,056	▲18,824	▲20,375
Fixed Liability	62,947	65,092	66,117
Current Liability	6,417	12,211	11,104
Capital/Liability Total	52,308	58,479	56,846

Source: prepared based on documents provided by LRTA

Note: figures of 2012 are results of transactions until October 2012.

Table 10: Cash Flows of LRTA

(Unit: million pesos)

	2010	2011
Cash Flows from Operating Activities	▲298	1,632
Cash Flows from Investing Activities	▲501	▲1,619
Cash Flows from Financing Activities	371	4,485
Net Increase in Cash and Cash Equivalents	▲428	4,498
Cash and Cash Equivalents at the Beginning of the Year	783	356
Cash and Cash Equivalents at the End of the Year	355	4,854

Source: audit report on LRTA HP (2012)

3.5.4 Current Status of Operation and Maintenance

At the time of ex-post evaluation, preventive maintenance of rolling stocks and other equipment and facilities is conducted regularly by CPG JV company, in which inspection, functional testing, cleaning, lubrication, and replacement of parts are conducted at accumulated operational distance and certain intervals of time, and corrective maintenance, in which equipment and facilities in a faulty condition are restored, is also conducted (preventive and corrective maintenance is regularly conducted for rail tracks, power supply systems, signalling systems, telecommunication systems, automatic fare collection systems, and buildings and facilities including stations and depot etc.)[46].

Table 11 shows a list of facilities that were not operational at the time of inspection in January 2013 and still not operational at the time of ex-post evaluation (April 2013), among those procured under this project.

Table 11: List of Non-Operational Facilities

Facility	Quantity	Situation
Automatic Gates (AFCS)	6	Waiting for delivery of spare parts
Passenger Agent Machine (AFCS)	11	Waiting for delivery of spare parts
On-board ATP System	27	Parts are under procurement by LRTA (most parts from depleted rolling stocks were cannibalized and used for operational rolling stocks, and hence no impact on train operation currently)
Air Conditioning Unit for First Generation Rolling Stocks	30	Under replacement of spare parts
Third Generation Rolling Stocks	3	Three cars are non-operational due to a collision accident in 2011 and waiting for procurement by DOTC

Source: documents provided by LRTA

According to the executing agency, facilities above that were procured under this project are all under the procurement process of spare parts etc. and there is no difficulty in procuring these parts. On the other hand, while not subject to this ex-post evaluation, among 28 in total of second generation rolling stocks that were procured under the phase 1 of this project, only 8 are currently operational[47]. For second generation rolling stocks, defects started to be found as early as one to two years after the start of operation, and spare parts are not easily available in markets, as the number of suppliers is limited, which has resulted in unsatisfactory bidding for such parts[48]. According to the executing agency and JICA Philippine Office, spare parts for first generation rolling stocks are also becoming obsolete, and first and second rolling stocks will be phased out in the concession of O&M for Line 1, and fourth generation rolling stocks (120

[46] Source: documents provided by LRTA
[47] Source: documents provided by LRTA
[48] Source: LRT Line 1 Capacity Expansion Project Phase 1 Ex-Post Monitoring Report and interviews with LRTA

vehicles) are planned to be procured under the south extension project of Line 1 with Japanese ODA loan. Operating rate of rolling stocks is hoped to be improved by these actions.

Some problems have been observed in terms of institutional and financial aspects of O&M, therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed at developing an urban transportation system in Metro Manila which was mainly dependent on road transport, reducing traffic congestions and materializing mass passenger transportation, by additionally procuring rolling stocks and improving signalling system etc. for Light Rail Transit (LRT) Line 1.

Relevance of this project is high, as the project is consistent with priority areas of Philippine's development plans and Japan's ODA policy, and moreover development needs for the project are high. While the actual number of passengers of Line 1 at the time of ex-post evaluation is about the half of the estimated number in the project appraisal, the number has been increasing steadily year by year, and evaluating comprehensively by taking into account the operating rate of rolling stocks, operation interval, and results of the beneficiary survey etc., effectiveness is judged to be fair. Efficiency of the project is also fair, as while actual project cost was lower than planned cost, actual project period significantly exceeded planned period. Sustainability of the project is also fair, as some problems were observed in the financial situation of the Light Rail Transit Authority (LRTA), which is responsible for operation and maintenance (O&M) of Line 1, and future O&M system.

In light of the above, this project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Philippine Government

(1) Due to fares being fixed at low levels, LRTA's net operating profit has been in chronic deficit. It would continue to be in deficit without revising fares for Line 1, and while an approval from the government is required, it is desirable to revise fares for LRTA's sustainable management.

(2) There are currently many uncertainties regarding the concession contract for O&M of Line 1. It is desired for the government to follow up the concession to process it smoothly.

4.2.2 Recommendations to the Executing Agency

According to interviews with the executing agency, spare parts that can be shared among second and third generation rolling stocks, which were procured under the phase 1 and 2 of the

project respectively, are only 5%, and the executing agency is faced with difficulties to procure parts for second generation rolling stocks. While first and second generation rolling stocks are planned to be phased out and fourth generation rolling stocks (120 vehicles) are planned to be procured with Japanese ODA loan in the near future, it is desirable to carefully consider the specification of spare parts when preparing bidding documents for fourth generation rolling stocks, so that parts can be commonly used among third and fourth generation rolling stocks as much as possible.

4.2.3 Recommendations to JICA

None

4.3 Lessons Learned

When implementing railway capacity expansion projects over several phases, procurement of spare parts would become time-consuming and might result in unsuccessful biddings, which might lead to lower operating rate of rolling stocks, if there are few spare parts that can be commonly used among different generations of rolling stocks. It is desirable to carefully consider the specification of spare parts that can be commonly used across generations and that are widely available in the market when preparing bidding documents.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	**Package A (procurement of rolling stocks / civil works):** ・ Procurement of rolling stocks (4 car-train x 12 sets = 48 cars, air-conditioned) ・ Procurement and installation of signalling system (ATC/ATP/ATO/ATS) ・ Upgrading of the existing communication system ・ Procurement of additional equipment for the existing automatic fare collection system (AFCS) ・ Track-work within depot ・ Upgrading of power distribution equipment ・ Civil works (upgrading of stations and depot) **Package B (procurement of air conditioners for exiting rolling stocks):** ・ Procurement of air conditioners for existing (first generation) rolling stocks (64 cars)	**Package A (procurement of rolling stocks / civil works):** Below were added to the original scope: ・ Structural soundness study of Line 1 structures ・ Replacement and strengthening of walls at 15 stations ・ Replacement of a roof and walls of the depot **Package B (procurement of air conditioners for exiting rolling stocks):** Below were added to the original scope: ・ Renovation of existing rails and sleepers (approximately 4km) ・ Replacement of faulty air conditioning units of the 2nd generation vehicles ・ Procurement and installation of equipment for AFCS (automatic gates / ticket machine) delivered by French company ・ Procurement of equipment and spare parts for track works
2. Project Period	April 2000 – January 2004 (46 months)	April 2000 – June 2009 (111 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 19,639 million yen 6,551 million yen (2,184 million pesos) 26,190 million yen 22,262 million yen 1 peso = 3.0 yen (As of August 1998)	 Unknown Unknown 21,841 million yen 20,540 million yen 1 peso = 2.27 yen (Average between April 2000 and September 2008)