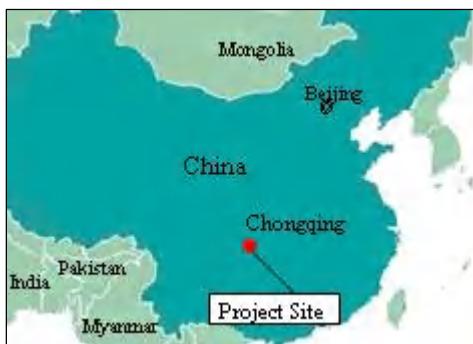


China

Ex-Post Evaluation of Japanese ODA Loan Project
Chongqing Urban Railway Construction Project

External Evaluator: Kenichi Inazawa, Office Mikage, LLC

1. Project Description



Map of the Project Area



Chongqing Monorail Line 2

1.1 Background

Under its policies of reform and openness China has been achieving economic growth averaging about 10% per year. On the other hand, along with the economic progress, urban development, and rising living standards brought about by the reforms and opening up, problems caused by the underdevelopment of urban infrastructure in major cities have surfaced. As a result, traffic congestion and air pollution were becoming increasingly serious.

Chongqing City is located in the eastern part of the Sichuan basin on the upper reaches of the Chang River. In 1997 the city became the fourth directly-controlled municipality in China following Beijing, Shanghai and Tianjin. After Chongqing City became the directly-controlled municipality, the city began actively promoting introduction of foreign investment and becoming a driving force for economic development in inland regions of China. However, along with the economic development, traffic congestion became much worse in the central city areas¹, impeding the functionality of the city, while air pollution increased due to exhaust gas from automobiles, leading to a worsening of the living environment. The situation reached a point where transportation via roads was being inhibited due to the terrain of Chongqing City and the condition of the existing city areas. The improvement of the urban environment was considered

¹ The central part of Chongqing City is in a rugged mountainous area. It is divided in two by the Chang River and the Jialing River.

as an issue that had to be overcome. As a result, there was a growing need to introduce a Light Rail Transit line (Monorail) which could provide reliable transportation as well as environmental benefits.

1.2 Project Outline

The objective of this project is to ease traffic congestion and reduce air pollution to protect the environment, by constructing an urban railway (Line 2 between Jiaochangkou and Dayancun: 14km) in the Chongqing central area, thereby contributing to improvement of the economic activities and living condition of people..

Approved Amount/ Disbursed Amount	27,108 million yen / 27,107 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2001 / March 2001
Terms and Conditions	<p>Interest Rate : 0.75% Repayment Period : 40 years (Grace Period: 10 years) Condition for Procurement: Bilateral tied</p>
Borrower / Executing Agency(ies)	Government of the People's Republic of China / Chongqing Municipal People's Government (Project Implementation Unit: Chongqing Rail Transit General Corporation (CRTC))
Final Disbursement Date	January 2007
Main Contractor (Over 1 billion yen)	China International Trust & Investment Corp. (China) / China Shanghai (Group) Corp. For Foreign Economic & Technology (China) and Changchun Railway Vehicles Co. Ltd. (China) (JV) / Mitsui & Co. Ltd. (Japan)
Main Consultant (Over 100 million yen)	Japan Railway Technical Service (JARTS) (Japan) and Pacific Consultants International (PCI) (Japan) (JV)
Feasibility Studies, etc.	<p>F/S prepared by the Second Design Department of the Ministry of Railways (2000)</p> <p>JICA Special Assistance for Project Formation (SAPROF) prepared by Japan Railway Technical Service (JARTS) and Pacific Consultants International (PCI) (1998)</p>

2. Outline of Evaluation Study

2.1 External Evaluator

Kenichi Inazawa, Evaluation Consultant, Office Mikage LLC

2.2 Duration of Evaluation Study

Duration of the Study: September 2009 - June 2010

Duration of the Field Study: December 20 - 31, 2009 (1st study)

March 14 - 20, 2010 (2nd study)

2.3 Constraints during the Evaluation Study

N/A

3. Results of the Evaluation (Overall Rating: B)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of China

At the time of the appraisal, the development of city railways was positioned as a priority area in the Ninth Five-Year Plan (1996-2000) of the Government of the People's Republic of China and the Chongqing Municipal People's Government. Aiming for economic development, high quality life and environmental improvement for its citizens, Chongqing City established the "Chongqing City Urban Development Plan Guidelines for 2010" and based upon these guidelines established the "Ninth Five-Year Chongqing City Development Master Plan (1996-2000)." In these plans, the development of urban transportation infrastructure and environmental improvements were positioned as priority projects. Furthermore, in Chongqing City's "Light Rail Transit Network Plan," Light Rail Transit-type transportation systems were positioned as the main transportation systems. Together with the arterial roads the systems were planned to be given the role of being short distance connecting routes among the 12 small urban districts and ensuring a method of travel to the new city districts for which construction is planned.

The development of city railways was positioned as a priority area in the Eleventh Five-Year Plan (2006-2010), the national development plan at the time of the ex-post evaluation. Furthermore, in 2006, the National Development and Reform Commission (NDRC) approved the "Chongqing City Urban Rapid Light Rail Transit Construction Plan (2006-2014)" and stipulated the Light Rail Transit construction plan for Chongqing City. Based on this plan, the city is aiming to complete three Light Rail Transit projects by 2013 and to commence one new project. On the other hand, the "Chongqing City Urban Area Plan (2006-2020)" approved by the State Council aims to fully establish the urban infrastructure of Chongqing City and develop the entire economy and society, and sets as its goal the complete development of a Light Rail

Transit network called “nine routes and one loop²” by 2020. Furthermore, the plan aims to construct a comprehensive transportation structure by developing organic connections with other means of transportation (public buses, etc.).

3.1.2. Relevance with the Development Needs of China

Chongqing City has a very uneven topography which gives it a multi-polar and dispersed urban structure comprised of 12 small urban districts. Before the project implementation, traffic congestion was getting much worse in the central city areas of Chongqing City as a result of economic development. 95% of city residents relied on public transport to move around. Public transport saw a passenger volume of over 600 million passengers (cumulative number) per year, with approximately 500 million people using buses. Approximately 70% of the arterial roads in the central city area suffered from constant traffic congestion, and at peak times 70% of the passenger volume of the entire city and 80% of the buses were concentrated in the central city area. Furthermore, due to the traffic congestion, huge volumes of automobile exhaust gases were being emitted, causing air pollution to increase and leading to a worsening of the living environment. Given this situation, there was a growing need to construct a monorail which could provide reliable and environmentally-friendly transportation to large numbers of people.

This project (phase 1 of the Line 2 project) commenced operations in June 2005. The line extension project (phase 2 of the Line 2 project) commenced operations in July 2006. The volume of monorail’s passenger has increased every year since then³. Furthermore, as the city works toward establishing a Light Rail Transit network, there are plans for Line 3 (monorail) which will commence operations in 2011 and plans for Line 1 (subway line)⁴ which will commence operations in 2012. The passenger volume on Line 2 is expected to increase substantially going forward⁵. The economic growth rate of Chongqing City in recent years has been high at about 15% per annum, and economic revitalization is expected to lead to even greater demand for public transport infrastructure projects. On the other hand, just as at the time of the appraisal, traffic congestion in the central city areas remains constant as a result of

² “Nine routes and one loop” refers to nine Light Rail Transit routes and one loop line. Developing the Light Rail Transit network, the central city district of Chongqing will expand greatly.

³ At the time of the ex-post evaluation, the total length of Chongqing City’s Light Rail Transit network was approximately 19 kilometers (Monorail Line 2 only). Refer to the section on Effectiveness, regarding data of quantitative effects for the Line 2’s transportation volume, etc.

⁴ This is being implemented using China’s own funds.

⁵ Work has also commenced on lines other than Light Rail Transit Lines 1 and Line 3. In December 2009, work commenced on the Line 6 (subway line) project, and line extension projects for Line 2 and Line 3 are planned to commence. Moreover, project plans for Lines 5, 7, 8 and 9 are currently being formulated.

economic development. There were approximately 4,300,000 bus users per day⁶ in 2008, accounting for approximately 80% of all transport modes used in Chongqing City. Going forward, further development of the Light Rail Transit system is expected to relieve traffic congestion in the central city areas and realize reliable transportation.

3.1.3. Relevance with Japan's ODA Policy

In the Official Development Assistance Charter (ODA Charter) approved by the Cabinet in 1992, “Environmental conservation and development should be pursued in tandem” is stipulated as one of the principles of Japan’s ODA policy. In 2000, a committee in the governing party proposed a “Summary of and Guidelines for Economic Assistance to China.” Based on the content of this document, the “Economic Cooperation Program for China” was established in 2001. This series of guidelines and plans designated cooperation towards resolving environmental and other global issues, improved living standards and social development in the inland regions, and the promotion of mutual understanding, etc. , as priority areas for Japan’s ODA to China. The objective of this project is therefore thought to be in compliance with the assistance policy of Japan because it aims for alleviation of air pollution in China’s inland regions.

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

3.2 Efficiency (Rating: b)

3.2.1 Project Outputs

Although the scope of some outputs was reduced, this project was implemented almost as planned. Table 1 compares and explains the differences between planned and actual major outputs.

⁶ Compared with the description in p4 “Public transport saw a passenger volume of over 600 million passengers (cumulative number) per year, with approximately 500 million people using buses”, the number of passengers using buses has greatly increased. The urban metropolitan area has expanded since the time of the appraisal. Consequently, the number of passengers has increased. However, another reason for the change could be that every passenger that used buses at the time of the appraisal was not counted. In other words, passengers except using buses run by both public and small bus companies were not counted. Currently, all buses in Chongqing City belong to the public bus companies, as a result of the restructuring of the companies. Therefore, the current passenger volume is increasing.

Table 1: Planned and Actual Major Outputs

Outputs	Planned	Actual	Difference
1. Civil Works, Railway Construction, and Procurement of Equipment (Construction of a straddle-beam and monorail and procurement of related equipment)	1) Section: Jiaochangkou - Dayancun Station	1) Section: Jiaochangkou - Dongwuyuan station	=> Almost as planned (Dayancun Station was constructed in phase 2 of the line 2 project.)
	2) Total Distance: Around 14km	2) Total Distance: Around 13.5km	=> Almost as planned (At the section was between Jiaochangkou and Dongwuyuan station, the rail distance decreased.)
	3) Number of Stations: 14 (11 elevated stations, 3 subway stations)	3) Number of Stations: 13 (10 elevated stations, 3 subway stations)	=> Almost as planned (A reduction of one station because Dayancun Station, an elevated station, was constructed in phase 2 of the line 2 project)
	4) Number of Rolling Stock Depots: 1 (The Rolling Stock Depot is adjacent to Dayancun Station)	4) Number of Rolling Stock Depots: 1	=> As planned
	5) Number of Carriages: 84 (14 trains) (6 carriages/train × 14 trains = 84 carriages)	5) Number of Carriages: 84 (21 trains) (4 carriages/train × 21 trains = 84 carriages)	=> The arrangement of carriages was changed. (However, the number of procured carriages is as planned.)
	6) Infrastructure: signals and communications equipment, electrical equipment, fire-prevention equipment, etc.	6) Infrastructure: signals and communications equipment, electrical equipment, fire-prevention equipment, etc.	=> As planned
2. Consulting Services	1) Supervision of work related to the PC beams, infrastructure installations, infrastructure interfaces, carriages, signals, etc. (Total 104M/M)	1) Total: 120M/M	=> Almost as planned (*The difference is shown in the next few pages.)

	2) Construction of precautions and environmental measures for soil runoff, noise problems, water pollution, etc., know-how and technology transfer for environmental monitoring, etc. (no establishment of M/M)	2) March 2001 to June 2005: Implemented from the project commencement to the operation commencement	
	3) Oversea Training (Total: 12M/M)	3) 24 staff participated (The training was held in Japan.)	

Source: JICA documents, Project Completion Report (PCR), Answers on questionnaires

The following is a series of brief explanations of the main points of difference between what was planned and what was actually implemented.

(1) Reason for choosing the Route between Jiaochangkou Station and Dongwuyuan Station

According to the Executing Agency, the reasons that the construction work only went as far as Dongwuyuan Station (one station before Dayancun Station) were that they took into account that: (i) trial runs of the section between Jiaochangkou Station and Dongwuyuan Station had already been carried out in 2004, and it had been confirmed that there were no problems, so the Agency aimed to commence operations as soon as possible; and (ii) at that time, the design plan for extending the line south of Dayancun Station (phase 2 of the Line 2 project) had not yet been decided, and in addition there was the possibility that there would be a height difference between the rail for the section from Dongwuyuan Station to Dayancun Station and the rail south of Dayancun Station, so the Agency decided to complete the line as far as Dongwuyuan Station without constructing Dayancun Station during this project. As a result, it was decided that the section between Jiaochangkou Station and Dongwuyuan Station would be the project section for Phase 1, and that Dayancun Station would be constructed in phase 2 of the Line 2 project (completed in July 2006).

(2) Reason for the Change to the Arrangement of the Carriages

The Executing Agency adopted a three stage plan for the arrangement of the carriages (first stage: four-carriage trains, second stage: six-carriage trains, third stage: eight-carriage trains),

and stipulated a carriage arrangement plan in which the first few years after the operation commencement were considered the first stage, with subsequent periods of operation after that considered the second and third stages. This resulted in a deviation from the plan⁷. The Executing Agency is taking into account actual passenger volume, and train is now running with 4 carriages, just as at the procurement stage.

(3) The Difference of Consulting Service

The reason for the increase in M/M (104M/M→120M/M) within 1) of Consulting Services is construction schedule delay. Regarding 2), there was no establishment of M/M⁸ at the time of the appraisal, and according to the Executing Agency, it was “implemented for all aspects of the project from the project commencement to the operation commencement.” Regarding 3), although the initial plan contained no details on this matter, 24 people came to Japan to participate in training for 15 days. The content of training included learning how to drive a monorail and how to work with infrastructure and machinery.



Figure 1: Project Site: Route Map of Monorail Line 2

⁷ However, the Agency arranges the carriages taking into account actual passenger volume, and judges that a four-carriage train is sufficient at the current volume. (Refer to the section on Effectiveness regarding quantitative effects for the passenger volume.)

⁸ According to the Executing Agency, 2) was not considered to be of a nature which required the establishment of M/M in the first place.



Figure 2: Railway Platform



Figure 3: Rolling Stock Depot
(Adjacent to Dayancun Station)

3.2.2 Project Inputs

3.2.2.1 Project Period

The planned project period was 41 months from March 2001 to July 2004; however it actually took 58 months, from March 2001 to December 2005, 141% longer than planned. The major reasons for this were a delay in the tendering process, and the fact that more time than anticipated was required for infrastructure and machinery procurement procedures and delivery. In 2004, the influence of SARS caused the delivery of carriages and infrastructure to take more time, and delays occurred in all aspects of construction work.

The following table explains a comparison of planned and actual period.

Table 2: Planned and Actual Project Period

Outputs	Planned	Actual
(The whole project)	March 2001 to July 2004 (41 months)	March 2001 to December 2005 (58 months)
1) Civil Works and Railway Construction	March 2001 to October 2003	March 2001 to June 2004
2) Construction of Electric Power	October 2001 to November 2003	March 2002 to June 2005
3) Construction of Signals and Telecommunications	October 2001 to March 2004	March 2002 to June 2005
4) Administration and Disaster Prevention Works	November 2001 to February 2004	March 2002 to December 2005
5) Procurement and Installation of Elevators and Escalators	January 2002 to February 2004	May 2002 to December 2005
6) Procurement and Delivery of the Monorail Carriages	October 2001 to July 2004	March 2002 to December 2005
7) Construction of Rolling Stock Depot	January 2002 to March 2004	January 2002 to December 2004

8) Consulting Service	*No establishment of planned period ⁹	October 2001 to August 2005
-----------------------	--	-----------------------------

Source: JICA documents, Project Completion Report (PCR), Answers on questionnaires

3.3.2.2 Project Cost

The planned cost was 44,328 million yen (Japan's ODA loan amount was 27,108 million), and the actual cost was 46,036 million yen (Japan's ODA loan amount was 27,107 million), which slightly higher than planned (about 104% of the plan). The main reason for cost excess was foreign exchange fluctuations.

Both project period and project cost slightly exceeded the plan, therefore efficiency of the project is fair.



Figure 4: Inside the Station
(Private company advertisements stand out)



Figure 5: Automatic Ticket Machine

3.3 Effectiveness (Rating: b)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

(1) The following table 3 explains the Volume of Transportation, Fare Revenues, Number of Running Carriages, Operating Rate and Running Distance, both at the time of appraisal (estimation) and at the time of ex-post evaluation (actual).

Table 3: Quantitative Data for

Both at the Time of Appraisal (Estimation) and at the Time of Ex-post Evaluation (Actual)

Quantitative Indicators	At the Time of Appraisal (Estimation)			At the Time of Ex-post Evaluation (Actual)			
	2004	2005	2010	2005	2006	2007	2008

⁹ There was no planned period for the consulting service, but in September 2001 after the L/A came into force (July 2001) a contract was agreed to and the consulting service commenced from the following month.

	(Completion Year)	(1 Year After Completion)	(6 Years After Completion)	(Completion Year) *Note 4	(1 Year After Completion)	(2 Years After Completion)	(3 Years After Completion)
1) Volume of Transportation (Ten Thousand People/km)	48,180	53,769	82,344	7,308	15,191	22,359	25,685 (47.8% of the Plan ¹⁰)
2) Fare Revenues (Ten Thousand CNY)	16,060	17,345	27,448	2,920	4,737	6,941	7,716 (44.5% of the Plan)
3) Number of Running Carriages (Number of Running Carriages / Day) *Note 1	N/A	N/A	N/A	32	40	54	60
4) Operating Rate (%) *Note 2	N/A	N/A	N/A	62.0	73.5	63.4	62.6
5) Running Distance (km) *Note 3	N/A	N/A	N/A	2,800,216	5,377,842	6,917,857	7,077,514

Source: JICA documents (Data at the time of the appraisal), Project Completion Report (PCR) (Data at the time of the ex-post evaluation)

*Note 1) This indicator was observed by the Executing Agency. It indicates the total number of running carriages per day. For example, if 15 trains operate per day, 60 carriages occur (15 trains × 4 carriages). One train consists of 4 carriages.

*Note 2) Operating Rate = cumulative operating days per year / (procured carriages × (365 - average number of days out of operation due to inspection)) × 100 %, according to JICA's Operation and Effect Indicators Reference

*Note 3) Running Distance = number of trains × annual running distance

*Note 4) As the operation commencement regarding phase 1 project of the Line 2 was in June 2005, the actual figure of that year is only composed of the figure with six months after its commencement.

The following 1) to 5) explain the analysis of difference and the actual situation among the actual and estimation at the time of appraisal, and the actual at the time of ex-post evaluation.

1) Volume of Transportation and 2) Fare Revenues

These are lower than the estimates at the time of the appraisal. The reasons for this are as follows:

- (i) It is thought that the volume of transportation that would be demanded was overestimated at the time of the appraisal. The view of the Executing Agency was that it was difficult to

¹⁰ These percentages of the plan for 1) volume of transportation and 2) fare revenues at the time of the ex-post evaluation (actual figures of 2008) show the comparison with the time of the appraisal (estimation) in 2005 (one year after project completion).

anticipate demand after completion, partly because this was China's first ever monorail project. As a result of gathering information for the demand anticipation at the time of the appraisal and of conducting several interviews to the Agency during this study, the Agency concluded that although these figures of demand anticipation were calculated at the time of the appraisal and submitted to JICA, unfortunately neither documents for proving the calculation nor back evidence information were being kept. While reviewing JICA's internal documents during this survey, data and documents were not found regarding the calculated figures¹¹. However, it was confirmed during the survey that a relatively large number of passengers used the monorail at peak and even at off-peak times. (Refer to Figure 6 on page 16.) It can be inferred that although the actual figures have not reached the initial demand anticipation, a sufficient number of passengers has been secured as the actual status.

Furthermore, the Agency stated that if Line 1 and Line 3 had gone into operation earlier¹², (the Light Rail Transit network system would have been developed) the volume of transportation on Line 2 would have increased greatly. (The Executing Agency stated that the planned date of completion for Line 1 and Line 3 was 2006, which was thought at the time of the appraisal, but for this survey they did not present any documents to confirm this.)

(ii) There was also a change in the city government's policy regarding the development of the residential areas in the central city and along the Jialing River (between Fortuguanyan Station and Huanghuayuan Station). Development became later than initially planned, and it is thought that this change also had an influence on the volume of transportation on Line 2.

(iii) In 2003, citing environmental problems, the Chongqing Municipal People's Government made a decision to move the factories located in the central city area (all of the production bases of Chongqing Construction and Engineering Co., Ltd.) out to the suburbs. It is thought that as a result, use of Line 2 by the company's employees (estimated to be approximately

¹¹ Although it was difficult to confirm the demand anticipation any further, it is believed that conducting evaluation analysis is inevitable to compare pre-data with post-data. The anticipated figures at the time of the appraisal were recognized as the future anticipation. Therefore, as shown in Table 3, the figures were adopted as data at the time of the appraisal.

¹² The background to the construction of Line 1 (subway line) and Line 3 (monorail) and the situation going forward were as follows:

Background to the construction of Line 1 and the situation going forward: in 1992 a Hong Kong company made a contract with the Chongqing Municipal People's Government and planned to construct the line using the BOT method by the end of 1998. However, the Hong Kong company experienced financial difficulties, and construction was suspended. Subsequently, the Executing Agency took charge of this project, and construction is currently under way (2007: commencement of the construction, 2012: planned date of completion).

Background to the construction of Line 3 and the situation going forward: under the initial plan the decision to commence work was expected to be made during the period between 1995 and 2002, but there were delays in the project appraisal procedures, so the commencement of construction was also delayed. Just as in the case of Line 1, construction is now underway using China's own funds (2007: commencement of the construction, 2011: planned date of completion).

10,000 people) and their families declined.

On the other hand, as shown in Table 3, since July 2006 when all of Line 2 commenced operations, the traffic volume has been growing every year. It is thought that this is due to the results produced by the line; namely, it has offered a convenient route to passengers and shortened traveling times. It is concluded that there has at least been significant recognition of the project effects.

3) Number of Running Carriages

Regarding the number of carriages running in 2005 and 2006, passenger volume remained low partly because not much time had elapsed since the operation commencement, and the Executing Agency ran only the number of carriages needed for the actual passenger volume. It increased the number of trains running (reduced the interval between trains) in 2007 and 2008 partly due to the fact that the number of passengers increased in each of these years relative to the previous year.

4) Operating Rate

The operating rate was around 60-70%, as a result of calculating with “cumulative operating days per year / (procured carriages × (365 - average number of days out of operation due to inspection)) × 100 %.” This means that there are a total of 21 trains and on average 14 to 15 of these are running continuously, while the remaining 6 to 7 trains are undergoing inspections¹³ at the rolling stock depot. In JICA’ Operation and Effect Indicators Reference an operating rate of 80% to 90% was said to be reasonable, so it can be concluded that the rate is a little low.

5) Running Distance

Phase 1 of the Line 2 project (this project) commenced operations in June 2005, so the running distance was about half of the running distance in 2006 (because the calculation of running distance for 2005 is for about half a year). From 2007 onwards, as stated above, the number of running trains was increased, and thus the annual running distance increased, as did running distance figures compared to the previous years.

¹³ It is assumed that this also includes the number of days in which trains are suspended according to the actual volume of transportation. In other words, it was difficult to confirm the days only for periodical inspections.

(2) The following table 4 shows the estimations at the time of the appraisal and the actual figures at the time of the ex-post evaluation for the allotment of number of passengers in Chongqing City after introducing the monorail. The actual passenger volume of the Light Rail Transit (Monorail Line 2) in 2008 was lower than estimated at the time of the appraisal. As explained in the analysis of this difference in (1) Volume of Transportation above, the main reasons for this were that the volume of transportation that would be demanded was overestimated, and that passenger volume did not grow due to delays in the development of residential areas in some sections.

Table 4: Allotment of Number of Passengers after Introducing Light Rail Transit (Monorail)

Classification (Transport Mode and Means)		At the Time of the Appraisal (Estimation)				At the Time of the Ex-post Evaluation (Actual)	
		2005		2010		2008	
		Number of Passengers (Ten Thousand People / Day)	Ratio (%)	Number of Passengers (Ten Thousand People / Day)	Ratio (%)	Number of Passengers (Ten Thousand People / Day)	Ratio (%)
Road	Bus	325.5	66.7	321.6	59.7	385.0	71.7
	Small Size Bus	93.4	19.1	101.6	18.9	50.0	9.3
	Taxi	19.5	4.0	21.5	4.0	50.0	9.3
	Private Car	1.0	0.2	1.6	0.3	10.0	1.8
	Motorcycle	0.2	0.1	0.3	0.1	30.0	5.5
	Others	24.4	5.0	26.9	5.0	1.2	0.2
Light Rail Transit	Line 2	23.8	4.9	37.6	7.0	12.0	2.2
	Others	0.0	0.0	27.0	5.0	0.0	0.0

Source: JICA documents (Estimation at the time of the appraisal), Answers on questionnaires (Actual at the time of the ex-post evaluation)

The reason that passenger volumes increased for road transport modes is that in order to cope with the rapid development of the city, the Chongqing Municipal People's Government also worked on the carrying capacity of public transport, in particular the expansion of the public buses network and transport policies to improve the level of services, in parallel with its Light Rail Transit network expansion policies. As a result the number of people using the road transport modes also increased.

For reference, Table 5 below shows the “Estimation of the Number of Passengers by Light

Rail Transit if Development of the Light Rail Transit Network Continues in the Future” made by Chongqing City. It is expected that if the other Light Rail Transit routes commence operation by 2012 and 2015, the number of passengers on Line 2 will experience greater increases from current levels than indicated by the data in Table 4.

Table 5: Estimation of the Number of Passengers by Light Rail Transit in the Future

Name of Line	Number of the Passengers by Light Rail Transit (Ten Thousand People/Day)	
	2012	2015
Line 1	31.2	42.6
Line 2	27.6	37.3
Line 3	49.8	69.7
Line 6	N/A	57.4
Total	108.6	207.0

Source: Extract from the joint research report written in 2008 by the Chongqing City Urban Transport Planning Research Institute (a research institute of the Chongqing Municipal People’s Government) and the Chongqing City Light Rail Transit Design Institute (an organization associated with the Executing Agency)

(3) Reduction of Emissions of Air Pollutants

As shown in Table 6 below, at the time of the appraisal, emissions of air pollutants (CO, NOx, HC) were anticipated to fall by a certain amount after the project completion. The actual falls were as shown in the table. According to the Executing Agency, all of the environmental data both at the time of the appraisal and at the time of the ex-post evaluation were “figures calculated based on data for the volume of transportation on Line 2, the rate of use of other means of transportation, etc. (theoretical figures), not figures obtained by actually measuring polluting substances in the atmosphere¹⁴”. As noted above, the actual number of passengers on Line 2 is lower than estimated at the time of the appraisal, so the figure for the reduction in pollutants is lower at the time of the ex-post evaluation. Therefore, it can be concluded that the size of the reduction of emissions of air pollutants will (theoretically) increase due to the future increase in passenger volume for the Light Rail Transit stated in (2) above.

Table 6: Size of Reduction of Emissions of Air Pollutants (Unit: Ton/Year)

	At the Time of the Appraisal (Estimation)		At the Time of Ex-post Evaluation (Actual)			
	2005	2010	2005	2006	2007	2008

¹⁴ The Executing Agency obtained verification from the environmental authority of the Chongqing Municipal People’s Government regarding the calculation of this data.

CO	442	772	47	124	189	224
NOx	21	37	3	7	10	11
HC	48	85	6	14	21	25

Source: JICA documents (Estimation at the time of the appraisal), Executing Agency documents (Actual at the time of the ex-post evaluation)



Figure 6: Inside the Monorail Carriage
(off peak time: about 11 am on a weekday)



Figure 7: Monorail Line 3, which is being constructed at present

3.3.1.2. Results of Calculation of Internal Rate of Return (IRR)

Financial Internal Rate of Return:

Recalculating the financial internal rate of return with the fare revenues and station and carriage advertising revenues as the benefits and project construction costs; and with operational and maintenance expenses, and taxes as the costs; and assumed a project life of 25 years, the result is 3.3%, a lower figure than the 4.2% estimated at the time of the appraisal. The main reason that the recalculated figure is lower than the figure at the time of the appraisal is that the volume of transportation was less than in the initial estimation, so operating income (fare revenues) were also lower than anticipated.

Economic Internal Rate of Return:

Recalculating the economic internal rate of return with the environment improvement effect, transportation cost reduction effect, traffic accidents decline effect, travel time reduction effect, labor productivity improvement effect, and operating revenues (fare revenues) as the benefits and project construction costs; and with operational and maintenance expenses as the costs; and assumed a project life of 25 years, the result is 7.9%, a lower figure than the 12.3% estimation at the time of the appraisal. In this case as well, the reason that the recalculated figure is lower than the figure at the time of the appraisal is that the volume of transportation was less than in the initial estimation, so the benefits, the primarily operating revenues, declined.

3.3.2 Qualitative Effects

3.3.2.1 Results of Beneficiary Survey on Satisfaction with Using the Monorail, Time Reduction and Fare Level¹⁵

An interview survey in questionnaire format was carried out about Monorail Line 2 aimed at station users and people who live around the stations respectively, overall positive results were obtained, as shown below.

¹⁵ This beneficiary survey consisted of an interview survey of users of Dapin Station and Dongwuyuan Station and people who live in the vicinity of these two stations. There are residential and commercial areas in the vicinity of these two stations and quite a large number of people use the stations, so we judged that these would be useful places to select for the survey.

Table 7: Results of Beneficiary Survey on Satisfaction with Using the Monorail, Time Reduction and Fare Level
 (Unit: People)

	People Who Use the Dapin Station	People Who Live around the Dapin Station	People Who Use the Dongwuyuan Station	People Who Live around the Dongwuyuan Station
1) Are you satisfied with using the monorail?	Very satisfied: 9	Very satisfied: 4	Very satisfied: 15	Very satisfied: 9
	Satisfied: 21	Satisfied: 16	Satisfied: 15	Satisfied: 11
	Unsatisfied: 0	Unsatisfied: 0	Unsatisfied: 0	Unsatisfied: 0
	Very unsatisfied: 0	Very unsatisfied: 0	Very unsatisfied: 0	Very unsatisfied: 0
2) The reasons for “Very Satisfied” and “Satisfied” in 1) (multiple answers allowed)	Reduction of travel time: 29	Reduction of travel time: 16	Reduction of travel time: 24	Reduction of travel time: 15
	Accuracy of operation: 8	Accuracy of operation: 3	Accuracy of operation: 14	Accuracy of operation: 8
	Operating interval is short. (Operating trains are many.) : 9	Operating interval is short. (Operating trains are many.) : 3	Operating interval is short. (Operating trains are many.) : 10	Operating interval is short. (Operating trains are many.) : 6
	Station is near: 4	Station is near: 0	Station is near: 6	Station is near: 7
	Fare is cheap: 3	Fare is cheap: 0	Fare is cheap: 8	Fare is cheap: 4
	Safe: 10	Safe: 4	Safe: 9	Safe: 11
	Comfortable: 4	Comfortable: 3	Comfortable: 11	Comfortable: 7
3) (Compared with the previous transport means) Has your travel time been reduced by using the monorail?	Reduced: 30	Reduced: 16	Reduced: 28	Reduced: 20
	Not changed: 0	Not changed: 0	Not changed: 2	Not changed: 0
	Become long: 0	Become long: 0	Become long: 0	Become long: 0
	Not clear/ No answer: 0	Not clear/ No answer: 4	Not clear/ No answer: 0	Not clear/ No answer: 0
4) To what degree has your travel time been reduced, regarding the above 3) “Reduced”?	0-10 min.: 12	0-10 min.: 6	0-10 min.: 9	0-10 min.: 3
	10-20 min.: 9	10-20 min.: 9	10-20 min.: 16	10-20 min.: 8
	20-30 min.: 9	20-30 min.: 0	20-30 min.: 3	20-30 min.: 8
	30-60 min.: 0	30-60 min.: 1	30-60 min.: 0	30-60 min.: 0
	More than 1 hour: 0	More than 1 hour: 0	More than 1 hour: 0	More than 1 hour: 1
5) What do you think of the present fare level?	Expensive: 6	Expensive: 5	Expensive: 1	Expensive: 4
	Adequate level: 20	Adequate level: 10	Adequate level: 23	Adequate level: 16
	Cheap: 4	Cheap: 1	Cheap: 5	Cheap: 0
	Not clear/ No answer: 0	Not clear/ No answer: 4	Not clear/ No answer: 1	Not clear/ No answer: 0

Source: Results of beneficiary survey (The total sample size was 100, of which were by 30 Dapin station users, 30 Dongwuyuan Station users (the total sample is 60), 20 people who live around the Dapin station and 20 people who live around the Dongwuyuan station (the total sample is 40).)

Looking at Table 7, both station users and those who live around the stations show a high

level of satisfaction with using the monorail. Most of the respondents said that the reasons for their high levels of satisfaction were the reduction of travel times, accuracy of operation, and the shortness of the interval between trains (which is nearly the same thing as the high number of running trains). It is assumed that the strong measures taken to ensure that the trains arrive and depart on time led to the high scores for accuracy of operation. Regarding the shortness of the interval between trains, the trains are scheduled to come at intervals of three minutes and 30 seconds during the peak times in the morning and evening and at intervals of seven minutes during off peak times¹⁶ so it can be imagined that quite a large number of station users and residents felt that the interval between trains is short compared with other means of transportation (felt that there is a large number of trains running).

Most of the respondents said that fare levels were set at an “adequate level.” Currently, the minimum fare is 2 CNY (approximately 28 yen) one-way. Traveling from the Jiaochangkou Station, the starting station to the Xinshancun Station, the last station is 5 CNY (approximately 70 yen) one-way. The average cost per passenger is 2.7 CNY (approximately 38 yen) one-way. It can be concluded that the respondents perceive these to be reasonable fare levels¹⁷.

(Determination of the Effectiveness Rating¹⁸ and Conclusions)

Comparing the quantitative data at the time of the ex-post evaluation (the figures for actual outcomes) with the data at the time of the appraisal (estimated figures) some of the indicators are less than 50%. However the actual passenger volume on Line 2 at one year after completion reaches about 50% of the planned data for passenger volume, in spite of obviously overestimated demand regarding volume. Furthermore, it is inevitable that the passenger volume at the time of the ex-post evaluation remains low compared to the planned data. Construction of Line 1 and 3, connecting to Line 2 in the future, is still ongoing. On the other hand, the results of the beneficiary survey are good with respect to effectiveness and impact (the next evaluation item).

Based on the above results, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

¹⁶ This is the operation schedule as of the end of December 2009.

¹⁷ For the sake of comparison, looking at examples of fares for public buses in Chongqing City, travel of 10 kilometers or less on a standard bus costs 1 CNY (with 0.5 CNY added for every 5 kilometers above 10 kilometers), and travel of 10 kilometers or less on a bus with air conditioning costs 1.5 CNY (with 0.5 CNY added for every 5 kilometers above 10 kilometers).

¹⁸ Under JICA's rating system, the results regarding impact are also used to some extent for the determination of the effectiveness rating.

3.4 Impact

3.4.1 Intended Impacts

3.4.1.1 Economic Development in Chongqing City

As shown in Table 8 below, Chongqing City's gross regional domestic product (GRDP) has been increasing rapidly since 2000. Although there are undoubtedly factors other than this project which are having an impact on the economic growth of Chongqing City, it is assumed that because this project developed a Light Rail Transit system that is expected to have a large transportation capacity and ensure stable passenger transportation, the project has contributed to the improvement of traffic congestion in the city and to the enhancement of city functions¹⁹. Thus, it is also assumed that the project is directly or indirectly supporting to the economic activities of companies in the city.

Table 8: Gross Regional Domestic Product (GRDP) in Chongqing City

	GRDP in Chongqing City (Hundred million CNY)	Population (Ten thousand people)
2000	1,603	3,091
2001	1,766	3,098
2002	1,990	3,114
2003	2,273	3,130
2004	2,693	3,114
2005	3,071	3,169
2006	3,452	3,199
2007	4,123	3,235
2008	5,097	3,257

Source: Chongqing Statistical Yearbook 2009

Furthermore, top managers at the zoo near Line 2's Dongwuyuan Station expressed positive views about the monorail, saying, "Before, most of our visitors came by bus. The number of visitors to the zoo has greatly increased because of the operation commencement of the monorail. Now 80% of our visitors come through the gate near Dongwuyuan Station, so it is thought that the monorail has had a huge impact," and, "Compared to 2003, before the monorail commenced operations, our revenues (sales) have greatly increased," etc.

¹⁹ At present, development of residential areas is progressing in areas along Line 2, and development of commercial areas is also progressing near the stations, including the construction of large shopping centers and office buildings, etc. Just for a reference, in 1999 the average unit price per square meter for residential areas near the line in the city was 1,500 CNY/m² but in 2009 this had risen substantially to 4,000 CNY/m².



Figure 8: Central Chongqing Area (Around the Jiaochangkou Starting Station)

3.4.1.2 Improvement of the People's Living Environment

Following on from the beneficiary survey on Effectiveness, Section 3.3.2.1, a further beneficiary survey was carried out about the economic and industrial impact and changes to the living environment caused by the operation commencement of the monorail (here mostly a questionnaire survey about the impact aspects). As shown below, overall positive results were obtained.

Table 9: Results of Beneficiary Survey on Economy, Industry, and Life Environment by

	Operation	Commencement of Monorail	(Unit: People)	
	People Who Use the Dapin Station	People Who Live around the Dapin Station	People Who Use the Dongwuyuan Station	People Who Live around the Dongwuyuan Station
1) Do you think that operation commencement of the monorail has had an economic and industrial impact in the areas along the route and in the central areas of Chongqing City?	I think so: 27 I don't think so: 3 Not clear/ No answer: 0	I think so: 11 I don't think so: 9 Not clear/ No answer: 0	I think so: 26 I don't think so: 4 Not clear/ No answer: 0	I think so: 17 I don't think so: 3 Not clear/ No answer: 0
2) Your reason for "I think so" in 1) (multiple answers allowed)	Attraction of enterprises advanced: 6 New residential areas were constructed: 13 New factories were constructed: 5 Construction of commercial buildings, etc advanced: 16 Construction of life infrastructure (hospital and school, etc) advanced: 12 Population grew: 9 Others: 1	Attraction of enterprises advanced: 5 New residential areas were constructed: 6 New factories were constructed: 0 Construction of commercial buildings, etc advanced: 7 Construction of life infrastructure (hospital and school, etc) advanced: 5 Population grew: 2 Others: 0	Attraction of enterprises advanced: 17 New residential areas were constructed: 13 New factories were constructed: 3 Construction of commercial buildings, etc advanced: 17 Construction of life infrastructure (hospital and school, etc) advanced: 12 Population grew: 7 Others: 0	Attraction of enterprises advanced: 6 New residential areas were constructed: 13 New factories were constructed: 0 Construction of commercial buildings, etc advanced: 7 Construction of life infrastructure (hospital and school, etc) advanced: 6 Population grew: 3 Others: 0
3) Have there been any changes to (your own) life due to the opening of the monorail?	Yes: 30 No: 0	Yes: 15 No: 5	Yes: 29 No: 1	Yes: 20 No: 0
4) Your reason for "Yes" in 3) (multiple answers allowed)	Access to the hospital and school improved: 17	Access to the hospital and school improved: 4	Access to the hospital and school improved: 18	Access to the hospital and school improved: 12

	Access to the commercial buildings improved: 12	Access to the commercial buildings improved: 9	Access to the commercial buildings improved: 15	Access to the commercial buildings improved: 12
	By reduction of travel time, leisure and time spending with family increased: 13	By reduction of travel time, leisure and time spending with family increased: 11	By reduction of travel time, leisure and time spending with family increased: 21	By reduction of travel time, leisure and time spending with family increased: 14
	Could find new jobs: 2	Could find new jobs: 2	Could find new jobs: 1	Could find new jobs: 0
	Cost of living rose: 1	Cost of living rose: 2	Cost of living rose: 0	Cost of living rose: 0
	Urbanization advanced and anxiety to public peace caused: 1	Urbanization advanced and anxiety to public peace caused: 0	Urbanization advanced and anxiety to public peace caused: 0	Urbanization advanced and anxiety to public peace caused: 1

Source: Results of beneficiary survey (The total sample size was 100, of which were by 30 Dapin station users, 30 Dongwuyuan Station users (the total sample is 60), 20 people who live around the Dapin station and 20 people who live around the Dongwuyuan station (the total sample is 40).)

The responses to questions 1) and 2) show that many station users and people who live around the stations feel that the operation commencement of the monorail has had an impact on the economy and industry in the city. It can be inferred that the respondents perceive that there has been an impact due to the fact of progress in the development of residential areas, the construction of commercial facilities such as large shopping centers, etc., and the construction of educational and medical infrastructure and facilities in the areas along the route.

The responses regarding changes to the living environment given in 3) and 4) were also mostly positive. It can be inferred that the operation commencement of the monorail has brought about a positive impact on their lives because it produced an improvement in access to the central city area, a reduction of travel times, etc.

The reason for a slightly greater number of people who live around the Dapin Station responded “I don’t think so” and “No” to questions 1) and 3) is that (i) the area around Dapin Station was already well developed before the monorail commenced operations, and (ii) there is quite a lot of competition at Dapin Station because there are also departure and arrival stations for other means of transportation such as public buses, etc.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

There is no serious negative impact on the environment from the civil works/railway

construction, or running the monorail. Furthermore, the Executing Agency worked hard to take into account environmental problems that could be occurred after the project completion. For example: (1) in order to reduce noise, the Executing Agency installed sound insulating walls, used sound insulating materials in the rail and station infrastructure²⁰, and took measures such as reducing the driving speed limit of the monorail²¹; and (2) commercial waste water and human sewage from the rolling stock depot and the stations was not discharged directly but rather treated and purified first²².

In the Executing Agency there is a department responsible for operations related to environmental protection, called the Department of Quality Environment Security. This department regularly implements environmental monitoring related to infrastructure and facilities that were provided through this project²³. There are no problems in particular with the department's implementation structures or its testing.

The Environmental Impact Assessment (EIA) for this project was implemented before the project commencement, and it was approved in September 1999.

3.4.2.2 Resettlement and Land Acquisition

A plan was made to resettle 470 residents and acquire approximately 12.00ha of land for the project implementation. The actual figures were with the resettlement of 470 people (190 families) and the land acquisition of 11.54ha, largely as was set forth in the initial plan. No particular problems occurred²⁴. The Chongqing Municipal People's Government and the Executing Agency, the bodies responsible for implementing the resettlement of residents and the land acquisition, went through the procedures, the Chongqing City Urban Resettlement Management Ordinance, and established the Chongqing Light Rail Transit Line 2 Land Confiscation and Resettlement Compensation Guidelines in order to pay compensation to resettled residents. The land acquisition was also implemented without any particular problems, based on the Law of Land Administration of the People's Republic of China.

²⁰ Sound insulating walls were installed during the project implementation, in places that were expected to be noisy. The sound insulating walls are being installed even after the project completion.

²¹ The maximum design speed is 80km/h or less, and the maximum running speed is 75km/h or less; furthermore, the monorail is electric (the electrical system is a DC1500V rigid catenary system) so there is not much noise.

²² There are human sewage bio-treatment ponds and sewage treatment facilities at the stations and the rolling stock depot. The appropriate treatment of waste water is being carried out.

²³ Regarding the structures for the implementation of environmental monitoring, there are two employees appointed to this task at all times. The Executing Agency implements tests of sound insulation and measures to prevent noise at the rate of approximately once every two years. It carries out tests of the wastewater measures of the stations at the rate of approximately once every three months. Furthermore, it has set up an environmental hotline (telephone), and has built a system that can respond immediately if there is a complaint from a resident (operating 24 hours a day).

²⁴ The land acquisition and resettlement were implemented before the project commencement.

Table 10: Planned and Actual Resettlement and Land Acquisition

	Planned	Actual
Resettlement	470 people	470 people (190 families)
Land Acquisition	Around 12.00ha	11.54ha

Source: JICA documents, Answers on questionnaires

3.5 Sustainability (Rating: a)

3.5.1 Structural Aspects of Operation and Maintenance

The Executing Agency for this project is the Chongqing Rail Transit General Corporation, a state-owned company that is 100% owned by the Chongqing Municipal People's Government. At the Chongqing Rail Transit General Corporation, under the overall head of the company, the president, there are five vice presidents and one chief engineer who have overall control of four divisions: the Division of General Management (the Department of Finance, the Department of Personnel, etc.), the Division of Processes and Construction (the Department of Construction, the Production Survey Office, etc.), the Division of Operations and Services (the Operating Carriages Team, the Department of Comprehensive Operating Equipment, etc.), and the Division of Development Management (the Department of Light Rail Transit Design, etc.).

At the time of the appraisal there were 147 employees, but at the time of the ex-post evaluation (the end of December 2009) there were approximately 2,500 employees. The reason for the difference in the number of employees at the time of the appraisal and at the time of the ex-post evaluation is that at the time of the appraisal Chongqing City had not yet introduced the Light Rail Transit system so the scale of the organization was small. However, as this project was commenced and completed, and as the construction of the other routes (Line 1, Line 3, etc.) made progress, it was judged that a large number of human resources, including employees in charge of the maintenance, were necessary. As a result, the number of employees grew substantially. According to the Executing Agency, they have secured the number of employees appropriate for the scale of the project, so the current number of employees is satisfactory. Through the field survey, it was confirmed and judged that although overall most of the employees are young employees, they have secured a number of employees and appointed them to each department appropriately. It can be judged that there is no problem regarding the structural aspects of operation and maintenance of this project.

The following 1)-5) show the names of the departments in the operation and maintenance division for this project, the content of the departments' work duties, and the number of employees. The five organizations all belong to the aforementioned Division of Operations and Services.

- 1) Operating Carriages Team: mainly in charge of the inspections and development of the monorail carriages. The number of the employees is 494.
- 2) Department of Comprehensive Operating Equipment: in charge of the maintenance of the signals and the telecommunications and electrical infrastructure. The number of the employees is 449. The maintenance of some of the electrical equipment is being outsourced.
- 3) Department of Operating Track Facilities: in charge of inspections and maintenance of the railway line, switches, and facility buildings. The number of the employees is 155.
- 4) Department of Transportation: in charge of management and administration of passenger tickets, passenger services in the stations. The number of the employees is 647.
- 5) Operational Safety and Production Control Center: in charge of the running and control of the carriages. The number of the employees is 37.

3.5.2. Technical Aspects of Operation and Maintenance

The Department of Human Resources of the Executing Agency is in charge of the personnel training courses and programs for the employees. The training program for executive, management and technical staff is sufficient. In 2008, 11 training programs were conducted, and 1,474 employees (cumulative number) participated in these programs. In 2009, 10 training programs were conducted, and 813 employees participated²⁵.

In addition, there are a number of experienced employees in each section, and On-the-Job Training (OJT) is also being conducted as necessary. Furthermore, the employees of the maintenance division are highly skilled, with a little over 40% of them being university graduates. The Executing Agency has hired human resources widely, from throughout China. Regarding the above, it can be judged that the technical level of operation and maintenance in the Executing Agency is being secured.

3.5.3. Financial Aspects of Operation and Maintenance

²⁵ Over the past few years, approximately 800 to 1,000 employees (the cumulative number of employees) per year have participated in training courses and programs, but in 2008, the Executing Agency provided large-scale programs for the improvement of personal computer skills (OA programs) to the general employees, so there were a particularly large number of trainees in 2008 compared to the number of participants in 2009.

Table 11 explains the operation and maintenance costs of this project. The amounts in the table also include the operation and maintenance costs for the section built in phase 2 of the Line 2 project (between Dayancun Station and Xinshancun Station)²⁶.

The reasons that the operation and maintenance costs in 2005 and 2006 were less than in 2007 and 2008 are: 1) 2005 and 2006 were immediately after the operation commencement; and 2) in 2007 and 2008, warranties for carriages and infrastructure expired one after another, so expenditures for maintenance rapidly increased (When the warranties expired, expenditure for maintenance commenced).

Table 11: O&M Cost of Monorail Line 2 (Unit: Ten Thousand CNY)

	2005	2006	2007	2008
Operation Cost	3,558	6,033	8,642	11,971
Maintenance Cost	178	927	1,378	2,668
Total	3,736	6,960	10,020	14,639

Source: Answers on questionnaires

The P/L sheet of the Executing Agency is shown in Table 12 below. The financial operation of the organization cannot be supported with fare revenues only, so a subsidy is allocated from the Chongqing Municipal People's Government. In 2007, approximately 57,900,000 CNY was allocated, and in 2008 approximately 46,990,000 CNY was allocated. According to the Executing Agency, sufficient subsidies are allocated for operation of the organization.

In 2008, this project (the Monorail Line 2 Construction Project) was accounted for “fair value fluctuating income”²⁷ (282,970,000 CNY) in the budget, so net profits greatly increased.

Table 12: P/L Sheet and Financial Data of the Executing Agency (Unit: CNY)

	2006	2007	2008
1) Operating Income	85,871,056.54	82,530,098.47	130,385,528.65
2) Operating Cost	(67,431,515.92)	(71,654,026.68)	(176,496,860.68)
3) Operating Taxes and Additional Costs	(905,786.66)	(2,593,939.95)	(4,651,660.30)
Gross Profit on Sales	17,533,753.96	8,282,131.84	(50,762,992.33)
4) Selling Expenses	(723,274.50)	(268,043.43)	(1,498,896.90)

²⁶ This is because the Executing Agency did not calculate the operation and maintenance costs for this project (phase 1 of the Line 2 project) and the line extension project (phase 2 of the Line 2 project) separately.

²⁷ This means that the value from all of the outputs constructed in this project were considered income. According to the Executing Agency, this was dealt with the objective of “evaluating the overall organization legitimately by evaluating the assets and liabilities currently held by the organization with their legitimate value, and considering this income” (the evaluation of asset value from the perspective of investors). Furthermore, assets are only evaluated from the perspectives of “what would the value of the assets be if they were sold at this moment in time?” and “how much income can the assets (of the outputs) be expected to produce for the organization in the future?” so this item is not considered in every financial year.

5) Administrative Costs	(4,817,820.48)	(20,783,994.35)	(18,964,451.24)
6) Finance Costs	(11,868,830.87)	(41,831,304.76)	(156,584,385.76)
7) Asset Evaluation Loss	-	-	(3,168,294.05)
8) Fair Value Fluctuating Income	-	-	282,972,011.22
9) Investment Income	320,051.22	479,924.51	10,821,629.18
Operating Profit	443,879.33	(54,121,286.19)	62,814,620.12
10) Non-operating Income	202,041.00	57,937,490.35	47,454,519.13
(Government subsidy income part of non-operating income)	-	57,897,764.23	46,984,832.00
11) Non-operating Expenditure	(49,379.99)	(138,677.00)	(4,845.00)
Current Pretax Profits	596,540.34	3,677,527.16	110,264,294.25
12) Corporate Income Tax	(357,549.44)	(972,194.08)	(32,738,724.32)
Current Net Profits	238,990.90	2,705,333.08	77,525,569.93

Source: Executing Agency documents

The Executing Agency is carrying out a variety of promotional activities to increase the number of passengers (to stimulate demand). The Agency is even outsourcing to private sector companies (advertising agencies) to develop commercials on television and other public relations activities. Other measures to stimulate demand include the introduction of an expanded function such as sales promotion of pre-paid passenger tickets and ticketless boarding using mobile phones. In addition to operation of the monorail business, the Executing Agency is running a real estate business, marketing inside the stations,²⁸ and an advertising business²⁹ to generate income.

Regarding the above, no major problems have been observed in the O&M costs and financial aspect of the Executing Agency; therefore, it can be judged that there is no problem regarding financial level of the operation and maintenance of the organization.

3.5.4. Current Status of Operation and Maintenance

The status of operation and maintenance for this project are as follows. Spare parts are being procured and stored appropriately and in a timely manner, so there are no problems with the status of operation and maintenance.

- 1) Operating Carriages Team (mainly in charge of the inspections and development of the monorail carriages)

²⁸ The Executing Agency is recruiting tenants to earn rent income.

²⁹ The Executing Agency is selling advertising space inside stations to generate advertising revenues. Most of the advertisers are companies inside the city.

This team is maintaining monorail carriages appropriately. No major problems were detected with the operation of the carriages during the field survey. The inspections and repair operations at the rolling stock depot are also being carried out without any problems, and there are no broken down or non-operational carriages.

2) Department of Comprehensive Operating Equipment (in charge of the maintenance of the signals and the telecommunications and electrical infrastructure)

None of the signaling equipment, electrical equipment, or communications equipment on the monorail track was broken down or defective and maintenance is being carried out appropriately. The maintenance operations include operations carried out during the day and operations carried out at night (to avoid the operating schedule during the day).

3) Department of Operating Track Facilities (in charge of inspections and maintenance of the railway line, switches, and buildings)

None of the monorail track, or the switches was broken down or defective, and at the current time maintenance is being carried out appropriately. The maintenance work is carried out during the day and at night, just as in the Department of Comprehensive Operating Equipment. Furthermore, inspections, maintenance and repair of buildings in relation to the operation of the monorail are being carried out appropriately, and there are no problems with degradation.

4) Department of Transportation (in charge of management and administration of passenger tickets, passenger services in the stations, etc)

Administration of the sale of passenger tickets at each station is being carried out without any problems. There is a structure in place for coordination with other departments and rapid response in the event that any trouble occurs.

5) Operational Safety and Production Control Center (in charge of the running and control of the carriages)

The level of the control and operations related to the running of the monorail carriages is high. It is possible to check the operational status of the carriages at all times using driving control equipment in the center, and the liaison structures is also top grade. None of the control equipment or devices was defective or broken down.



Figure 9: Check and Maintenance of the Rolling Stocks



Figure 10: Operational Safety and Production of Control Center

In relation to the above, no major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project is in compliance with development policy and needs, and no problems were seen with respect to operation and maintenance. However the data for the volume of transportation on the monorail after the project completion shows results less than 50% of what was initially estimated, partly because the expected volume of transportation was overestimated at the time of the appraisal. On the other hand, the results of beneficiary surveys confirmed that the project realized an improvement in convenience and a reduction in travel times by the monorail.

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

4.2 Recommendations

4.2.1 Recommendations for the Executing Agency

In order to realize an increase in the volume of transportation on Line 2, the Executing Agency should work hard to ensure that there are no delays in the construction work for the other Light Rail Transit routes such as Line 1, etc. In particular, for the construction work on Line 1 which was started in 1992 and then restarted after a series of troubles and difficulties, and the Executing Agency should take care to ensure that no factors work hindering arise before the line's completion in 2012.

4.3 Lessons Learned

At the time of the ex-post evaluation, the volume of transportation estimated at the time of the appraisal had not yet been achieved. The reason for this is that there were not as many users as anticipated as the expected volume of transportation was overestimated at the time of the appraisal, and in addition there was a delay in the development of the residential areas in the central city (along the Jialing River). In the future, when implementing a similar kind of Light Rail Transit project, it will be necessary to present the volume of transportation estimated and determine a project plan only after sufficiently studying and confirming how the building of a Light Rail Transit network and the development of residential areas along the route will progress during the time from the commencement to the completion of the project.

Comparison of the Original and Actual Scope of the Project

Items	Original	Actual
1. Project Outputs	(Civil Works, Railway Construction, Procurement of Machinery and Equipments) => Almost as planned	
	1) Section: Jiaochangkou - Dayancun Station	1) Section: Jiaochangkou - Dongwuyuan station (Dayancun Station was constructed in phase 2 of the line 2 project.)
	2) Total Distance: Around 14km	2) Total Distance: Around 13.5km (As the section was between Jiaochangkou and Dongwuyuan station, the rail distance decreased.)
	3) Number of Stations: 14 (11 elevated stations, three subway stations)	3) Number of Stations: 13 (A reduction of one station because Dayancun Station, an elevated station, was constructed in phase 2 of the line 2 project)
	4) Number of Rolling Stock Depot: 1 (The Rolling Stock Depot is adjacent to Dayancun Station)	4) =>As planned
	5) Number of Carriages: 84 (14 trains) (6 carriages/train × 14 trains = 84 cars)	5) Number of Carriages: 84 (21 trains) (4 carriages/train × 21 trains = 84 cars)
	6) Infrastructure: signals and communications equipment, electrical equipment, fire-prevention equipment, etc.	6) =>As planned
	(Consulting Service) => Almost as planned	
	1) Supervision of work related to the PC beam, infrastructure installation, the infrastructure interface, carriages, signals, etc. (Total 104M/M)	1) Total 120M/M
	2) Construction of precautions and environmental measures for soil runoff, noise problems, water pollution, etc., know-how and technology transfer for environmental monitoring, etc. (no establishment of M/M)	2) March 2001 to June 2005: implemented from the commencement of the construction to the commencement of operations
	3) Overseas Training (Total: 12M/M)	3) 24 Staff Participated (The training was held in Japan.)
2. Project Period	March 2001 - July 2004 (41 months)	March 2001 - December 2005 (58 months)
3. Project Cost	Amount paid in Foreign currency	
	27,108 million yen	27,107 million yen

Amount paid in Local currency	17,220 million yen (1,324.62 million CNY)	18,929 million yen (1,324.62 million CNY)
Total	44,328 million yen	46,036 million yen
Japanese ODA loan portion	27,108 million yen	27,107 million yen
Exchange Rate	1 CNY=13.00 yen (As of March 2001)	1 CNY=14.29 yen (Average between March 2001 and December 2005)